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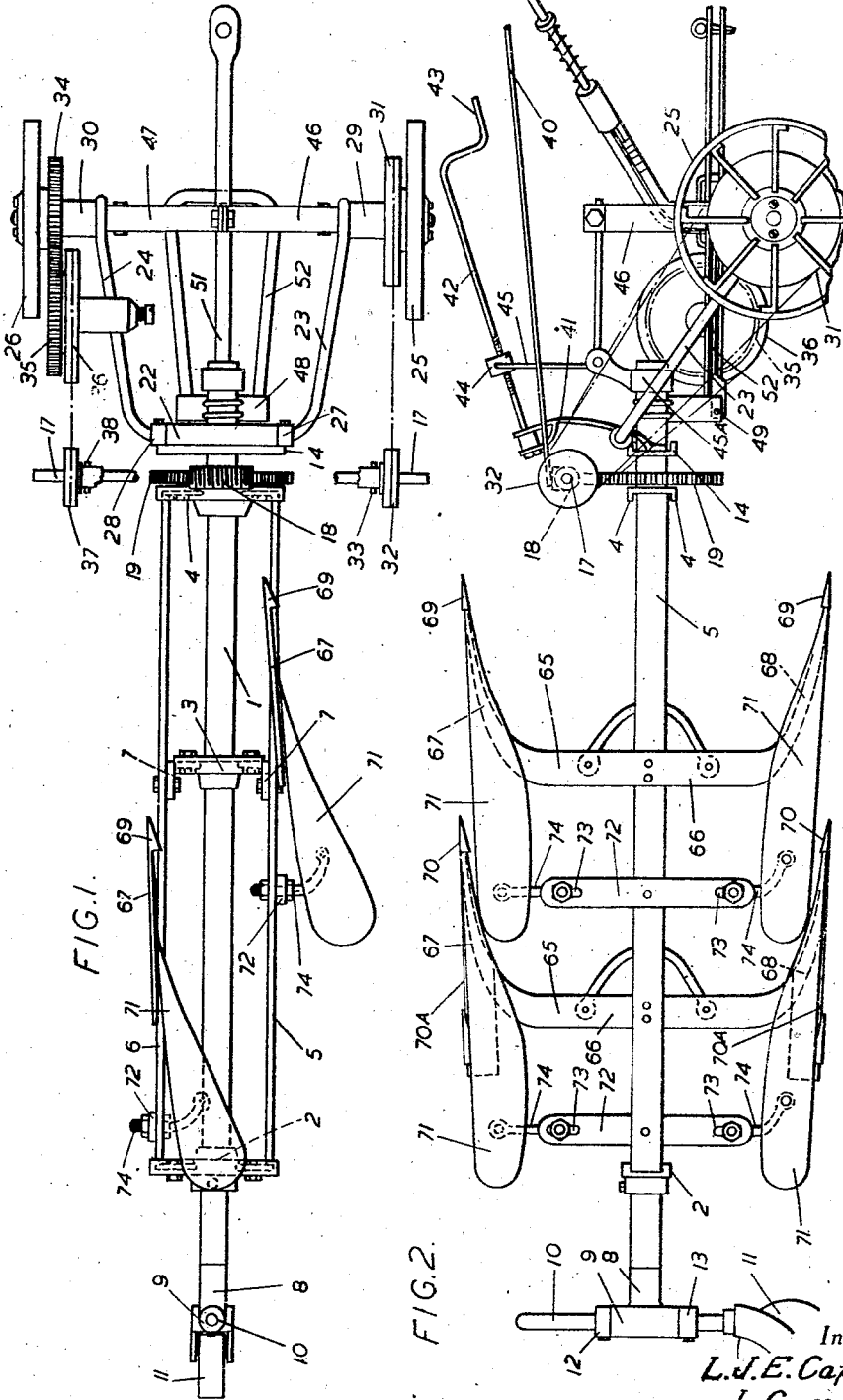
L. J. E. CAPON ET AL

2,426,548

PLOUGH

Filed Feb. 9, 1944.

6 Sheets-Sheet 1



Inventors
L. J. E. Capon
J. Carne

By: Kimmel & Crowell Attorneys

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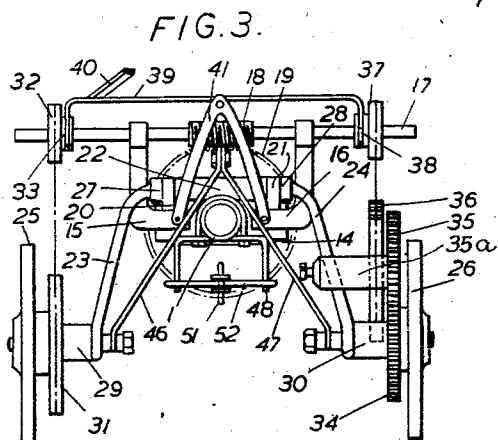
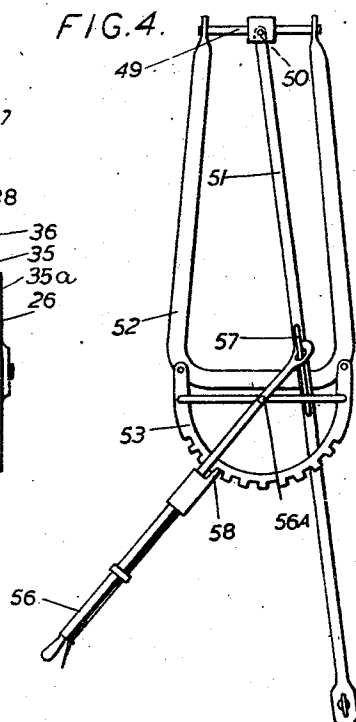
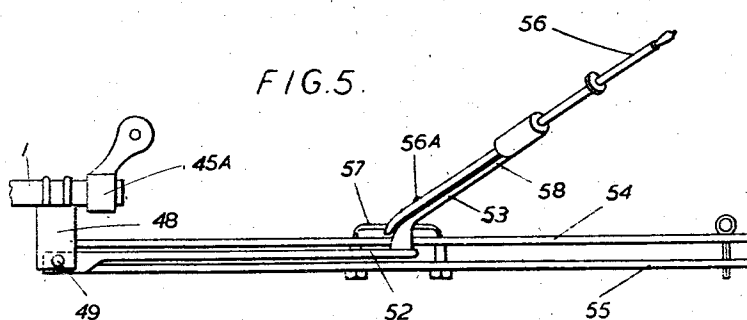
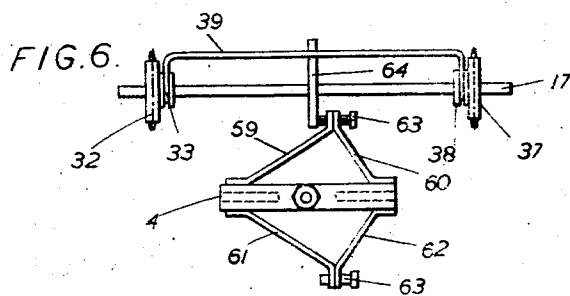
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Inventors
L. J. E. Capon
J. Carne

