Jan. 8, 1924. 1,480,273

A. S. KROTZ

POWER LIFT PLOW

Filed Dec. 8, 1920 3 Sheets-Sheet 1

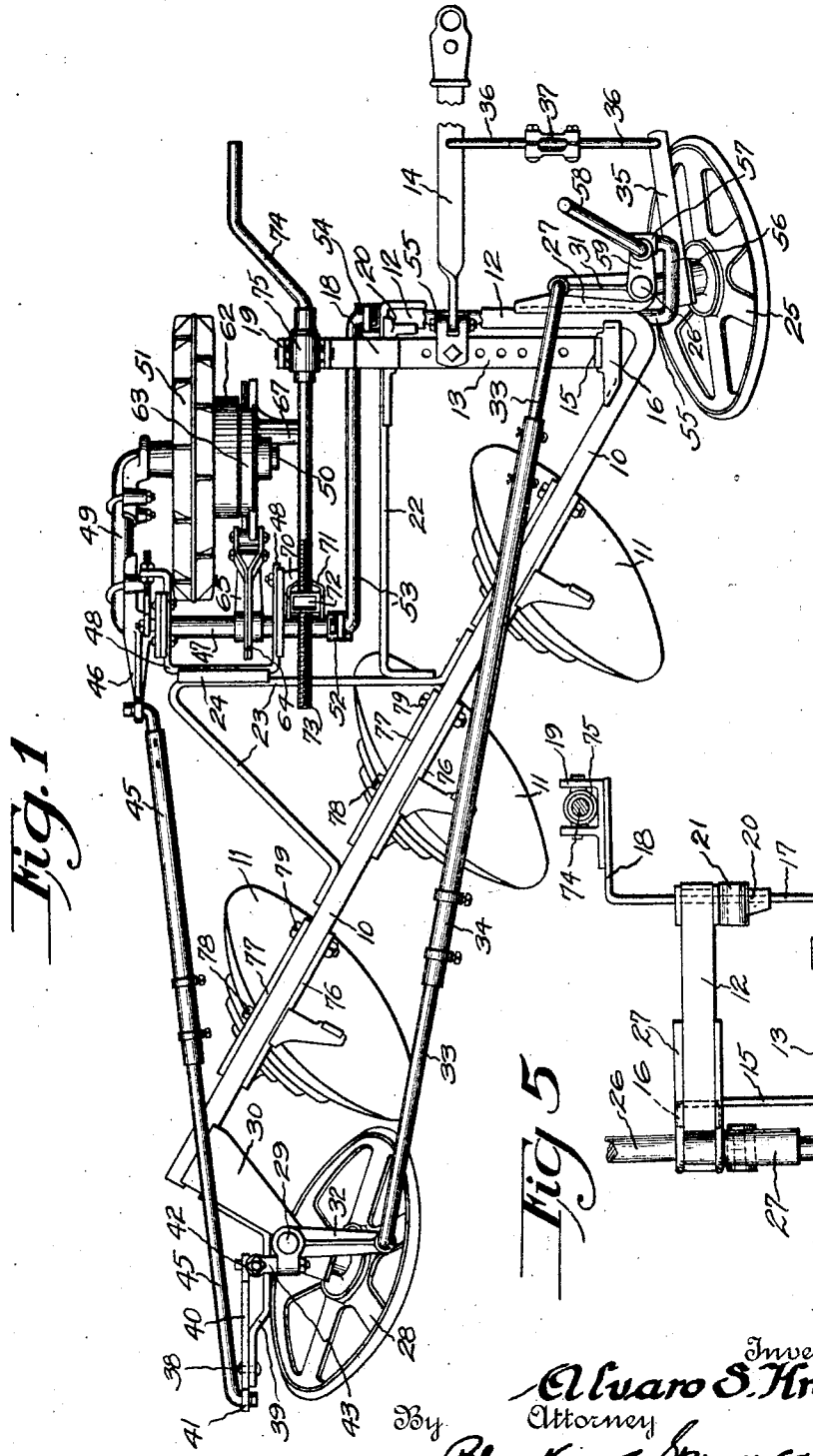


Fig. 1

Fig 5

Inventor
Alvaro S. Krotz
By Attorney
Blackmore, Spencer & Flint

Jan. 8, 1924. 1,480,273

A. S. KROTZ

POWER LIFT PLOW

Filed Dec. 8, 1920 3 Sheets-Sheet 2

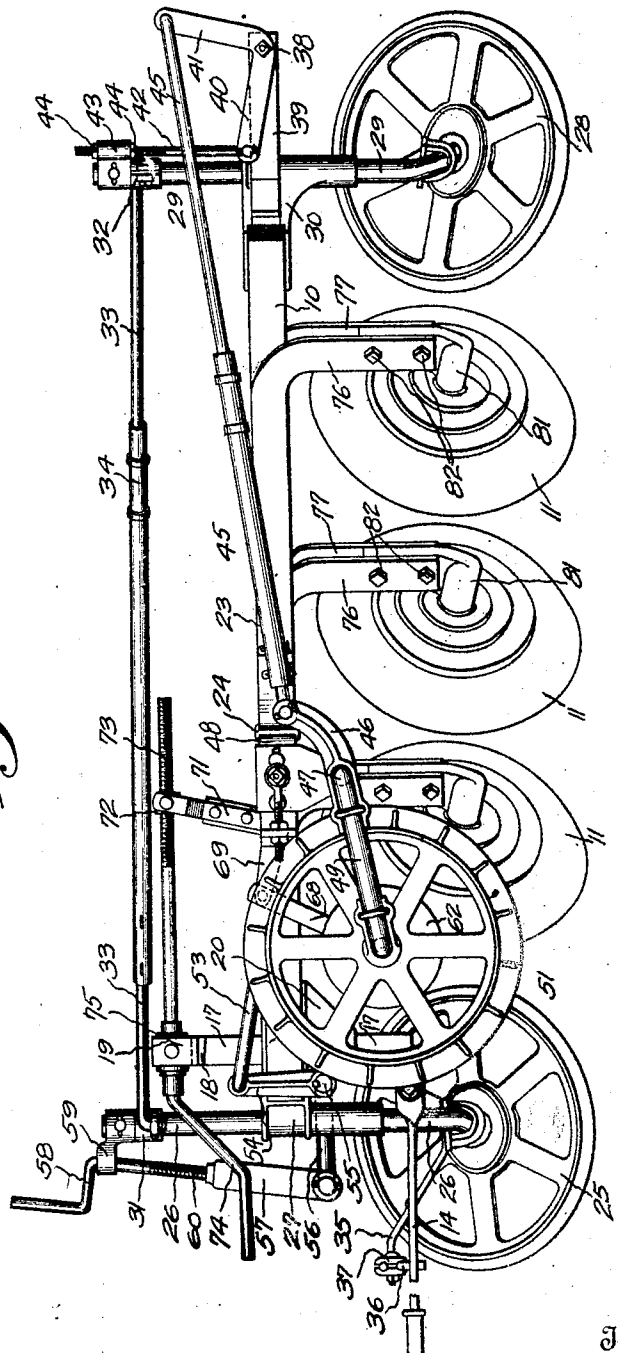


Fig. 2

Inventor
Alvaro S Krotz

By Attorneys
Blackmore, Spencer & Flint

Jan. 8, 1924. 1,480,273

A. S. KROTZ

POWER LIFT PLOW

Filed Dec. 8, 1920 3 Sheets-Sheet 3

Fig. 3

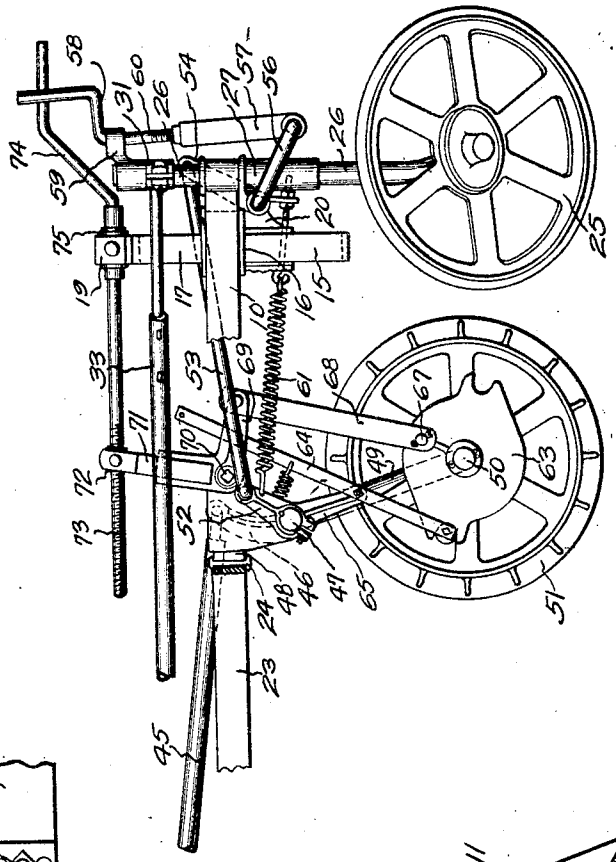
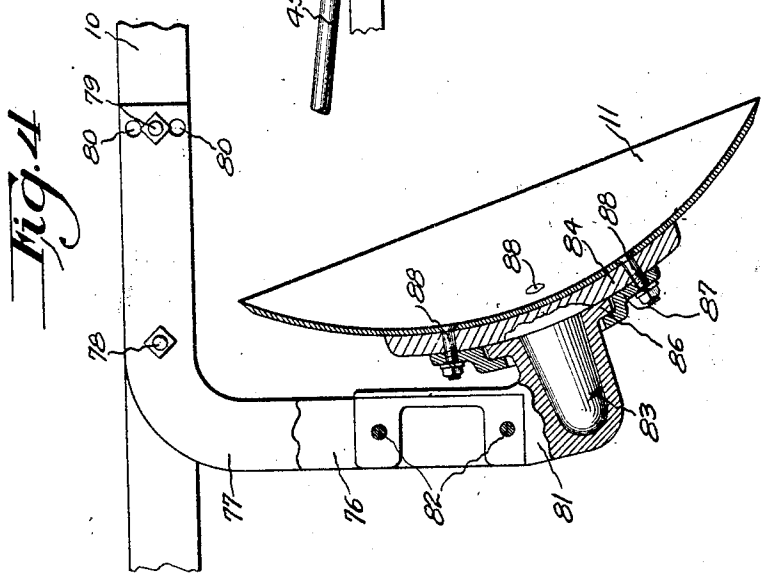


Fig. 4



Inventor
Alvaro S. Krotz.
By Attorney
Blackmore, Spencer & Flint.

Patented Jan. 8, 1924. 1,480,273

UNITED STATES PATENT OFFICE.

ALVARO S. KROTZ, OF JANESVILLE, WISCONSIN, ASSIGNOR TO GENERAL MOTORS CORPORATION, OF DETROIT, MICHIGAN, A CORPORATION OF DELAWARE.

POWER-LIFT PLOW.

