Dec. 20, 1966 H. A. PURSCHE Re. 26,129

TWO WAY PLOW

Original Filed July 14, 1947 5 Sheets-Sheet 1

Fig. 1

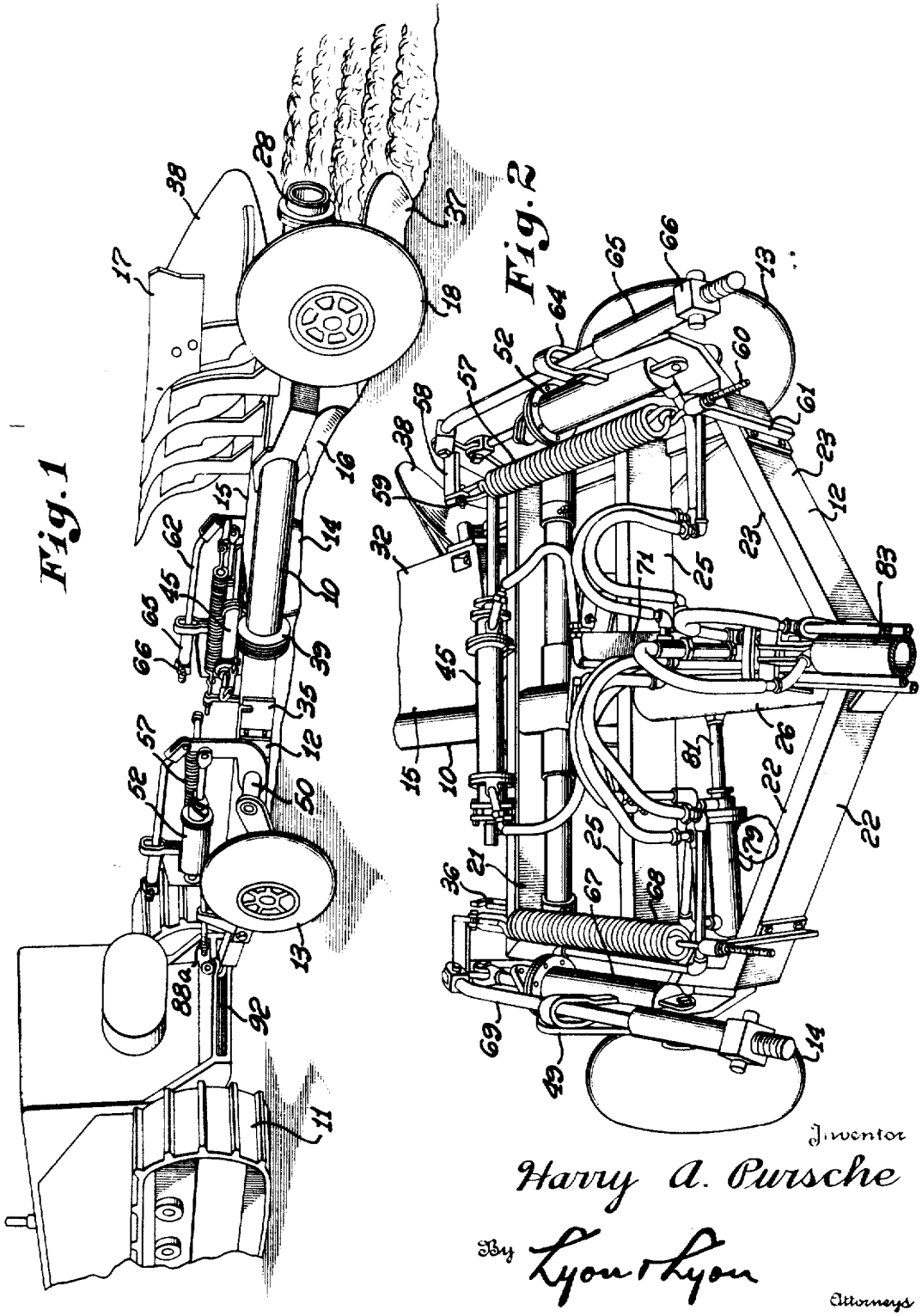


Fig. 2

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Dec. 20, 1966 H. A. PURSCHE Re. 26,129