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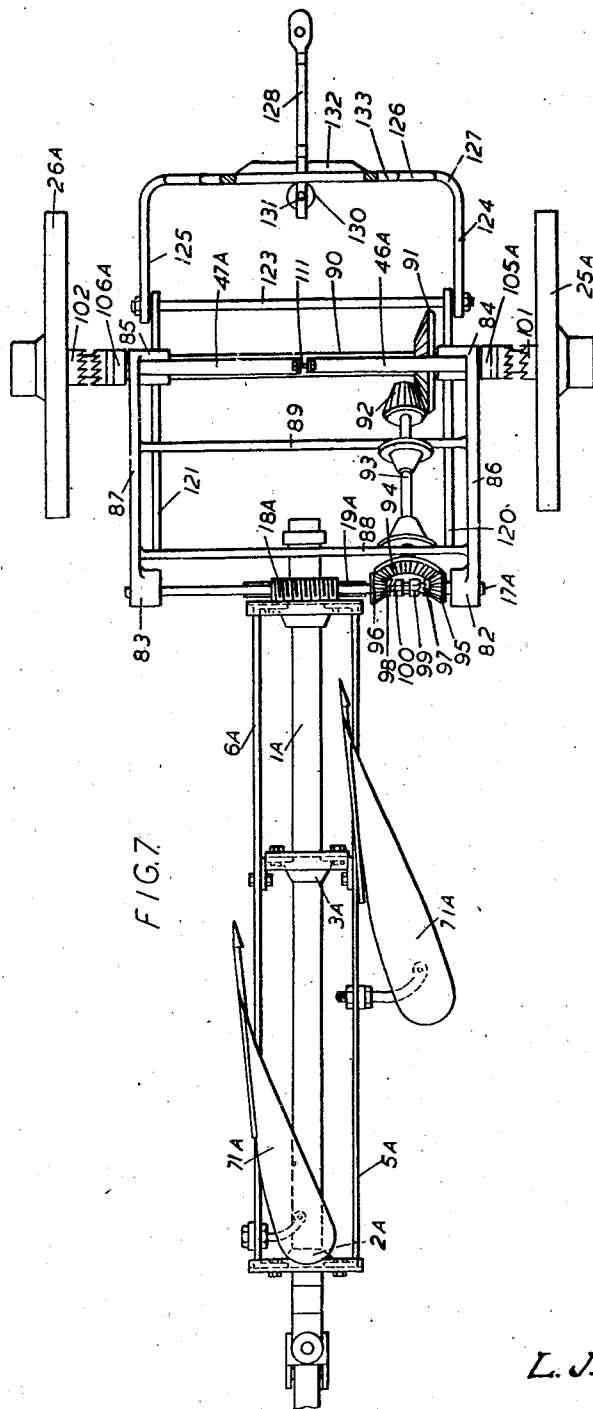


FIG. 7

Inventors
L. J. E. Capon
J. Carne

By: Kimmel & Crowell Attorneys

Aug. 26, 1947.

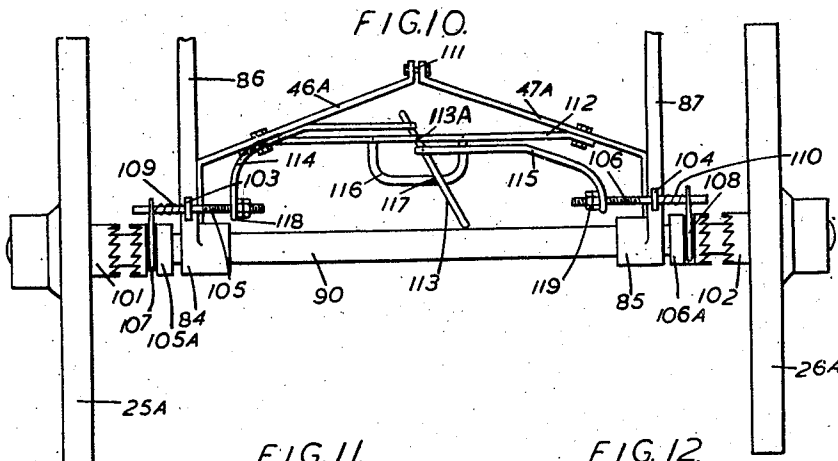
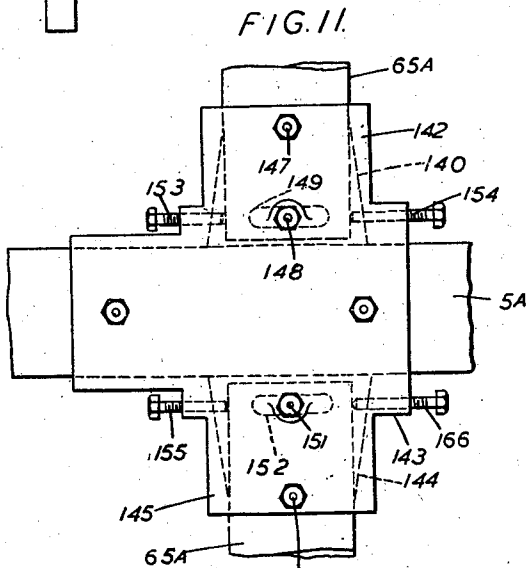
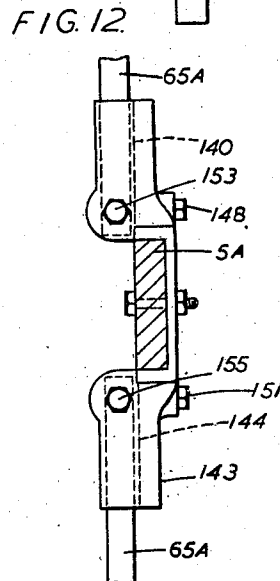
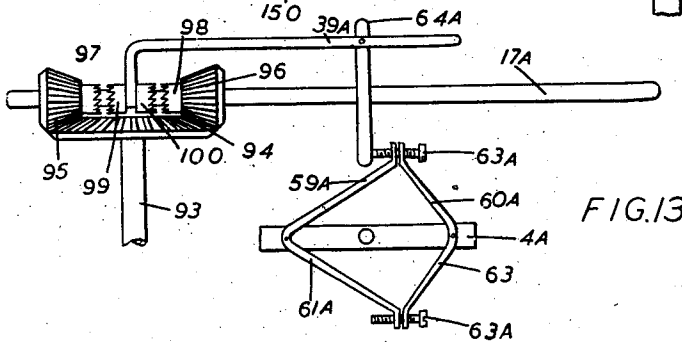
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Inventors
L. J. E. Capon
J. Carne

By: Kimmel & Crowell Attorneys

Aug. 26, 1947.