Application filed December 8, 1920. Serial No. 429,205.

To all whom it may concern:

Be it known that I, ALVARO S. KROTZ, a citizen of the United States, and a resident of Janesville, county of Rock, and State of Wisconsin, have invented certain new and useful Improvements in Power-Lift Plows, of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawings, which form a part of this specification.

My invention relates to plows of the wheel supported gang type designed to be hauled by a tractor; and particularly to plows of the above type which are self lifting, and wherein means are provided for raising the frame and furrow turning elements by power derived from the tractor or other hauling agency whereby the plow is drawn at the ends of the furrows and when the plow is to be turned about.

The principal object of my invention is to provide a self-lifting or power lift plow of the general class above referred to and in which improved mechanism is present for supporting the frame and plowing elements thereof when in their lowermost position; which supporting mechanism co-operates to equalize the upward movement of the frame when the same is lifted, and insures the return of the frame and plowing elements to a predetermined and fixed position upon the subsequent lowering of the frame and plow bottoms.

A further object of my invention is to provide an improved frame element or structure for plows of the class above referred to which will be simpler in construction, and stronger than has heretofore commonly been the case; and in which an improved construction and arrangement of draft frame is present for facilitating the transmission of the pull exerted by the hauling agency to and its distribution relative to and throughout the frame structure of the plow.