TWO WAY PLOW

Original Filed July 14, 1947 5 Sheets-Sheet 2

Fig. 3

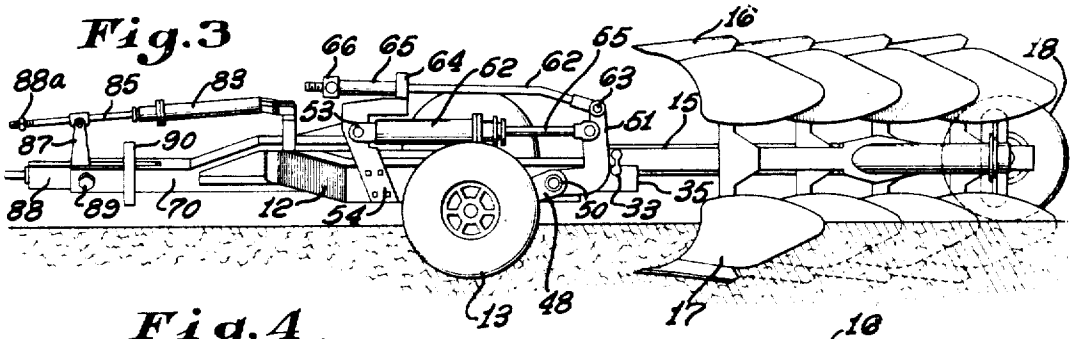


Fig. 4

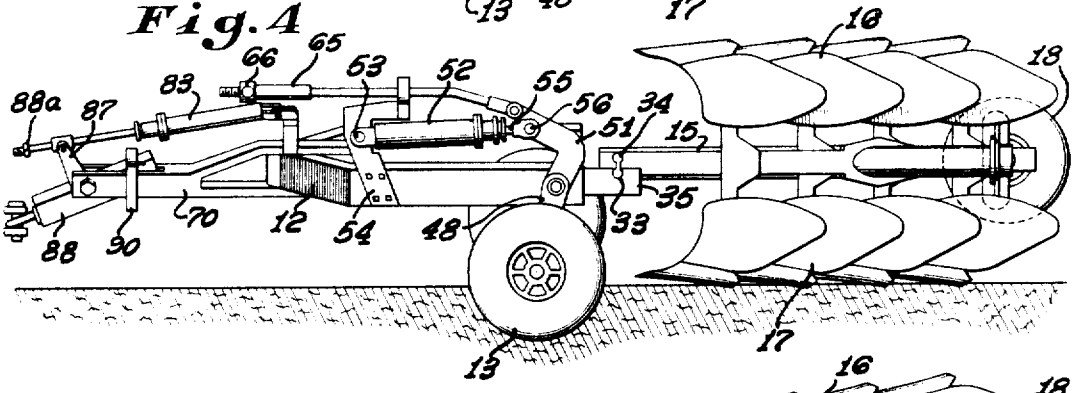


Fig. 5

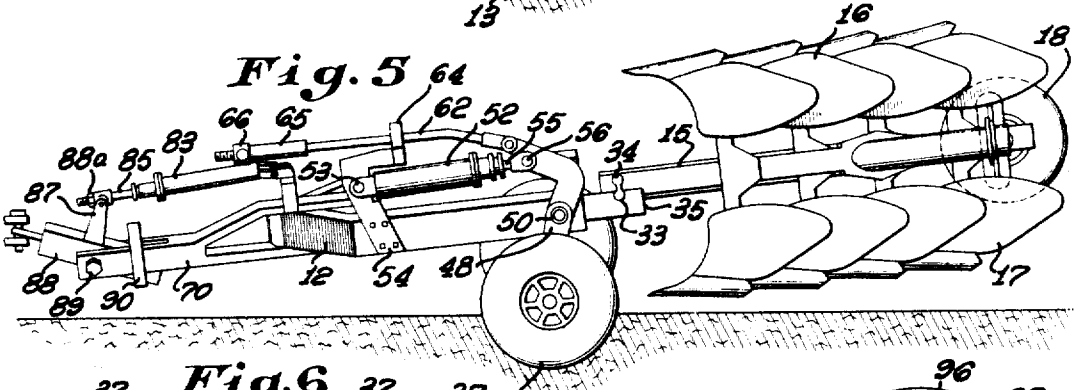


Fig. 6

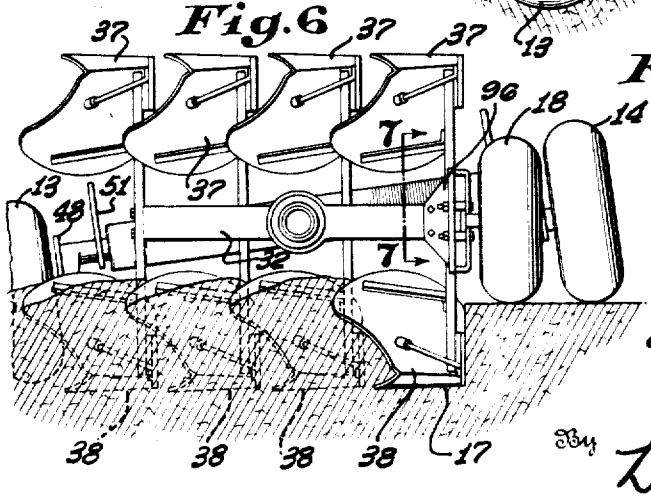
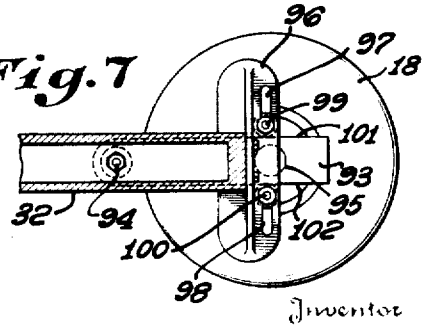


Fig. 7



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Dec. 20, 1966 H. A. PURSCHE Re. 26,129

TWO WAY PLOW

Original Filed July 14, 1947 5 Sheets-Sheet 3

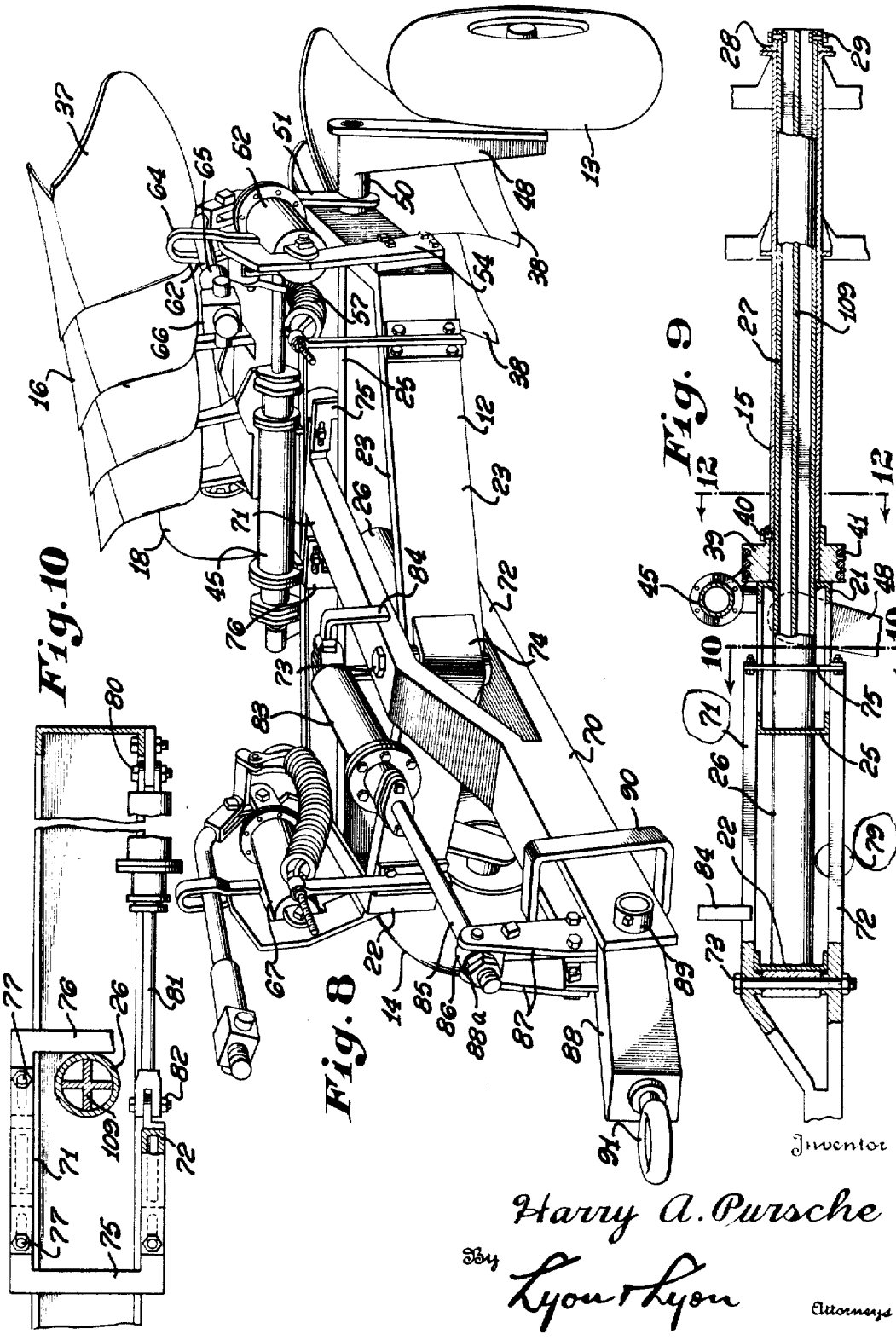


Fig. 10

Fig. 8

Fig. 9

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Dec. 20, 1966 H. A. PURSCHE Re. 26,129