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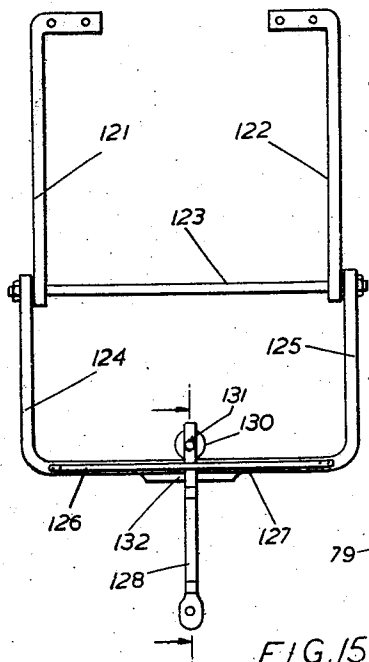


FIG. 14.

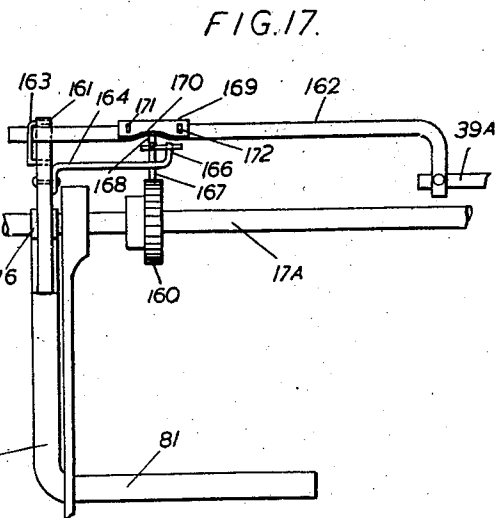


FIG. 17.

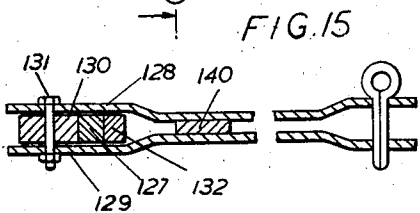


FIG. 15

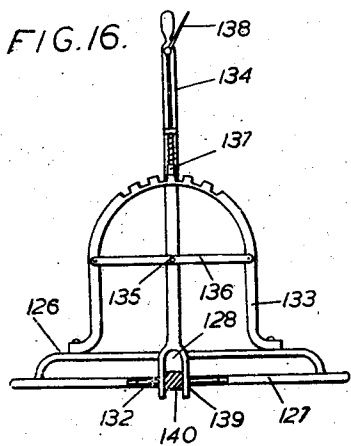


FIG. 16.

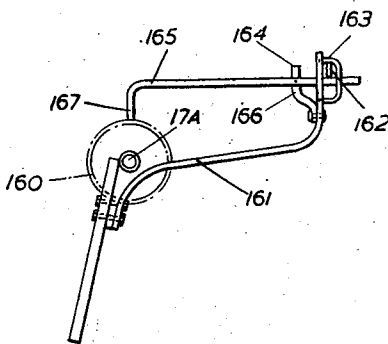


FIG. 18

L.J.E. Capon
J Carne
Inventors

By: Kimmel & Crowell Attorneys

UNITED STATES PATENT OFFICE

2,426,548

PLOUGH

Leslie John Edward Capon, East Taphouse, and
John Carne, East Taphouse, near Liskeard,
England; said Carne assignor to said Capon

Application February 9, 1944, Serial No. 521,678
In Great Britain November 13, 1942

14 Claims. (Cl. 97—26)

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This invention relates to a plough of the type which comprises a main shaft or bearer arranged longitudinally of the machine forming part of the plough frame and supported above the ground by road wheels, bearings or supporting members, turnably mounted upon the said main shaft or bearer and spaced thereon in the longitudinal direction of the shaft or bearer, at least one plough share and its cooperating parts carried by said bearings or supporting members on one side of the axis of said main shaft or bearer and at least one plough share and its cooperating parts carried by said bearings or supporting members on the other side of said axis, the plough shares being spaced in the longitudinal direction and spaced transversely at a distance equal to the distance between two furrows and, by virtue of their connections to the said bearings or supporting members, adapted to be swung about the axis of the main shaft or bearer.

One of the objects of the invention is to provide a plough of the type referred to which is so constructed that it is only necessary to swing the plough shares out of the ground and unnecessary to lift the plough as a whole at the end of the field in order to turn it in readiness to plough fresh furrows.

The invention is particularly applicable to tractor-drawn ploughs and another object of the invention is to provide a plough of the type referred to which can be used for ploughing between the ends of the field, thus avoiding the disadvantages of one-way tractor drawn ploughs which circulate around and from the outside to the center of the field.

A further object of the invention is to provide a plough, comprising in combination a plough frame, a bearer arranged longitudinally of the plough and forming part of said frame, a traveling wheel for supporting the rear end of said bearer at a predetermined fixed height above the ground, an axle arrangement carried by said frame at the front of said bearer, transversely-spaced road wheels carried by said axle arrangement, plough beam supporting members turnably mounted upon said bearer and spaced thereon in the longitudinal direction between the front and rear ends of said bearer, plough beams interconnecting said supporting members and arranged on opposite sides of the rotational axis thereof, at least one plough share and its cooperating parts carried by one of said beams on each side of the latter, at least one plough share and its cooperating parts carried by the other beam on each side of the latter, and spaced from said

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first mentioned plough shares in the longitudinal direction, a worm wheel fixed to the foremost of said beam supporting members, a worm shaft turnably supported by said plough frame, a worm fixed to said worm shaft, said worm being in permanent engagement with said worm wheel, a driving transmission between said road wheels and said worm shaft, said transmission including clutch means on said worm shaft and means for shifting said clutch means from neutral to operative positions, whereby the worm shaft, said worm, and said beams may be rotated in either direction to cause the operative plough shares to be swung out of the ground and the inoperative plough shares to swing into the ground and whereby it is only necessary to swing the operative plough shares out of the ground and unnecessary to lift the plough as a whole at the end of the field in order to turn it in readiness to plough fresh furrows.