A further object of my invention is to provide a plow of the type defined in which the draw bar through which the same is drawn is connected to and co-operates with certain of the supporting wheels of the plow in such a manner as to secure a better following of the plow after the tractor.

A further object of my invention is to provide improved lifting means for elevating the frame and furrow turning elements of the plow; and to provide improved supporting means for supporting the revolving discs, when discs are used to form the furrows, in a plow of the type or class in question.

With the above and other objects of invention in view, my invention consists in the improved self lifting gang plow and subordinate parts and features thereof illustrated in the accompanying drawings and hereinafter described and claimed; and in such variations and modifications thereof, within the scope of the concluding claims, as will be obvious to those skilled in the art to which my invention relates.

Referring now to the drawings wherein the preferred embodiment of my invention is illustrated:

Figure 1 is a view showing my improved plow in plan.

Figure 2 is a view showing the same in side elevation, and as seen from a position at the left hand side thereof; the parts being shown in the positions which they assume when the plow is operating to turn furrows.

Figure 3 is a fragmentary view showing certain elements and features of the front end of the plow in side elevation, and as seen from a positon at the right hand side thereof.

Figure 4 is a view showing the method of supporting the discs from the main frame member of the device.

Figure 5 is a view showing certain details of the draft mechanism at the front end of the plow and through force is communicated thereto to draw the same.

In the drawings, the reference numeral 10 designates the main frame member of the plow the same extending longitudinally from the front to the rear end of the plow and being arranged diagonally relative to the direction of travel thereof, and serving as a support for a plurality of furrow turning elements shown as discs 11 disposed one in front of another; although plow bottoms of the mold board and share type may be secured to and carried by the said frame member or beam if desired. Said frame member is bent at an acute angle to provide a transversely extending portion 12 at the front end thereof; and a transversely extending draft member or frame is secured

to said front end; said draft frame comprising a horizontal portion 13 extending substantially parallel with the bent in portion 12 and having a plurality of holes, so that the rear end of a draw bar 14 may be adjustably positioned along the same to secure the proper following of the plow after a tractor or other draft device. Said draft frame is provided also with an upwardly extending arm 15 at the right hand or outer end thereof the extremity of which is fixedly secured to the main frame bar 10 as by means of a suitable bracket 16; and with an arm 17 extending upward from the left hand or inner end thereof above the level of the frame member 10 and bent outward, as at 18, to provide a support for a bracket 19 which serves as a support for a member of certain adjusting mechanism, as will hereinafter appear, all as best shown in Figure 5 of the drawing.

The arm 17 and the inner free end of the transversely extending portion 12 of the main frame bar or beam 10 are secured together through and by means of a suitable bracket 20, which carries a bearing 21 for supporting the inner end of an oscillating shaft concerned with the lifting of the main frame bar and the plows carried thereby, upward, as will hereinafter appear; and a longitudinally disposed brace bar 22 has its forward end connected with the bracket 20 and end of the frame bar 10 and its rear end fixedly secured to said bar adjacent the middle thereof, to thereby strengthen the frame and to properly distribute the pull transmitted thereto from the tractor whereby the plow is drawn.

Secured to the frame bar 10 intermediate its length and extending laterally therefrom is an angular bracket or support 23 to which is secured, as through a saddle plate 24 or otherwise, an auxiliary frame whereby the lifting mechanism for the bar 10 and the discs or plow bottoms 11 carried thereby is carried, which lifting mechanism will be hereinafter described in detail.

The front furrow wheel 25 of my improved plow is rotatable upon an outwardly bent arm at the lower end of a vertically disposed supporting shaft 26, which is movable angularly about its axis within a vertically disposed bearing provided in a supporting bracket 27 secured to the front of and at the right hand side of the plow; said bracket being shown as secured to the transversely extending portion 12 of the frame bar 10 and the same sliding up and down the said shaft 26 as the plow bottoms are raised and lowered. Similarly, the rear furrow wheel 28 is supported from the lower end of a vertically disposed furrow wheel shaft or axle 29 which is capable of oscillating movement within a bearing provided for it in a bracket 30 secured to the rear end of the plow supporting bar 10, and offset relative to said bar; the bracket being slidable vertically upon the shaft the same as in the case of the front furrow wheel.