TWO WAY PLOW

Original Filed July 14, 1947 5 Sheets-Sheet 4

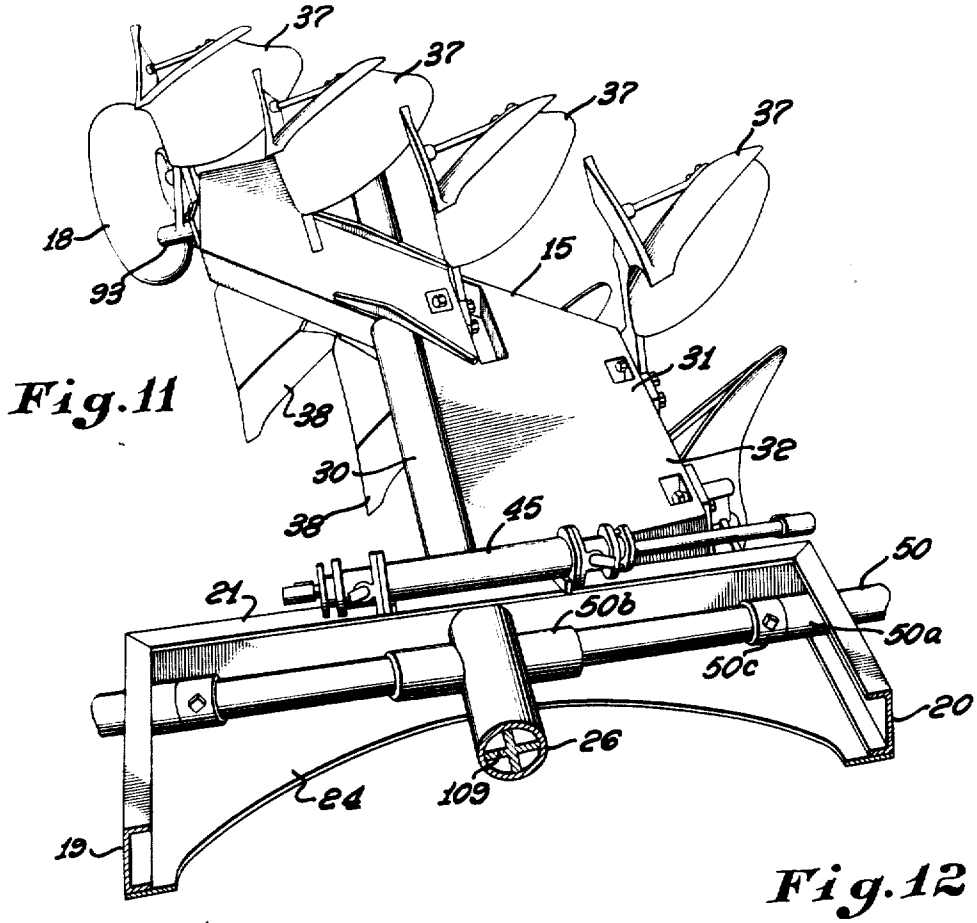
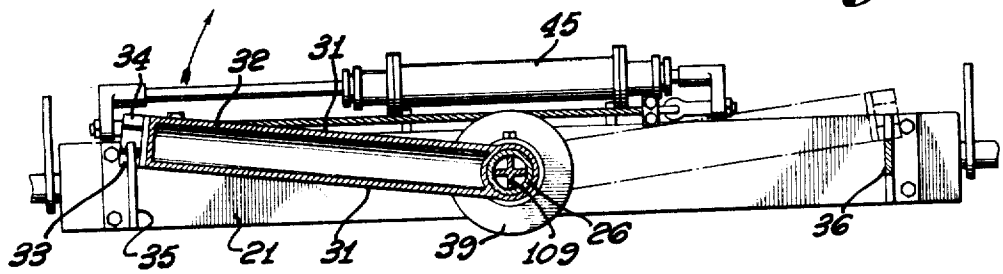


Fig. 11

Fig. 12



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Dec. 20, 1966 H. A. PURSCHE Re. 26,129

TWO WAY PLOW

Original Filed July 14, 1947 5 Sheets-Sheet 5

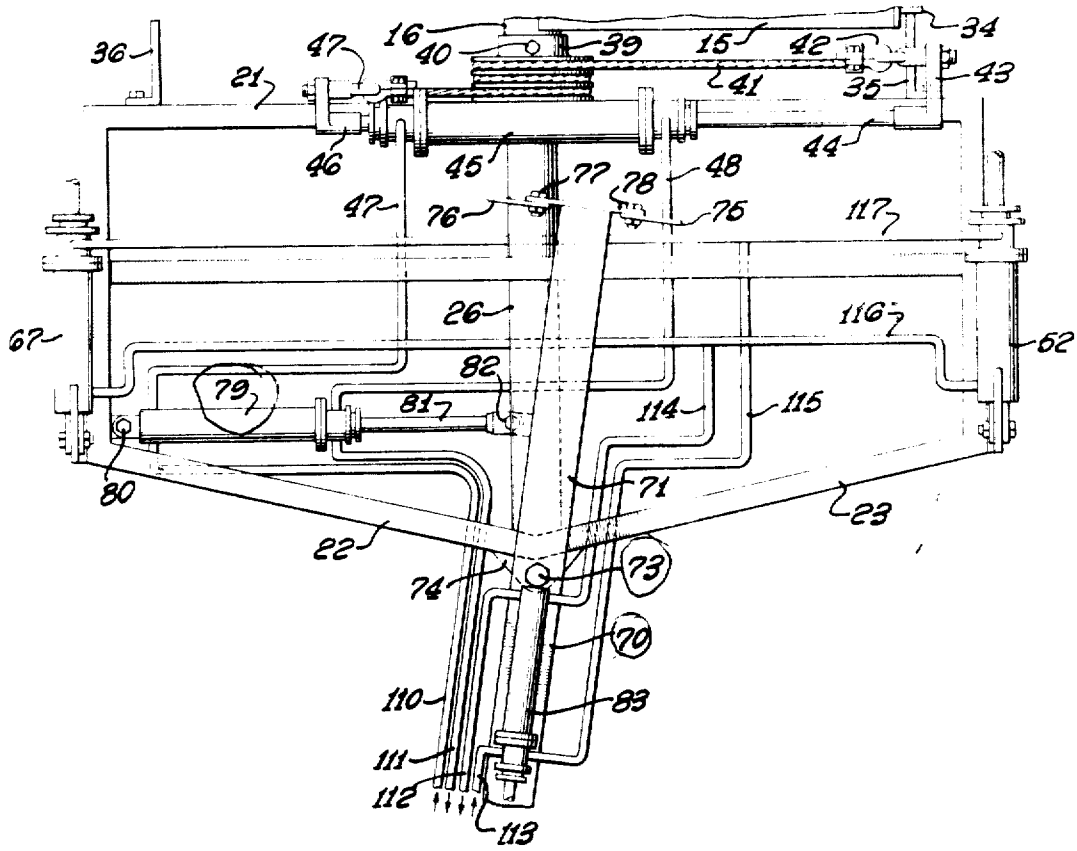


Fig. 13

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26,129

TWO WAY PLOW

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Original No. 2,625,090, dated Jan. 13, 1953, Ser. No. 760,846, July 14, 1947. Application for reissue July 11, 1962, Ser. No. 211,930
28 Claims. (Cl. 172—206)

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This invention relates to a two-way plow, and is particularly directed to a plow assembly having a right hand gang and a left hand gang of plow shares, which may be operated sequentially in plowing a field.

Two-way plows have been found to be superior to the conventional one-way plow in maintaining a level field, so that hills and gullies are avoided and the irrigation of the field is facilitated. One gang of plows is employed while the device is pulled across the field in one direction, and when the device is returned parallel to the furrow just completed the other gang of plows is used and, accordingly, no gully is formed. The usual leveling operations subsequent to plowing are thereby eliminated.

Accordingly, the principal object of this invention is to provide an improved form of two-way plow.

Another object is to provide a plow of this type with which the plow gangs are rotatable about an axis extending longitudinally of the plow frame.

Another object is to provide a plurality of wheels for supporting the entire plow assembly during plowing operations in a manner so that substantially no vertical forces are transmitted to the towing vehicle.