Another object is to provide a plough of the type referred to in which the swinging movements of the plough shares is carried out under manual control and is stopped automatically.

Further objects and advantages of the invention will be apparent from the following description:

Further constructional features of the invention will be referred to hereinafter.

Constructional forms of the present invention, applied to two-furrow ploughs, are shown, by way of example, on the accompanying sheets of drawings, whereon:

Fig. 1 is a plan view, with certain details omitted for clearness, of a form of plough in which the beams carrying the plough bodies, moldboards, landsides and plough shares are adapted to be turned by motion transmitted from both the road wheels;

Fig. 2 is a longitudinal elevation corresponding to Fig. 1, many of the parts of the plough at the front of the plough being omitted, however;

Fig. 3 is a front end view of the plough;

Fig. 4 is a plan view of the draught frame and draw bar;

Fig. 5 is a side view corresponding to Fig. 4, but drawn to a different scale;

Fig. 6 is a diagrammatic view of the means for automatically stopping the swinging movements of the plough bodies, plough shares, moldboards and landsides in either direction;

Fig. 7 is a diagrammatic plan view showing some of the constructional details of a modified form of plough in which the beams carrying the plough bodies, moldboards, landsides and plough

shares are adapted to be turned by motion transmitted by the axle upon which the road wheels are turnably mounted;

Fig. 8 is a longitudinal elevation corresponding to Fig. 7, many of the constructional details of the front of the plough being omitted;

Fig. 9 is a rear view of the plough shown in Figs. 7 and 8;

Fig. 10 is a fragmentary view, to a larger scale, of the plough shown in Figs. 7 and 8, and shows the means for coupling the road wheels to their axle;

Fig. 11 is a fragmentary view, to an enlarged scale, showing the method of supporting the inner ends of the plough body parts used in the plough shown in Figs. 7 and 8;

Fig. 12 is a side view corresponding to Fig. 11;

Fig. 13 is a diagrammatic view of the mechanism used in the plough shown in Figs. 7 and 8 for automatically stopping the turning movements of the beams carrying the plough bodies, moldboards, landsides and plough shares;

Fig. 14 is a diagrammatic plan view showing the draught frame and draw bar mechanism used in the plough shown in Figs. 7 and 8, the adjusting lever and the notched quadrant being omitted from this figure;

Fig. 15 is a fragmentary view of the draw bar;

Fig. 16 is an end view of the draught frame and draw bar, showing the adjusting lever and the notched quadrant;

Fig. 17 is a fragmentary view of the rear of part of the frame of the plough shown in Figs. 7 to 16 and shows automatically acting catch means for preventing movement of the beams and plough bodies during the ploughing operation; and

Fig. 18 is an end view corresponding to Fig. 17. Referring first to Figs. 1 to 6:

The plough comprises a main shaft or bearer arranged on the longitudinal axis of the plough. Turnably mounted on the shaft are three spaced main bearings 2, 3 and 4, each comprising two opposed lateral arms. Two beams 5 and 6 are secured to the three bearings, one on one side of the shaft and one on the other and parallel thereto. The ends of each beam are turned inwards and are adjustably secured to the lateral arms of the rear and front bearings 2 and 4, and brackets 7, fixed to the beams between the front and rear ends thereof, are adjustably secured to the arms of the other bearings 3, see Fig. 1. Thus, the transverse distance between the beams 5 and 6, which carry the plough bodies, can be altered to adjust the spacing of the two furrows. The rear end of the main shaft 1 projects through the rear main bearing 2 and on it is fixed a T-piece 8, the vertical limb 9 of which is bored to provide a bearing for the vertical axle 10 of a swivelling rear wheel 11. Collars 12 and 13 are adjustably fixed to the axle above and below the said bearing, so that the height of the wheel can be adjusted.

A supporting member 14, see particularly Fig. 3, is fixed on the main shaft 1 at the front of the front main bearing 4 and on it are fastened two brackets 15 and 16 each provided with a bearing at its top end. A worm shaft 17 is turnably mounted in the two bearings and extends across the plough at right angles to the axis of the main shaft 1. A worm 18 is fixed on the worm shaft and is engaged with a worm wheel 19, see Fig. 1, which is fixed to the front face of the front main bearing 4. Thus, the worm wheel 19, the three main bearings 2, 3 and 4 and the beams 5

and 6 carrying the plough bodies can be turned around the main shaft 1 by turning the worm 18. The said supporting member 14, see Fig. 3, also carries two other laterally-spaced bearings 20 and 21 supporting a turnable transverse tubular socket 22, in the ends of which there are engaged the shorter limbs of angled axle supports 23 and 24 upon which the two main travelling wheels 25 and 26 are turnably supported as described hereinafter. Collars 27 and 28 are formed at the ends of the tubular socket 22 so that the shorter limbs of the axle supports can be fixed therein by means of set screws, the tubular socket and the axle supports thus being turnable in the bearings. The two axle supports extend downwardly and forwardly. Transverse axles 29 and 30 are secured at, and project outwardly from, the lower end of the axle supports. The axle 29 carries the rotatable road wheel 25 to which is fixed a sprocket 31 connected by a chain to a chain sprocket 32 which is loosely mounted on the said worm wheel shaft 17 but can be caused to turn therewith by means of a sliding clutch 33. On the axle 30 secured at, and projecting outwardly from, the lower end of the other axle support 24, is fixed a gear wheel 34 which meshes with another gear wheel 35 fixed to a layshaft 35A. A chain sprocket 36 is fixed to the gear wheel 35 on the layshaft and is connected by a chain to another sprocket 37 loosely mounted upon the said worm shaft 17 but adapted to be turned therewith by means of a sliding clutch 38. The two sliding clutches 33 and 38 are connected by a clutch selector bar 39, Fig. 3, to which a clutch operating lever 40 is fixed, the lever extending forwards within reach of the tractor seat, as shown in Fig. 2.

Thus, the worm shaft 17 can be driven from one or the other of the road wheels by engaging one or the other of the two clutches 33 and 38. When one of the clutches is engaged the worm shaft is turned in one direction, and it is turned in the opposite direction if the other clutch is engaged, whereby the main bearings 2, 3 and 4, the beams 5 and 6 and the plough bodies can also be turned in opposite directions about the main shaft 1 through the worm 18 and worm wheel 19.