Fixedly secured to the upper end of the front furrow wheel shaft 26 is an arm 31 which extends inward toward the longitudinal center line of the plow, and the upper end of the rear furrow wheel shaft 29 is provided with a similar but outwardly extending arm 32. These arms are fast upon the respective shafts so as to communicate angular movement thereto about vertical axes and within their respective bearings; and the extremities of said arms are connected with one another through a reach rod 33 pivotally connected with said extremities, and adjustable as to length as by the provision of a sleeve connection at 34.

A forwardly extending arm 35 is fixedly secured relative to the forward furrow wheel shaft 26, preferably adjacent the lower end thereof, and the free end of this last mentioned arm is connected with the draw bar 14 through and by means of a link 36 the effective length of which may be adjusted as by the provision of an adjustable joint between the two parts thereof, as indicated by the reference numeral 37; from which it follows that movement of the draw bar from side to side about the pivotal connection between its rear end and the transverse bar 13 of the draft frame will be communicated to the shaft of the front furrow wheel through the link 36 and arm 35, and from said shaft to the rear furrow wheel shaft through the arm 31, the rod 33 and the arm 32; the furrow wheel shafts being moved angularly and in opposite directions about their respective axes, as will be appreciated. The effect of the linkage through which said axles are oscillated is to secure movement of said axles simultaneously with and proportionate to the sidewise movement of the draw bar, and a consequent better following of the plow as a whole after the tractor assume to be used for hauling the same.

Pivotally supported adjacent the rear furrow wheel 28 as at 38 upon an arm 39 carried by the bracket 30 which supports the shaft 29 of said wheel, as aforesaid, is a bell crank lever one arm 40 of which extends forward from said pivot, and the other arm 41 of which extends upward therefrom. The forwardly extending arm 40 of said lever is pivotally connected with the lower end of a supporting rod 42 which is threaded at its upper end and extends loosely through a passage in a lug 43 fast upon the upper end of the shaft 29, said threaded end being adjustable in said passage by means of two nuts 44; while the upper end of the other arm 41 of said bell crank lever is pivotally connected with the rear end of an

adjustable link 45 the front end of which is pivotally connected with the free end of an arm 46 fixedly secured to the left hand end of an oscillating plow lifting shaft 47 supported in suitable bearings provided in bearing plates or brackets which are carried by a U-shaped auxiliary frame 48. This auxiliary frame 48 is supported from the frame bar 10 through the bracket 23 and saddle plate 24 as above explained and serves as a support for the lifting mechanism of the plow, the lifting force being communicated to the supporting bar 10 through said frame and through the bracket 23.

The lifting shaft 47 is bent to provide a forwardly extending and downwardly inclined arm 49 the lower end of which is bent inward to provide a crank axle 50 upon which a ground wheel 51 is freely rotatable, and whereby the lifting of the beam 10 and of the discs or plow bottoms carried thereby is effected at the will of the operator, as will hereinafter appear.

Fixedly secured to the inner end of the oscillating lifting shaft 47 is an upwardly extending arm 52; and 53 designates a link the rear end of which is pivotally connected with the upper end of said arm 52, and the forward end of which is pivotally connected with the upper end of an arm 54 fast upon a transversely disposed oscillating shaft 55 located at the front end of the plow, and supported in bearings carried by the brackets 20 and 27 in the embodiment of my invention illustrated. The right hand end of this shaft 55 is provided with a forwardly extending arm or crank 56 the extremity of which is pivotally connected with the lower end of a stirrup or link 57.

An adjusting crank 58 is rotatably supported by an abutment 59 fixedly secured at the upper end of the front furrow wheel shaft 26, said crank having a threaded shank portion 60 which is in threaded engagement with the upper end of the stirrup or link 57; and the reference numeral 61, see Figure 3, designates a spring under tension and the force of which acts normally to hold the parts in the positions in which they are shown, with the discs 11 or equivalent plow bottoms down and in the furrows or, as otherwise expressed, to oppose upward movement of the plowing elements; the rear end of said spring being secured to the arm 52 of the oscillating shaft 47 and the front end thereof being secured to a fixed abutment in the embodiment of my invention illustrated.