Another object is to provide a plow of this type in which the plow gang assembly, including the right hand plow shares and the left hand plow shares, are removable axially, as a unit.

Another object is to provide a two-way plow of this type employing a rear wheel, which rolls on unplowed ground during the plowing operation, and serves to support the rear portion of the plow frame.

A related object is to provide adjustment for such rear wheel to control the depth of the furrow.

Another object is to provide a carrier for the left hand and right hand plough gangs, which is provided with trunnions adapted to engage one of a pair of spaced brackets mounted on the frame of the plow assembly in order to provide additional stiffness against deflection when one of the plow gangs is in operation.

Another object is to provide power means for laterally shifting the tongue of the plow assembly in coordination with the turning of the carrier to bring one of the plow gangs into operative position, in order that the plow assembly may be properly spaced laterally of the tractor, or other towing vehicle, as it moves back and forth across the field.

A further object is to provide means for jack-knifing the tongue in coordination with vertical movement of the wheels supporting the plow assembly, in order to assist in bringing a plow gang from operative position to inoperative position above the ground surface.

Various other objects and advantageous features of this invention may be had from the following description, and the preferred embodiment thereof may be seen in the accompanying drawings, in which:

FIGURE 1 is a general perspective view showing a plow embodying my invention in operative position behind a tractor.

FIGURE 2 is a perspective view looking down on a portion of the frame of the plow assembly.

FIGURE 3 is a side elevation showing one of the plow gangs in operative plowing position.

FIGURE 4 is a view similar to FIGURE 3 showing the supporting wheels in their lowermost position, with the plow gangs positioned above the surface of the ground.

FIGURE 5 is a view similar to FIGURES 3 and 4, showing the tongue jackknifed to raise the plow gangs higher off the ground surface preparatory to rotating the assembly to bring the other gang of plow shares into operative position.

FIGURE 6 is a rear elevation, partly broken away showing the left hand plow gang in operative plowing position.

FIGURE 7 is a sectional detail taken substantially on the line 7—7, as shown in FIGURE 6.

FIGURE 8 is a perspective view illustrating the tongue in jackknifed position, and with the main supporting wheels in their lowermost position with respect to the frame.

FIGURE 9 is a longitudinal sectional view, partly broken away, showing details of construction of the plow frame and carrier assembly.

FIGURE 10 is a transverse sectional view taken substantially on the line 10—10, as shown in FIGURE 9.

FIGURE 11 is a perspective view, partly in section, showing portions of the frame construction and right and left hand plow gangs.

FIGURE 12 is a transverse sectional elevation, partly broken away, taken substantially on the line 12—12, as shown in FIGURE 9.

FIGURE 13 is a plan view showing connection of the hydraulic lines for operating the various power cylinders incorporated in the plow assembly.

Referring to the drawings, the plow assembly generally designated **10** is adapted to be towed behind a powered vehicle such as the tractor **11**. The plow assembly **10** includes a frame **12** which is carried on supporting wheels **13** and **14**.

The assembly also includes a carrier **15** having a left hand plow gang **17** and a right hand plow gang **16**. A rear wheel **18**, mounted near the rear end of the carrier **15** serves to support the rear portion of the plow assembly and rolls on unplowed ground. The frame **12** includes a pair of side channels **19** and **20** which are in parallel spaced relationship, and which are connected by a rear channel **21** and forwardly extending channels **22** and **23**. A bottom plate **24** extends between the side channels **19** and **20** to provide additional stiffness, and a cross beam **25** is interposed between the rear channel **21** and the forward channels **22** and **23**.

A hollow stationary tube **26** is joined to the intersection of the channels **22** and **23** at its forward end and projects rearwardly parallel to the side channels **19** and **20**, and through the brace **25** and rear channel **21**. This hollow tube **26** extends rearwardly from the rear channel **21** and provides an elongated bearing surface **27** for the carrier **15**. A thrust collar **28** is mounted on the extreme rear portion of the hollow tube and is attached thereto by threaded connections **29**. The tube **26** may be provided with internal stiffening reinforcements **109**.

The carrier, generally designated **15**, includes a pipe **30** welded to laterally extending parallel plates **31**, forming a rigid box section, generally designated **32**. A pair of trunnions **33** and **34** are carried at the outer forward end of the box section **32**. As shown in FIGURE 12, the trunnion **33** is adapted to be supported by the bracket **35**, and the trunnion **34** is adapted to be received by the bracket **36** when the box section **32** assumes the position illustrated by the dashed lines. The brackets **35** and **36** are secured to the rear channel **21** of the frame **12**.

A series of left hand plow shares **38** are individually

secured to the rear portion of the box section **32** and comprise the left hand plow gang **17**. Each of these plow shares **38** may be of conventional design and individually bolted or otherwise attached to the box section **32** of the carrier **15**. Any preferred type of plow share or plow disc may be used. Extending in an opposite direction from the plow shares **38** is another set of right hand plow shares **37** similarly mounted on the carrier **15** and comprising the right hand plow gang, generally designated **16**. The carrier **15** may be rotated on the stationary tube **26**, bringing either the plow gang **16** or **17** into operative position.

Means *including hydraulic turning mechanism* are provided on the frame **12** for rotating the carrier **15** from the position shown in FIGURE 1 to the position shown in FIGURE 11, and as is shown in the drawings, this means includes a torque-receiving element or drum **39** fixed to the forward end of the pipe **16** on the carrier **15** by any suitable means, such as the set screw **40**. A helical groove **41** is formed in the drum **39** and is adapted to receive a plurality of wraps of the flexible cable **41**. One end of the cable **41** is secured at **42** to rearwardly extending bracket **43** mounted on the extended end of piston rod **44**. The piston rod **44** extends from both ends of the power cylinder **45** which is secured to the rear channel **21** of the frame **12**. A bracket **46**, mounted on the other end of the piston rod **44**, is connected at **47** to the other end of the flexible cable **41**. From this description, it will be understood that when pressure fluid is admitted into the power cylinder **45** via line **47**, the piston rod is moved to the position shown in FIGURE 13 to revolve the carrier **15** and bring the right hand plow gang **16** into operative position. The rotation of the carrier **15** is arrested when the trunnion **33** engages the bracket **35**. Similarly, when pressure fluid is admitted through the line **48** the piston rod **44** moves to the left, as is viewed in FIGURE 13, to turn the drum **39** and revolve the carrier **15** to bring the left hand plow gang **17** into operative position. In the latter position the trunnion **34** engages the bracket **36**.

The supporting wheels **13** and **14** are each carried on an arm **48** and **49** which is pivotally mounted with respect to the frame **12**. Since the mounting for the supporting wheel **14** is substantially a duplicate of the mounting provided for the wheel **13**, only the latter will be described in detail. The arm **48** is fixed on a tubular shaft **50**, projecting transversely of the frame **12** through the side channel **20** and stationary bearing sleeve **50a**. The inner end of the tubular shaft **50** is received within stationary bearing sleeve **50b** secured to the tube **26**. A collar **50c** removably secured to the shaft **50** engages the end of the bearing sleeve **50a** to maintain the shaft in position. Fixed to the tubular shaft **50** is a crank arm **51**, which is adapted to be actuated by a power cylinder **52**. The rear end of the power cylinder is pivotally secured at **53** to a bracket **54**, carried on the frame **12**, and the piston rod **55**, extending from the forward end of the power cylinder **52** is pivotally connected to the crank arm **51** at **56**. A tension spring **57** is connected to the upper end of the crank arm **51** by means of the bracket **58** and pin **59**, is adapted to counterbalance the weight of the frame assembly and thereby reduce the load imposed upon the power cylinder **52** in raising frame **12** with respect to the supporting wheel **13**. The forward end of the tension spring **57** is secured by means of adjusting screw **60** to a stationary bracket **61** mounted on the channel **23** of the frame **12**.