An upstanding bracket 41 is also fixed to the said supporting member 14, and to it is turnably attached a screwed shaft 42 having a cranked handle 43, see Fig. 2. A nut 44 is mounted on the screwed shaft and by means of a bell crank lever 45 pivoted to a bracket 45A fixed to the front end of the main shaft 1, is connected to two stays 46 and 47 which are respectively connected to the axles 29 and 30 of the road wheels, see Fig. 3. By turning the crank handle 43, the bell crank lever 45 is turned about its fulcrum support 45A and, through the said stays 46 and 47, the axle supports 23 and 24 of the road wheels can be swung upwards or downwards so as to adjust the height of the main shaft 1, the rear swivelling wheel 11 being correspondingly adjusted.

The pull of the tractor is taken by the main shaft 1 on which, in front of the said supporting member 14, there is fixed a transverse plate 48 having downturned ends. The plate is arranged below the main shaft 1 and a transverse shaft 49 is fixed in the downturned ends of the plate. The shaft carries a knuckle joint 50 for the rear end of the draw bar 51. The shaft also carries a forwardly-extending draught frame 52 of U-shape, see also Figs. 4 and 5, to the transverse front end of which an upwardly and forwardly-inclined notched quadrant 53 is fixed. The draw

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bar comprises interconnected upper and lower bars 54 and 55 between which the front end of the draught frame 52 is disposed. A forwardly and upwardly extending lever 56 is pivotally carried at 56A on the draught frame at a point between the quadrant and the front end of the frame. The rear end of the lever is formed with a slot in which is engaged a staple 57 fixed on top of the draw bar at the rear of the pivotal connection of the lever. The latter carries a manually-operable, spring-pressed catch 58 adapted to engage with one or other of the notches in the quadrant. When the catch 58 is disengaged, the lever can be swung about its pivot 56A so as to swing the draw bar in the opposite direction about the knuckle joint 59, the bar being fixed in its adjusted position by re-engaging the catch. The lever is of such a length that it can be reached from the tractor seat, and the draw bar can thus be adjusted while the plough is in operation in order, for example, to alter the draught of the plough.

Referring to Fig. 6 an automatic throw-out mechanism is provided for the clutches 33 and 38 associated with the chain sprockets 32 and 37 on the worm shaft 17 and comprises two plate brackets 59 and 60 fixed on one side of the front main bearing 4 and two plate brackets 61 and 62 fixed on the opposite side thereof. The contacting outer ends of the two brackets of each pair thereof are spaced from the adjacent surface of the said main bearing and each pair of ends carries a screwed adjustable stop 63. The stops are so arranged that when the main bearings 2, 3 and 4 and the beams 5 and 6 are swung in one or the other direction about the main shaft 1 through an angle of 180°, one or the other of the stops 63 is adapted to strike a lever 64 which is engaged in a slot in the clutch selector bar 39, thereby throwing out the engaged clutch and automatically stopping the turning of the main bearings and the beams.

The present construction is provided with two plough bodies. Referring to Figs. 1 and 2, each of these bodies consists of a substantially C-shaped bar 65 and comprises a straight limb 66 which is detachably secured centrally to one of the beams 5 or 6 and two forwardly and upwardly-directed and tapered parts 67 and 68, one of which is above the beam and the other below the beam. A tapered toe 69 is provided at the end and on the appropriate side of each of the said parts 67 and 68 and a plough share 70 is detachably fixed as a sleeve to each plough toe. A landside 70A is bolted to each plough body and a moldboard 71 is bolted to each toe. A supporting plate 72 is secured to each of the two beams at the rear of each plough body, and above and below the beam each plate is formed with an elongated slot 73. An arm 74 is fixed at one end near to the rear of each moldboard, the opposite end of the arm being detachably attached to the adjacent supporting plate 72 by means of bolts on opposite sides of the plate screwed on to a part of the arm which passes through the slot in the plate, the arrangement being such that the rear of the moldboard 71, can be moved inwards and outwards to adjust the width of furrow. By forming a slot in the end of the arm 74 attached to the moldboard, the latter can be adjusted up and down. The two plough bodies 65 are secured in spaced longitudinal relationship one on one of the two beams and one on the other. When the plough is not in operation the plough bodies are secured

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for transport with their normally vertical parts 66 horizontal.

In operation, the plough shares 70 are set to the required depth by turning the said crank handle 43, Fig. 2, so as to swing the road wheels forwardly. The height of the swivelling rear wheel 11 is also adjusted to suit. If necessary, the driver of the tractor then engages one or the other of the clutches 33 and 38 on the worm shaft 17 by the lever 40, so that the correct plough shares are engaged in the furrows previously opened up at the end of the field. The clutch is disengaged automatically. On reaching the opposite end of the field, the driver engages the other clutch 33 or 38 on the worm shaft 17 so that the worm wheel 19, the main bearings 2, 3 and 4, the beams 5 and 6, the plough bodies 65, moldboards 71, land plates 70A, and shares 70 are swung around the main shaft 1 through an angle of 180°, whereupon the clutch 33 or 38 is automatically disengaged by one of the said adjustable stops 63, Fig. 6, striking the lever 64 engaging the clutch selector bar 39. The clutches 33 and 38 can always be engaged and disengaged by the said clutch operating lever 40, so that the driver can always stop and start the turning of the beams 5 and 6 in order to bring the plough shares into the ground at the correct position after the turning movement of the plough has been completed at the end of the field.

Means (not shown) are also provided for tightening the chains when the road wheels are adjusted to lower the plough bodies.

In the modified construction shown in Figs. 7 to 12, the worm shaft 17A is turnably supported in bearings formed in two bearing bosses 75 and 76, Fig. 9, which are fixed at the top ends of the upwardly-extending arms 78 and 79 of two right-angled brackets. The horizontal arms 80 and 81 of these brackets extend inwardly towards the axis of the plough and their inner ends are secured to the fixed supporting member 14A which, like the member 14 of the preceding construction, is fixed on the main shaft 1A at the front of the front main bearings 4A. The two bearing bosses 75 and 76 are provided with extensions which project inwards towards the axis of the plough and are machined externally to act as bearings for two upper brackets 82 and 83, forming part of a casting which also comprises the two axle bearing brackets 84 and 85. The latter are connected to the upper brackets by means of side bars 86 and 87. The two side bars are interconnected by an upper transverse bar 88 arranged in proximity to the bearing brackets 82 and 83 and a lower transverse bar 89 arranged in proximity to the axle bearings. A rigid rectangular casting is thus formed by the two side bars and the two transverse bars, and this frame serves as a pivoted mounting for the road wheels 25A and 26A and their axle 90, which can thus be swung about the axis of the worm shaft 17A in order to adjust the depth of cut of the plough.