When the plow is in operation the weight of the frame and parts carried thereby, the downward pull or suction due to the resistance encountered by the furrow turning elements in the plowing operation, and the action of the spring 61 when the same is employed act together to hold the discs or equivalent elements and the frame in the lowermost position in which it is shown in Figure 2, the plow being supported for the most part by the front and rear furrow wheels; the land wheel, however, bearing sufficient weight to insure the driving thereof by contact with the unplowed land and the lifting of the frame at the will of the operator. There are, however, no abutments upon the furrow wheel shafts for supporting the frame bar 10 in its lowermost position; the rear end of the frame being supported from the shaft 29 through the abutment 43, the rod 42 and bell crank lever 40, 41, and the front end of the frame being supported from the shaft 26 through the abutment 59, the adjusting crank 58, the link 57 and the transverse shaft 55. Such being the case, and the linkage through which the bell crank lever and transverse shaft are connected together comprising the link members 45 and 53, the lifting shaft 47 and the arms 46, 52 and 54 being loose at the several points of pivotal connection as explained, it follows that the link 45 is subjected to tension and the link 53 to compression stresses and that the total downward force acts to keep the link mechanism as a whole in equilibrium or balance, as the weight sustained tends to move the arms 46 and 56 angularly upward and toward one another and the arms 52 and 54 act toward and in opposition to one another through the link 53. The frame is thus supported from the furrow wheel shafts at the two ends thereof through link mechanism which is normally in equilibrium, and the stresses throughout which are balanced through the oscillating lifting shaft 47.

It therefore follows that the entire plow structure is supported from the upper ends of the front and rear furrow wheel shafts through the link mechanism as distinguished from by means of abutments upon the said shafts upon which the frame rests, as has heretofore commonly been the case; that the lowermost position of the frame and plowing elements is determined entirely by said link elements of said mechanism; and that the frame and plows after having been lifted return to a position determined entirely by the adjustment of said link mechanism upon the subsequent lowering of the frame.

The front furrow wheel end or corner of the frame may be adjusted vertically and the plow levelled relative to the land wheel to secure a uniform depth of the several furrows turned by properly manipulating the adjusting crank 58; the rear end of the frame having been initially adjusted to secure a proper normal depth of the furrows by means of the nuts 44, 44 upon the supporting rod 42. This adjustment of the

rear furrow wheel will thereafter need to be made but seldom, as the rear adjustment having been made with a certain depth of furrow in view a uniform depth of all the furrows may be readily secured by manipulating the adjusting crank 58 at the front end of the plow; while a simultaneous change in depth of all the furrows is provided for by mechanism to be hereinafter described in detail.

The mechanism for lifting the frame in its entirety and the discs carried thereby comprises a clutch drum 62 secured to and rotating with the land wheel 51; a clutch plate 63 loose upon the land wheel axle 50 and disposed adjacent said clutch drum; and clutch mechanism controlled by a lever 64 pivotally supported at the free end of an arm 65 carried by the lifting shaft 47, and operable by a rope extending to the hauling tractor, and which clutch mechanism is adapted to secure the locking of the clutch plate and clutch drum together and the driving of the plate from the drum and land wheel throughout successive half rotations, and the locking of the plate in fixed positions at the ends of its movements to thereby hold the frame in both its uppermost and lowermost positions; such clutch mechanism, however, not being shown in detail as the same may be of various forms such, for example, as of the form shown in either of two applications for patent filed by me upon the 8th day of December, 1920, Serial Numbers 429,203 and 429,204.