Means are provided for limiting the maximum descent of the frame **12** with respect to the supporting wheel **13**, and as shown in FIGURE 3 of the drawings, this means includes a rod **62** pivotally attached to the crank arm **51** at **63**, and extending through a stationary loop **64**, carried on the bracket **54**. A collar **65**, telescopically mounted on the rod **62**, is adapted to engage the loop **64** at one

end and to engage the nut **66** at the other end. The nut **66** is threaded on the end of the rod **62**.

When pressure fluid is supplied to the cylinder **52** the crank arm **51** and supporting arm **48** are rotated in a counterclockwise direction, as viewed in FIGURE 3, to bring the frame from the position shown in FIGURE 3 to the position shown in FIGURE 4. When the pressure fluid is allowed to escape from the power cylinder **52**, the position of the parts return to that shown in FIGURE 3, the frame and associated parts descending by gravity. A power cylinder **67**, acting through parts similar to that described in connection with power cylinder **52**, serves to control the position of the supporting wheel **14**, and is assisted in this action by the tension spring **68** and the rod **69**.

When a conventional one-way plow is used in plowing around the perimeter of a field, the relative widths of the tractor and plow are unimportant, and the tongue of the plow is arranged to position the plow assembly at the proper lateral spacing relative to the tractor. Once established, this adjustment need not be changed while the entire field is plowed. With a two-way plow, however, the plow assembly must ordinarily be shifted laterally with respect to the tractor each time the direction of the tractor is reversed.

Accordingly, I prefer to provide means on the plow assembly for automatically shifting the tongue laterally in order that the plow assembly shall always be laterally positioned at the proper spacing with respect to the tractor, irrespective of which one of the two plow gangs is in plowing position. As shown in FIGURES 8 and 13 of the drawings, the tongue **70** is bifurcated to provide an upper leg **71** and a lower leg **72**, and the apex formed by the forward channels **22** and **23** of the frame **12** is received by the legs **71** and **72**. A pivot pin **73** extends through the housing **74** secured to the channels **22** and **23**, and serves to connect the tongue **70** to the frame **12**. The rear ends of the legs **71** and **72** are connected by U shaped limit stops **75** and **76**, which are bolted at **77** to flanges **78** provided on the legs **71** and **72**.

The limit stops **75** and **76** alternately engage the stationary tube **26** to limit pivotal movement of the tongue **70** about the pivot pin **73**. The limit stops **75** and **76** are adjustable with respect to the flanges **78** so that the maximum angularity of the tongue **70** may be changed to correspond to the widths of different tractors. Power means are provided for pivoting the tongue **70** with respect to the frame **12**, and this means includes the power cylinder **79** which is pivotally secured to the frame at **80**. The piston rod **81** extending from the power cylinder **79** is pivotally connected to the lower leg **72** of the tongue **70** at **82**.

From this description, it will be understood that when the power cylinder **79** is energized to project the rod **81**, the tongue **70** is moved pivotally in clockwise direction to assume the position shown in FIGURE 13. When the power cylinder **79** is energized to retract the piston rod **81** the tongue **70** is shifted to bring the limit stop **75** into contact with the outer surface of the tube **26**.

A power cylinder **83** is pivotally secured at its rear end to a bracket **84** fixed on the upper leg **71** of the tongue **70**. The piston rod **85** passes through a sleeve **86** which is pivotally received between the upward extending plates **87**. A nut **88a** threaded to the forward end of the rod **85** acts as a limit stop for the sleeve **86**. The plates **87** form a crank arm integrally with the connector piece **88** and the latter forms an extension of the tongue **70**. A horizontal pin **89** pivotally connects the connector piece **88** to the tongue **70**, and a rectangular bracket **90** encircling the forward end of the tongue **70** serves to limit the extent of pivotal movement between the parts **88** and **70**. A draft member **91** is provided at the forward end of the connector piece **88** for connection to the draft bar **92** of the tractor **11**.

The function of the power cylinder **83** is to change

the angular relationship of the tongue **70** and connector piece **88** by causing relative pivotal motion about the horizotal pin **89**. The operation of the power cylinder **83** in moving the connector piece **88** from the position shown in FIGURE 3 to the position shown in FIGURE 5 is referred to as "jackknifing the tongue," and the purpose of this operation is to tilt the frame **12** about the main supporting wheels **13** and **14** to raise the plow gangs **16** and **17** clear of the ground surface. When pressure fluid is supplied to the power cylinder **83**, the piston rod **85** is retracted and the engagement of the nut **88a** with the sleeve **86** causes the crank arm **87** to pivot the forward end of the connector piece upwardly against the draft bar **92** on the tractor **11**. The weight of the tractor **11** resists the upward force thus applied with the result that the plow gangs **16** and **17** are raised further off the ground than is possible by moving the wheels **13** and **14** downwardly with respect to the frame **12**.

The piston rod **85** is sufficiently long to allow freedom of movement of the sleeve **86** thereon while one of the plow gangs **16** or **17** is in normal operation. Small irregularities in level of the land cause the plow frame **12** to tilt relative to the tractor **11**, and this action causes pivotal movement between the parts **88** and **70**, without applying any substantial vertical forces to the draft bar **92** of the tractor **11**.

The rear wheel **18** cooperates with the main supporting wheels **13** and **14** to support the plow frame **12** independently of the tractor **11**. As shown in FIGURES 7 and 11 of the drawings, a supporting arm **93** is pivotally secured by pin **94** to the rear portion of the box section **32**. The wheel **18** is carried on the arm **93** by means of the axle **95**. A bracket **96** secured to the end of the box section is provided with spaced vertical slots **97** and **98**, and limit stops **99** and **100** are adjustably positioned in these slots. The stop **99** extends through the slot **97** to engage the surface **101** of the supporting arm **93**, and similarly the stop **100** extends through the slot **98** to engage the surface **102** of the supporting arm **93**. The stops **99** and **100** may be set to provide any desired extent of angular travel of the arm **93** about the pin **94**.

When the left hand plow gang **17** is in operation, as shown in FIGURE 6, the arm **93** is in contact with the stop **99**, and when the right hand gang **16** is in operation, as shown in FIGURE 1, the arm **93** is in contact with the stop **100**. Adjustment of the stops **99** and **100** provides for variation in the depth of the furrows.

As shown in FIGURE 13, four hydraulic lines extend between the plow assembly and the tractor for operation of the various power cylinders **45, 52, 67, 79** and **83** which are carried on the plow frame **12**. A pump and suitable valve control assembly, not shown, are provided on the tractor **11**. The lines **110** and **111** operate the power cylinders **45** and **79** conjointly and in unison, and hence rotation of the carrier **15** and lateral shifting of the tongue **70** are coordinated. The lines **112** and **113** operate the power cylinders **52, 67** and **83**, and hence raising and lowering of the frame **12** on the main supporting wheels **13** and **14** is coordinated with jackknifing of the tongue. The hydraulic line **110** connects with the left end of the double acting cylinder **79** and the line **111** connects with its right end. The hydraulic leads **47** and **48** serve to connect the cylinders **45** and **79** in parallel. Similarly, the line **112** connects to the rear end of cylinder **83**, and line **113** connects to its forward end. The cylinders **52** and **67** are connected in parallel with the cylinder **83** by means of the leads **114, 115, 116** and **117**.