A bevel wheel 91 is fixed upon the axle 90 and meshes with a bevel pinion 92 fixed on a shaft 93 which is arranged at right angles to the worm shaft 17A and is turnably mounted in coaxial bearings carried on the upper and lower transverse bars 88 and 89. The said shaft projects above the upper transverse bar 88 and a bevel crown wheel 94 is fixed on its projecting end. Two bevel pinions 95 and 96 are loosely mounted upon the worm shaft 17A, and are in constant mesh with the crown wheel 94 at diametrically opposite sides thereof. On their inner faces, the bevel

pinions are provided respectively with clutch members 97 and 98 and two interconnected slidable clutch members 99 and 100 are slidably arranged on the worm shaft between the two bevel pinions. Any turning movement of the two sliding clutch members 99, 100 on the worm shaft 17A is prevented by the engagement of a keyway in the clutch members with a key fitted in the shaft. One or the other of the two sliding clutch members is moved into engagement with the respective clutch member 97 or 98 on the adjacent bevel pinion 95 or 96 by means of a manually-operable selector bar 39A as in the preceding construction. In this construction, the road wheels 25A and 26A are turnably arranged upon the axle 90. As shown more particularly in Figs. 9 and 10, the road wheel 25A is provided with a dog clutch 101 and the road wheel 26A is provided with a dog clutch 102. The aforesaid side bars 86 and 87 are respectively formed with lugs 103 and 104, through which are passed rods 105 and 106 screwed at their inner and outer ends. Slidably mounted upon the axle 90 are two dog clutches 105A and 106A which are respectively embraced by straps 107 and 108 into upwardly-projecting parts of which are screwed the outer ends of the rods 105 and 106, springs 109 and 110 being arranged between the lugs 103 and 104 and the said upwardly-projecting parts. The springs normally act to keep the clutches 101, 105A and 102, 106A engaged.

As in the preceding construction, the road wheels 25A and 26A are adapted to be swung backwards and forwards by mechanism including two stays 46A and 47A, Figs. 8, 9 and 10, the outer ends of which are respectively secured to the said side members 86 and 87. The adjacent upper ends of the said stays are secured by a bolt 111 to the front end of the front arm of a bell crank lever 45A, Fig. 8, the upwardly extending arm of which is provided at its upper end with a nut 44A mounted on a screwed turnable shaft 42A having a cranked handle 43A. A bar 112, Fig. 10, is connected to the stays 46A and 47A at its opposite ends and an operating hand lever 113 is pivotally mounted at 113A on this bar. The outer end of a lever 114 is attached to the screwed rod 105 and its inner end is connected to the operating lever 113 at the rear of the fulcrum 113A thereof. The outer end of another lever 115 is attached to the screwed rod 106 and its inner end is connected to the operating lever 113 at the front of the fulcrum 113A of the latter. The operating lever works over a quadrant 116 carried by the bar 112 and provided with an upstanding stop 117. Thus, when the operating lever 113 is turned about its pivot, the levers 114 and 115 and the rods 105 and 106 are moved in opposite directions. In the position shown in Fig. 10, with the lever 113 on the right of the stop 117 the springs 109 and 110 can force the dog clutches 105A and 106A into engagement with the clutches 101 and 102 on the road wheels, while when the lever 113 is on the opposite side of the stop 117, the clutches will be disengaged and the said springs will be unable to force the clutches 105A and 106A into engagement with the clutches 101 and 102. The positions of the clutches 105A and 106A can be adjusted by locknuts 118 and 119 on the rods 105 and 106.

It will be understood that as long as the road wheels are clutched to the axle 90, the bevel crown wheel 94 and the two bevel pinions 95 and 96 engaged therewith will be constantly rotated

through the crown wheel 91, pinion 92 and shaft 93. The worm shaft 17A will remain stationary, however, until one or the other of the two sliding clutch members 99 or 100 is slid into engagement with the clutch member 97 or 98 on the adjacent bevel pinion. Further, owing to the arrangement of the bevel pinions 95 and 96 on diametrically opposite sides of the bevel crown wheel 94, the worm shaft will be rotated in one direction when one of the sliding clutch members, e. g., 99, is engaged with the clutch member on the adjacent bevel pinion and in the opposite direction when the other sliding clutch member 100 is engaged with the clutch member on the adjacent bevel pinion. This arrangement, obviously, provides the required clockwise and anticlockwise turning movement of the worm 18A, worm wheel 19A, the beams 5, 6 and the plough bodies 65A thereon.

The present construction comprises mechanism, like that provided in the construction described above, for disengaging the engaged sliding clutch member 99 or 100 from the clutch member 97 or 98 on the adjacent bevel pinion 95 or 96 after the worm wheel 19A has been turned through 180°.

In this construction, however, see Fig. 13, a lever 64A is connected to the selector bar 39A which in turn is connected to the clutch members 99, 100 slidable on the worm shaft 17A. The lower end of the lever 64A is adapted to cooperate with adjustable stops 63A carried by plate brackets 59A and 60A and 61A and 63A fixed on opposite sides of the main front bearing 4A.

The draw-bar and draught frame mechanism of this construction may be like that of the above described construction, but the shaft carrying the draw-bar knuckle joint and the draught frame may be supported in two spaced, forwardly-extending brackets 120 and 121, Figs. 7, 8, 9 and 14 fixed to the horizontal arms 80 and 81 of the aforesaid brackets carrying the worm shaft bearings 75 and 76.

A preferred arrangement of the draw-bar mechanism, however, is shown more particularly in Figs. 14 to 16. A shaft 123 is supported in eyes provided at the bottom ends of the said brackets 120 and 121 and on the ends of the shaft are pivotally mounted the ends of the arms 124 and 125 of a U-shaped draught frame. A bridge piece 126 is secured upon the top of the front part 127 of the said frame. The draw-bar comprises upper and lower plates 128 and 129, the rear ends of which, as shown in Fig. 15, project rearwards above and below the front part 127 of the U-frame. A roller 130 is pivotally mounted between the rear ends of the top and bottom plates upon a pivot pin 131 and secured between the said plates and at the front of the roller 130 is a transverse bar 132. A notched quadrant 133 is fixed on top of the bridge piece and a hand lever 134 is pivotally mounted at 135 upon a cross member 136 fixed to the quadrant 133. Mounted on the hand lever is a catch 137 which is normally spring-urged downwards into engagement with one or another of the notches in the quadrant but can be retracted therefrom by a lever 138. The lower end of the hand lever 134 is forked at 139 and embraces a rounded member 140 fixed between the plates 128 and 129 of the draw-bar. It will thus be seen that when the catch 137 is retracted and the hand lever 134 is pivoted in one direction or the other, the draw-bar will slide along the front part 127 and will be maintained at right angles there-

to by virtue of the roller 130 and the bar 132 disposed on opposite sides of the said front part. By this arrangement, the draw-bar is always kept parallel to the plough beams and the plough is bound to travel parallel with the tractor.