Pressure supplied in line **113** from the pump (not shown) causes the cylinder **83** to jackknife the tongue and causes the cylinders **52** and **67** to raise the frame **12** relative to the main supporting wheels **13** and **14**, the return fluid from the cylinders passing through line **112** back to the pump. If pressure should be supplied to the line **112** by the pump, the gravity descent of the frame **12** relative to the wheels **13** and **14** would be hastened. Assuming the frame **12** to be in its upper position, pressure supplied to the line **110** by the pump causes the cylinder **79** to shift the tongue **70** to the position shown in FIGURE 13 and causes the cylinder **45** to rotate the carrier **15** to bring the right hand plow gang **16** into position, the return fluid from the cylinders **79** and **45** passing through line **111** back to the pump. If pressure is supplied to the line **111**, the tongue **70** is shifted to the opposite side and left hand plow gang **17** is brought into position, the line **110** serving as a return to the pump.

In the operation of that form of my device as shown in FIGURES 1 to 13, the plow **10** is attached behind the tractor **11** by connecting the draft element **91** to the draft bar **92**, and the four hydraulic lines **110, 111, 112** and **113** are connected to the hydraulic pump (not shown) on the tractor. Pressure fluid is admitted through line **113** to cause the power cylinders **52** and **67** to raise the frame **12** and plow gangs **16** and **17** to their highest position, and the power cylinder **83** jackknifes the tongue of the plow to further elevate the plow gangs. The tractor **11** then tows the plow **10** to the field where plowing is to be done. Assuming that the nuts **66** and limit stops **99** and **100** have been previously set to produce the desired depth of furrows, the plow is brought into operation by lowering the proper plow gang **16** or **17** into the earth as the tractor moves across the field. Assuming that the right hand plow gang **16** is in operation, as shown in FIGURE 1, the frame **12** and right hand plow shares **37** descend until further descent is prevented by the rear wheel **18**, and by the stop sleeves **65** meeting the stationary abutment **64**.

When the far end of the field is reached, the right hand plow gang **16** is brought out of the earth while the tractor is still under forward motion. This is accomplished by admitting pressure fluid to the power cylinders **52, 67** and **83**, as described above, the tongue being jackknifed to raise the plow gang **16** clear of the earth by a safe margin. The tractor and plow assembly are then turned around on the field to head back toward the starting point. The left hand plow gang **17** is rotated into position by admitting pressure fluid into the cylinder **45** via the lines **111** and **48**, and this action serves to cause the cylinder **79** to shift the tongue **70** about the pin **73**, as shown. The tractor starts back parallel to the furrow just completed, rolling on the unplowed ground, and towing the plow assembly **10** with the wheel **13** rolling in the furrow as shown in FIGURE 6. The plowshares **38** enter the earth when pressure is relaxed from the power cylinders **52** and **67**. When the end of the field is reached from which plowing operations were originally started, the left hand plow gang **17** is withdrawn from the earth, the tractor and plow assembly are turned around and again started toward the far end of the field with the wheel **14** rolling in the furrow and the right hand plow gang **16** in operation.

It should be noted that each time the tractor and plow are turned around at the end of the field that the tongue **70** is automatically shifted when the plowgang carrier is revolved, and hence the plow assembly is always positioned at the correct lateral spacing behind the tractor. Hence the tractor rolls along the unplowed ground next to the furrow, and the proper side supporting wheel **13** or **14** on the plow assembly rolls in the furrow.

During the plowing operation the plow assembly rolls on its three wheels **13, 14** and **18** and no vertical forces are transmitted to the tractor. Slight irregularities or unevenness in the ground surface are permitted by the connector piece **88** which pivots about the horizontal pin **89** at the forward end of the tongue **70**.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. In a two-way plow assembly, the combination of

a mobile frame, a carrier mounted *to turn* on the frame [and provided with a right hand plow and a left hand plow, means on the frame adapted to turn the carrier] about an axis extending longitudinally of the frame, *a set of right hand plows and a set of left hand plows fixed on said carrier on opposite sides of said axis, means including hydraulic turning mechanism operatively interposed between said frame and said carrier to turn the carrier about said axis independently of either simultaneous forward movement or simultaneous lifting movement of said frame* to bring either [plow] *set of plows* into operative position, and a single supporting wheel on the carrier laterally offset from said axis to roll on unplowed ground when either [plow] *set of plows* is in operation.

2. In a two-way plow assembly, the combination of a frame, side supporting wheels for said frame, *means for connecting the frame to a towing vehicle,* means on the frame for raising the frame relative to said wheels, a carrier mounted *to turn* on the frame [and provided with a right hand plow and a left hand plow, means on the frame adapted to turn the carrier] about an axis extending longitudinally of the frame, *a set of right hand plows and a set of left hand plows fixed on said carrier on opposite sides of said axis, means including hydraulic turning mechanism operatively interposed between said frame and said carrier to turn the carrier about said axis independently of either simultaneous forward movement or simultaneous lifting movement of said frame* to bring either [plow] *set of plows* into operative position, and a single rear supporting wheel on the carrier laterally offset from said axis to roll on unplowed ground when either [plow] *set of plows* is in operation, said rear supporting wheel cooperating with the side supporting wheels to support the frame in operative position.

3. In a two-way plow assembly, the combination of a frame, a stationary [member] *longitudinal beam* extending rearwardly from the frame, a carrier turnably mounted on said [member] *beam* and provided with a *set of* right hand [plow] *plows* and a *set of* left hand [plow] *plows on opposite sides of said beam,* means [on the frame adapted] *including hydraulic turning mechanism operatively interposed between said frame and said carrier* to turn the carrier [relative to said member] *about said beam independently of either simultaneous forward movement or simultaneous lifting movement of said frame* to bring either [plow] *set of plows* into operative position, and a supporting wheel mounted near the rear end of the carrier at a location laterally offset from the stationary [member] beam, whereby it may roll on unplowed ground when either [plow] *set of plows* is in operation.

4. In a two-way plow assembly, the combination of a frame, a pair of laterally spaced ground-contacting wheels for supporting said frame, *means for connecting the frame to a towing vehicle,* a carrier mounted *to turn* on the frame [and provided with] *about an axis extending longitudinally of the frame,* a *set of* right hand [plow] *plows* and a *set of* left hand [plow] *plows fixed on said carrier on opposite sides of said axis,* a third supporting wheel on the carrier at the rear end thereof, means on the frame for raising the frame and carrier relative to said pair of side supporting wheels, said means acting to lift the plows and third wheel clear of the ground [and means on the frame for rotating the carrier and third supporting wheel about a longitudinal axis] *means including hydraulic turning mechanism operatively interposed between said frame and said carrier to turn the carrier and third supporting wheel about said axis independently of either simultaneous forward movement or simultaneous lifting movement of said frame* to bring either [plow] *set of plows* into operative position, said third supporting wheel rolling upon unplowed ground when either [plow] *set of plows* is in plowing position.

5. In a two-way plow assembly, the combination of a frame, a stationary longitudinal [member] *beam* fixed on and extending rearwardly from the frame, a carrier axially insertable on said [member] *beam* in telescopic relation, right and left hand plow gangs on said carrier, [power] means [on the] *including hydraulic turning mechanism operatively interposed between said* frame [adapted] *and said carrier* to turn the carrier *about said beam independently of either simultaneous forward movement or simultaneous lifting movement of said frame* to bring either plow gang into operative position, and a thrust collar removably positioned on said [member] *beam* at the rear end of said carrier adapted to maintain the carrier in position relative to the frame.

6. In a two-way plow assembly, the combination of a frame, a tongue pivotally connected to the frame for relative laterial movement, a carrier mounted on the frame and provided with a right hand plow and a left hand plow, first power means on the frame for moving the carrier to bring either plow into operative position, second power means on the frame for shifting the tongue, and a stationary power transmitting elements interconnecting said first and second power means for conjoint operation, whereby the tongue is shifted in response to movement of the carrier.

7. In a two-way plow assembly, the combination of a mobile frame, a forwardly extending tongue pivotally connected to the frame for relative lateral movement, a rearwardly extending carrier on the frame provided with a right hand plow and a left hand plow, first hydraulic means for turning the carrier about a longitudinal axis to bring either plow into operative position, second hydraulic means on the frame for shifting the tongue, and hydraulic conduits connecting said first and second hydraulic means for conjoint operation, whereby the tongue is shifted in accordance with movement of the carrier.

8. In a two-way plow assembly, the combination of a mobile frame, a forwardly extending tongue pivotally connected to the frame for relative lateral movement, a rearwardly extending carrier on the frame provided with a right hand plow and a left hand plow, fluid pressure responsive means adapted to turn the carrier about a longitudinal axis to bring either plow into operative position, additional fluid pressure responsive means on the frame for shifting the tongue, and fluid conduit means connecting the two said fluid pressure responsive means in parallel for conjoint operation, whereby the tongue is shifted in accordance with movement of the carrier.

9. In a two-way plow assembly, the combination of a mobile frame, a forwardly extending tongue pivotally connected to the frame for relative lateral movement, a rearwardly extending carrier on the frame provided with a right hand plow and a left hand plow, a pair of double acting hydraulic power cylinders on the frame, one of said power cylinders being adapted to turn the carrier to bring either plow into operative position, and the other power cylinder being adapted to shift the tongue in either direction, and means including hydraulic lines for connecting said power cylinders in parallel for operation in unison.

10. In a two-way plow assembly, the combination of a stationary beam member extending longitudinally in the direction of normal movement of the plow assembly, a carrier turnably mounted on said beam member between the ends thereof and provided with a *set of* right hand [plow] *plows* and a *set of* left hand [plow] *plows,* a cross member fixed relative to said beam member at a position in advance of said carrier and plows, lift means connected with the cross member for lifting the entire length of the beam member and thereby raising the carrier and plows out of ground-engaging position, and power means *including hydraulic turning mechanism* mounted on the cross member *and* operatively connected to the carrier *to turn the carrier on said beam member independently of either simultaneous forward movement or*

simultaneous lifting movement of said beam member to bring either [plow] *set of plows* into operative position.

11. In a two-way plow assembly, the combination of a stationary beam member extending longitudinally in the direction of normal movement of the plow assembly, a carrier turnably mounted on said beam member and provided with a right hand plow and a left hand plow, a cross member fixed relative to said beam member at a position in advance of said carrier and plows, lift means connected with the cross-member for lifting the entire length of the beam member and thereby raising the carrier and plows out of ground-engaging position, a spooling drum on the forward end of the carrier, a flexible cable spooled on said drum, and power means independent of the lift means mounted on the cross member and operatively connected to the cable, the power means acting through the cable and drum to turn the carrier to bring either plow into operative position.

12. In a two-way plow assembly, the combination of a stationary beam member extending longitudinally in the direction of normal movement of the plow assembly, a carrier turnably mounted on said beam member between the ends thereof and provided with a right hand plow and a left hand plow, a cross member fixed relative to said beam member at a position in advance of said carrier and plows, means including a hydraulic power cylinder carried on the cross member for turning the carrier to bring either plow into operative position, and lift means connected with the cross member for lifting the entire length of the beam member and thereby raising the carrier and plows out of ground-engaging position.

13. In a two-way plow assembly, the combination of a stationary beam member extending longitudinally in the direction of normal movement of the plow assembly, a carrier turnably mounted on said beam member and provided with a right hand plow and a left hand plow, a cross member fixed relative to said beam member at a position in advance of said carrier and plows, power means including a double-acting hydraulic cylinder mounted on the cross member parallel thereto, a flexible element connected for operation by said hydraulic cylinder and encircling a portion of the carrier to bring either plow into operative position, and lift means connected wtih the ends of the cross member for lifting the carrier and plows out of ground-engaging position.

14. In a two-way plow assembly, the combination of a frame, *means for connecting the forward end of the frame to a towing means, a rearwardly extending beam fixed to said frame, a carrier turnably mounted on the beam intermediate the ends thereof and provided with a set of right hand plows and a set of left hand plows,* a pair of laterally spaced ground-contacting wheels for supporting *the front portion of* the frame *independently of said towing means when either set of plows is in operation,* [a rearwardly extending beam fixed to said frame, a carrier turnably mounted on the beam intermediate the ends thereof and provided with a right-hand plow and a left-hand plow, a tail wheel supported on the carrier,] *a tailwheel, means connecting the tailwheel to the carrier for supporting the rear portion of the carrier when either set of plows is in operation,* means on the frame for raising the frame and carrier relative to said pair of supporting wheels [, said means acting] to tilt the beam and raise its [outer] *rearward* end to lift the plows and tailwheel clear of the ground *when said frame is connected to said towing means,* and [means on the frame independent of movement of the plow assembly relative to the ground for turning the carrier relative to the beam] *hydraulic turning mechanism operatively interposed between said frame and said carrier to turn the carrier about said beam independently of either simultaneous forward movement or simultaneous lifting movement of said frame* to bring either [plow] *set of plows* into operative position.

15. In a two-way plow assembly, the combination of: a frame, a pair of laterally spaced ground-contacting wheels for supporting the frame, a forwardly extending tongue pivotally connected to the frame and adapted for connection to a towing vehicle, a rearwardly extending beam fixed to said frame, a carrier turnably mounted on the beam intermediate the ends thereof and provided with a right-hand plow and a left-hand plow, a tail wheel supported on the carrier, means on the frame independent of movement of the plow assembly relative to the ground for raising the frame and carrier relative to said pair of supporting wheels, said means acting to tilt the beam about the forward end of the tongue and raise the outer end of the beam to lift the plows and tail wheel clear of the ground, and means on the frame for turning the carrier relative to the beam to bring either plow into operative position.

16. In a two-way plow assembly, the combination of: a frame, a pair of laterally spaced ground contacting wheels for supporting the frame, a forwardly extending tongue pivotally connected to the frame and adapted for connection to a towing vehicle, a rearwardly extending beam fixed to said frame at longitudinally spaced locations, a carrier mounted to turn on the beam and provided with a right-hand plow and a left-hand plow, a tail wheel supported on the carrier adapted to roll on unplowed ground when either plow is in operation, means on the frame for raising the frame and carrier relative to said pair of supporting wheels, said means acting to raise the beam and lift the plows and tail wheel clear of the ground, first power means on the frame for moving the carrier to bring either plow into operative position, second power means on the frame for shifting the tongue toward the same side of the frame on which the tail wheel is positioned, and means interconnecting the first and second power means for conjoint operation.