As shown in Figs. 8, 11 and 12, the plough bodies may be so constructed and arranged that the pitch of the plough shares may be adjusted in another or an additional manner than that referred to with reference to Figs. 1 to 6. To this end, each plough body is made in two parts 65A. The lower end of the upper part is arranged in a tapered, recessed housing 140 formed in the upwardly-extending part 142 of a casting 143, which latter is slotted centrally to fit upon the beam 5A or 6A, as shown in Fig. 12. The upper end of the lower plough body part is arranged in a corresponding, tapered, recessed housing 144 formed in the downwardly extending part 145 of the casting. The upper plough body part 65A is fixed in the housing 140 by means of two bolts, one of which is passed through holes 147 formed coaxially in the part 142 and the plough body part and the other through a hole 148 in the part 142 and an elongated slot 149 in the plough body part. Similarly, the lower plough body part is fixed in the housing 144 by means of two bolts, one of which is passed through holes 150 formed coaxially in the part 145 of said casting and the lower plough body part and the other through a hole 151 formed in the part 145 and a slot 152 in the lower plough body part. Adjusting screws 153 and 154 are screwed through the ends of the casting 143, the inner ends of said screws being adapted to bear against the opposite sides of the top plough body part, and the inner ends of two other adjusting screws 155 and 156 screwed into the casting 143 are adapted to bear against the opposite sides of the bottom plough body. Thus, by slackening back one of the set screws, say 153, and screwing the set screw 154 at the opposite side of the plough body part inwards, the nut on the bolt passing through the hole 147, the nut on the arm 74A, and the nut on the bolt passing through the hole 148 having previously been slackened back, the inner end of the upper plough body part 65A can be rocked within the housing 140, whereby the plough share is moved inwards or outwards and the pitch of the plough share is adjusted accordingly. After this adjustment, the nuts on the bolts passing through the holes 147 and 148 and the nut on the arm 74A are again tightened up. The like remarks apply to the adjustment of the lower plough body part and the plough share associated therewith.

Under certain conditions, especially when the plough is working in rough ground, the worm wheel 19A, Fig. 8, may creep back and thus bring the stop screw 63A, Fig. 13, away from the stop 64A, with the result that the plough may be turned back slightly and the width and depth of the front furrow be varied slightly. In order to obviate this, the plough may include automatic locking means, which in the case of the construction of Figs. 7 to 16, may be arranged as follows.

A toothed wheel 160 is keyed upon the worm shaft 17A near to the end of the latter remote from the bevel crown wheel 94 and the bevel pinions 95 and 96. At the back of the upwardly-extending arm 79 of the said right angled bracket secured to the fixed supporting member 14A (see Fig. 9) there is secured an angled stay 161 which extends upwardly and rearwardly. The downwardly-extending end of a slide bar 162 is secured to the clutch selector bar 39A and the hori-

zontal part of this bar 162 is slidably guided in a slide bracket 163 fixed to the upturned end of the stay 161. Another stay 164 is fixed to the said upturned end and the longer arm 165 of a right-angled catch lever is pivoted to this stay at 166. The end of the shorter arm 167 of the catch lever is shaped to engage between the teeth of the pinion 160 and thereby prevent any rotation of the worm shaft 17A, this engagement, unless restrained, taking place automatically under the action of the preponderance of the weight of the part of the catch lever at the front of the fulcrum 166. Under the same action, the part of the catch lever on the opposite side of the fulcrum is pressed upwards towards the bar 162. The latter is formed with a groove 168 and immediately above the groove a plate 169 (not shown in Fig. 18) formed with a groove 170 is adjustably mounted for up and down movement upon the bar 162 by means of screws (not shown) screwed into the bar and engaging in slots 171 and 172 formed in the plate. The plate is fixed in such a position that when the clutch members 99 and 100 on the worm shaft are in the neutral position, the longer arm 165 of the catch lever is pressed upwards into the grooved part of said plate 169 and the end of the shorter arm of the catch is engaged between two of the teeth in the pinion 160, thus locking the worm shaft against movement. When, however, the clutch selector bar 39A is moved in one or the other direction to engage the clutch members 99 and 97 or 100 and 98, the bar 162 is also moved so that the part of the bar on one side or the other of the groove 170 engages with the part 165 of the catch lever and thus causes the end of the shorter arm 167 of the lever to become disengaged from between the teeth in the pinion 160. In these circumstances, the beams and the plough bodies thereon are free to turn but they will be automatically locked again when the selector bar 39A and the clutch members 99 and 100 are returned, automatically as described above, to the neutral position.

The adjustable notched plate 169 is provided to counteract wear on the catch lever. Further, in the event of the plate becoming loose, the parts of the catch lever on opposite sides of the groove 170 will act to lift the end of the catch lever out of engagement with the pinion 160 whenever the selector bar 39A is moved to engage one or other of the worm shaft clutches.

The application of locking means like those described above to the plough shown in Figs. 1 to 6, will be well understood from the above description.

It will be appreciated that the invention is applicable to ploughs adapted to plough one or more than two furrows. A plough adapted to plough an odd number of furrows would, however, require some balancing arrangement to counteract the greater turning moment on one side of the main shaft.

We claim:

1. A plough structure, including in combination a bearer arranged longitudinally of the plough, a travelling wheel carried at and adapted to support the rear end of said bearer at a predetermined fixed height above the ground, transversely spaced supporting means carried at the front end of said bearer, an axle-supporting frame pivotally carried by said supporting means, a front axle turnably supported by said axle-supporting frame, transversely spaced road wheels turnably carried by said axle, means for swinging said frame about said supporting means so as

to raise and lower the front end of said bearer, plough beam supporting members turnably mounted upon said bearer and spaced thereon in the longitudinal direction between the front and rear ends of said bearer, plough beams inter-connecting said supporting members and arranged on opposite sides of the rotational axis thereof, at least one plough share and its cooperating parts carried by one of said beams on each side of the latter, at least one plough share and its cooperating parts carried by the other beam on each side of the latter, and spaced from said first mentioned plough shares in the longitudinal direction, a worm wheel fixed to the foremost of said beam supporting members, a worm shaft turnably supported by said transversely spaced supporting means, a worm fixed to said worm shaft, said worm being in permanent engagement with said worm wheel, a driving transmission between said road wheels and said worm shaft, said transmission including clutch means on said worm shaft and means for shifting said clutch means from neutral to operative positions, whereby the worm shaft, said worm, and said beams may be rotated in either direction to cause those plough shares which are on one side of said beams and are engaged in the ground to be swung out of the ground, and those plough shares which are on the opposite side of said beams and are not engaged in the ground to swing into the ground and whereby it is only necessary to swing the operative plough shares out of the ground and unnecessary to lift the plough as a whole at the end of the field in order to turn it in readiness to plough fresh furrows.

2. The plough claimed in claim 1, comprising mechanism for automatically stopping the rotation of said worm shaft and the swinging movements of the plough shares after the latter have been swung through a predetermined angle, said mechanism including means connected to said clutch means on said worm shaft and means fixed to said foremost beam supporting member and adapted by cooperation with said first mentioned means to shift said clutch means from operative to neutral position.

3. The plough claimed in claim 1, wherein the said road wheels are mounted upon a single axle, and wherein there is a single driving transmission between said axle and said worm shaft which includes a first clutch mechanism associated with said worm shaft and a second clutch mechanism associated with said worm shaft, and means for selectively engaging said clutch mechanisms with said transmission, whereby when said first clutch mechanism is engaged with said transmission, said worm shaft, said beam supporting members and said plough shares are turned in one direction, whereas when said second clutch mechanism is engaged with said transmission, said worm shaft, said beam supporting members and said plough shares are turned in the opposite direction, and whereby said plough shares can be selectively swung in one direction or the other to suit the direction of travel of the plough.

4. The plough claimed in claim 1, wherein the said road wheels are mounted upon a single axle, and wherein said worm shaft is driven from said axle by a driving transmission including a crown wheel operatively connected to, and receiving its motion from, the said axle, a first bevel pinion turnably mounted upon said worm shaft and permanently meshing with said crown wheel on one side thereof, a second bevel pinion turnably mounted upon said worm shaft and permanently

meshing with said crown wheel on the opposite side thereof, a clutch associated with each of said pinions, two connected clutch members slidable on said worm shaft between said pinions but incapable of rotation relatively to said worm shaft, said slidable clutch members being so constructed that only one clutch member at a time can engage with one of the clutch members associated with said pinions and such that both slidable clutch members can be brought into a neutral position in which they are disengaged from said clutch members associated with said pinions, and means for shifting said slidable clutch members into and out of their operative positions.

5. The plough claimed in claim 1, wherein the said road wheels are turnably mounted upon a single axle, the said axle being supported by a frame member which is pivotally mounted upon a fixed part of the plough frame, and means being provided for raising and lowering the frame member so as to adjust the height of the front end of the said bearer carrying the said supporting members, and wherein each of the road wheels is provided with a clutch member adapted to cooperate with a clutch member slidable upon, but incapable of turning relatively to, the axle, means being provided for simultaneously engaging and disengaging both clutch members on the axle with and from the clutch members on the road wheels.

6. The plough claimed in claim 1, and means for coupling the plough to a tractor including a draught frame pivotally mounted upon supporting means carried by a fixed part of the plough frame, and a draw bar which is carried by, and is movable transversely across, the draught frame, means being provided for ensuring that the draw-bar shall always be disposed parallel to the longitudinal axis of the plough.

7. The plough claimed in claim 1, and means for coupling the plough to a tractor including a draught frame pivotally mounted upon supporting means carried by a fixed part of the plough frame, and a draw bar which is carried by, and is movable transversely across, the draught frame, means being provided for ensuring that the draw-bar shall always be disposed parallel to the longitudinal axis of the plough, and means for moving the draw-bar transversely across the draught frame and for fixing it in its adjusted positions.

8. The plough claimed in claim 1, wherein the turning movement of the worm shaft in both directions is automatically stopped by adjustable stop means carried by, and rotatable with, one of the said supporting members.

9. The plough claimed in claim 1, wherein means are provided for preventing swinging movement of the plough shares, when the plough is in operation.

10. The plough claimed in claim 1, wherein automatically-acting means are provided for preventing the said worm shaft turning when the clutch mechanism through which the drive to the worm shaft is communicated are in the neutral position.

11. A plough as claimed in claim 1, comprising manually operated adjusting mechanism and means connecting the same to said axle-supporting frame, so that by operating said mechanism said frame can be swung upwards or downwards and thus raise or lower the front end of said bearer and thereby alter the depth of cut of the plough.

12. A plough as claimed in claim 1, including means pivotally mounting said plough shares on said beams and adjustable means for fixing said

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plough shares in selected pivoted position, whereby the pitch of said plough shares may be selectively adjusted.

13. A plough as claimed in claim 1, including plough shares pivotally carried on said beams and set screws engaging said plough shares for locking said plough shares in selected pivoted position.

14. A plough structure, including in combination a bearer arranged longitudinally of the plough, a travelling wheel carried at and adapted to support the rear end of said bearer at a predetermined fixed height above the ground, transversely spaced supporting means carried at the front end of said bearer, an axle-supporting frame pivotally carried by said supporting means, a front axle turnably supported by said axle-supporting frame, transversely-spaced road wheels turnably carried by said axle, means for swinging said frame about said supporting means so as to raise and lower the front end of said bearer, plough beam supporting members turnably mounted upon said bearer and spaced thereon in the longitudinal direction between the front and rear ends of said bearer, plough beams inter-connecting said supporting members and arranged on opposite sides of the rotational axis thereof, at least one plough share and its cooperating parts carried by one of said beams on each side of the latter, at least one plough share and its cooperating parts carried by the other beam on each side of the latter and spaced from said first mentioned plough shares in the longitudinal direction, a worm wheel fixed to the foremost of said beam supporting members, a worm shaft turnably supported by said transversely spaced

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supporting means, a worm fixed to said worm shaft, said worm being in permanent engagement with said worm wheel, a driving transmission between said road wheels and said worm shaft, manually operated clutch means for initiating the turning movements of said worm shaft and the swinging movements of the plough shares by shifting said clutch means from neutral to operative positions, whereby the worm shaft, said worm and said beams may be rotated in either direction to cause those plough shares which are on one side of said beams and are engaged in the ground to be swung out of the ground and those plough shares which are on the opposite side of said beams and are not engaged in the ground to swing into the ground.

LESLIE JOHN EDWARD CAPON.
JOHN CARNE.

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