17. In a two-way plow assembly the combination of: a frame, a stationary longitudinal beam fixed on the frame and extending rearwardly therefrom, a carrier turnably mounted on the beam and provided with ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, means *including a hydraulic power cylinder carried on said frame* for turning the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow as desired, *said turning movement of the carrier being independent of either siultaneous forward movement or a simultaneous lifting movement of the frame* means to support the plow assembly in operative position, said means including a pair of laterally spaced ground-contacting wheels on the frame and a third supporting wheel on the carrier laterally offset to roll on unplowed ground in either operative position of the carrier, *means for connecting the frame to a towing vehicle,* and means on the frame for raising the frame and carrier relative to said pair of side supporting wheels.

18. In a two-way plow assembly, the combination of: a mobile frame having a rearwardly extending longitudinal beam fixed thereto, a carrier turnably mounted on the beam intermediate the ends thereof and provided with ground-engaging plow gangs for producing either a right-hand furrow or a left-hand furrow, means *including a hydraulic power cylinder carried* on the frame for turning the carrier to either of two operative positions relative to the frame to cause the plow gangs to produce a right-hand furrow or a left-hand furrow as desired, *said turning movement of the carrier being independent of either simultaneous forward movement or a simultaneous lifting movement of the frame* each plow gang including a plurality of individual plow bodies symmetrically positioned on the carrier so that in operative position on level ground each plow gang has at least one plow body on each side of a vertical plane containing the axis of said beam, and inter-engaging means on the carrier and frame adapted to limit the extent of turning movement of the carrier relative to the frame.

19. In a two-way plow assembly, the combination of: a frame, a stationary longitudinal member fixed on and extending rearwardly from the frame, ground-engaging wheels supporting the frame, a carrier axially insertable on said longitudinal member in telescopic relation, the carrier having ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, power means *including a hydraulic power cylinder carried* on the frame for turning the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow as desired, *said turning movement of the carrier being independent of either simultaneous forward movement or a simultaneous lifting movement of the frame* means on the frame to raise and lower the frame relative to said wheels, *means for connectnig the frame to a towing vehicle*, and a thrust collar removably positioned on said longitudinal member at the rear end of said carrier adapted to maintain the carrier in position relative to the frame.

20. In a two-way plow assembly, the combination of: a frame, a tongue pivotally connected to the frame for relative lateral movement, a carrier mounted on the frame and provided with ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, power means on the frame for turning the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow as desired, second power means on the frame for shifting the tongue, and stationary power-transmitting elements interconnecting said first and second power means for conjoint operation, whereby the tongue is shifted in response to movement of the carrier.

21. In a two-way plow assembly, the combination of: a mobile frame, a forwardly extending tongue pivotally connected to the frame for relative lateral movement, a rearwardly extending carrier on the frame provided with ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, first hydraulic means on the frame for turning the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow as desired, second hydraulic means on the frame for shifting the tongue, and hydraulic conduits connecting said first and second hydraulic means for conjoint operation, whereby the tongue is shifted in accordance with movement of the carrier.

22. In a two-way plow assembly, the combination of: a mobile frame, a forwardly extending tongue pivotally connected to the frame for relative lateral movement, a rearwardly extending carrier on the frame provided with ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, fluid pressure responsive means on the frame for turning the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow as desired, additional fluid pressure responsive means on the frame for shifting the tongue, and fluid conduit means connecting the two said fluid pressure responsive means in parallel for conjoint operation, whereby the tongue is shifted in accordance with movement of the carrier.

23. In a two-way plow assembly, the combination of: a mobile frame, a forwardly extending tongue pivotally connected to the frame for relative lateral movement, a rearwardly extending carrier on the frame provided with ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, a pair of dougle-acting hydraulic power cylinders on the frame, one of said power cylinders being adapted to turn the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow as desired, and the other power cylinder being adapted to shift the tongue in either direction, and means including hydraulic lines for connectnig said power cylinders in parallel for operation in unison.

24. In a two-way plow assembly, the combination of: a frame, a pair of laterally spaced ground-contacting wheels for supporting the frame, a forwardly extending tongue pivotally connected to the frame and adapted for connection to a towing vehicle, a rearwardly extending beam fixed to said frame at longitudinally spaced locations, a carrier mounted to turn relative to the beam and provided with ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, a tail wheel assembly supported on the carrier, means on the frame for raising the frame and carrier relative to said pair of supporting wheels, said means acting to raise the beam and lift the plow means and tail wheel assembly clear of the ground, first power means on the frame for turning the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow as desired, a second power means on the frame for shifting the tongue toward the same side of the frame on which the tail wheel assembly is positioned, and means interconnecting the first and second power means for conjoint operation.

25. In a two-way plow assembly, the combination of: a frame, a stationary longitudinal member fixed on and extending rearwardly from the frame, a carrier having a tubular element axially insertable on the longitudinal member in telescopic relation, a thrust collar removably positioned at the rearward end of said longitudinal member and engaging the rear end of said tubular element to maintain the carrier in position relative to the frame, ground-engaging plow means for producing either a right-hand furrow or a left-hand furrow, support means for said plow means mounted on said tubular element at a location in advance of the position of said thrust collar, and power means *including a hydraulic power cylinder carried* on the frame for turning the carrier to either of two operative positions relative to the frame to cause the plow means to produce a right-hand furrow or a left-hand furrow, as desired, *said turning movement of the carrier being independent of either simultaneous forward movement or a simultaneous lifting movement of the frame.*

26. In a two-way plow assembly, the combination of: a frame, a stationary longitudinal member fixed on and extending rearwardly from the frame, a carrier having a tubular element axially insertable on the longitudinal member in telescopic relation, a thrust collar removably positioned at the rearward end of said longitudinal member and engaging the rear end of said tubular element to maintain the carrier in position relative to the frame, a right-hand plow and a left-hand plow for producing either a right-hand furrow or a left-hand furrow, support means for said plows mounted on said tubular element at a location in advance of the position of said thrust collar, and power means *including a hydraulic power cylinder carried* on the frame for turning the carrier to either of two operative positions relative to the frame to bring either of said plows into ground-engaging position, *said turning movement of the carrier being independent of either simultaneous forward movement or a simultaneous lifting movement of the frame.*

27. In a two-way plow assembly, the combination of: a frame, a stationary longitudinal beam member fixed on and extending rearwardly from the frame, a carrier turnably mounted on the beam member and provided with ground-engaging plow means for producing a right-hand furrow or a left-hand furrow, power means for turning the carrier relative to the beam member including a torque receiving element fixed on the forward end of said carrier, a hydraulic power cylinder assembly mounted on the frame and having a power element movable in a plane normal to said beam member, and means including an intermediate power transmitting element

operatively interposed between the power element and the torque receiving element, whereby the power cylinder assembly may turn the carrier in either direction.

28. In a two-way plow assembly, the combination of a mobile frame having a cross member, a carrier mounted to turn on the frame about an axis extending longitudinally of the frame, a set of right hand plows and a set of left hand plows fixed on said carrier on opposite sides of said axis, means including hydraulic turning mechanism operatively interposed between said frame cross member and said carrier to turn the carrier about said axis independently of either simultaneous forward movement or simultaneous lifting movement of said frame to bring either set of plows into operative position, and a single supporting wheel on the carrier laterally offset from said axis to roll on unplowed ground when either set of plows is in operation.

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