The clutch plate 63 is provided with a crank pin 67 with which the lower end of a lifting link 68 is connected; and the upper end of said link is pivotally connected with the free end of the forwardly extending arm 69 of a bell crank which is pivotally supported at 70 from the auxiliary frame 48 which supports the lifting shaft 47; so that as successive half rotations are imparted to the clutch plate 63 the entire frame, together with the plow bottoms, will be lifted through the link 68 and bell crank lever acting as a fixed abutment during one half of a complete rotation from the position shown in Figure 2 into the position shown in Figure 3, and returned to its former or down position during the next half rotation. As the frame and plows are lifted the ground wheel swings rearward and communicates angular movement to the shaft 47 throughout an angle determined by the link mechanism whereby the frame is supported from the furrow wheel shafts, as hereinbefore explained, during which lifting operation the link mechanism follows the movement of the lifting shaft and secures uniform upward and downward movement of the frame at the front and rear ends of the plow and acts to lift said ends; upward lifting forces being communicated directly to the frame through the link 68 acting upon the bell crank lever, and indirectly to the two ends thereof through the frame supporting link mechanism, as will be appreciated.

In order that the pivotally supported bell crank lever through which the lifting of the plow frame is accomplished may act as a fixed abutment as above mentioned the second arm 71 thereof is bifurcated and supports a trunnioned sleeve or nut 72 between its arms, through which sleeve the threaded shank 73 of an adjusting crank 74 extends; the forward end of said crank extending through a sleeve 75 pivotally supported by the bracket 19 and longitudinal movement of the crank being restrained by suitable collars thereupon, as shown; from which it follows that the bell crank lever is held in a fixed position as the bracket 19 is fixedly secured upon and relative to the frame of the plow. The operator may, however, vary the position of the bell crank lever upon its supporting pivot and move the frame and plow bottoms carried thereby either upward or downward by rotating the crank 74, such operation resulting in an adjustment of the plow as a whole to secure a greater or less depth of all the furrows turned. During such an adjustment it will be appreciated that movement is communicated to the front and rear ends of the frame simultaneously, thus maintaining the level of the frame as it is raised or lowered; and that the adjustment to secure uniform depth of all the furrows is in no way disturbed by adjusting the frame to increase or decrease the depth of the furrows.

The plow discs 11 are dished in form as best shown in the enlarged view Figure 4, and are supported from the main supporting bar 10 in each case by two right angular supports 76, 77 secured one upon each side thereof and having each an upper horizontal arm extending along the bar, and a substantially vertical arm; the said members being secured to the supporting bar by a bolt 78 located adjacent the bends therein and extending through registering holes in the bar and disc supporting members. The front ends of the arms which extend along the bar have a plurality of vertically spaced holes 80 through one of which, as regards each arm, and a registering hole in the bar a forward securing bolt 79 extends; so that angular disposition of the disc as a whole relative to the supporting bar may be varied by causing the bolt 79 to extend through different pairs of holes 80 in the oppositely located right angular disc supports. The depending arms of the disc supports are obviously spaced apart a distance corresponding with the thickness of the bar 10; and the numeral 81 designates a bearing member or disc support having a portion lying in between the lower ends of the depending arms

of the supports 76, 77 and secured in place by bolts 82, 82 extending through holes in the supports and brackets and which bearing bracket is provided with a bearing recess into which a gudgeon 83 projecting from a disc supporting plate 84 extends, and within which the same is rotatable; a flange 86 being provided at the extremity of the disc supporting bracket 81 with which an annular rabbeted holding ring 87 engages to hold the parts together; the ring, the gudgeon carrying plate and the disc being held together by properly spaced fastening bolts 88 as will be appreciated.

It will be appreciated that upon removing the supporting brackets 76, 77 which support the rear one of the discs 11 the said disc may be removed from the bar, thus leaving two discs secured to and supported by the said bar. After thus removing the rear disc the bracket 30 which supports the rear furrow wheel 28 may likewise be unfastened from the bar and moved up into the position occupied by the supports which have been removed from the bar, the said bracket being then secured to the bar by a bolt which passes through one of the holes provided for the bolts 78, 79 whereby the supports 76, 77 were secured to the bar. This adjustment of the bracket 30 forward along the bar after removing the rearmost disc converts the plow into one having a lesser number of discs, such adjustment being provided for and permitted by the adjustable connections in the link members 33 and 45; the three disc plow illustrated being readily convertible into a plow having a smaller number of discs in case the plow is to be used upon ground which is hard to plow, or in cases where the power of the hauling tractor is not sufficient to haul the plow when equipped with all the discs which it is capable of carrying. When the bracket 30 is thus moved forward on the frame bar it will be seen that it occupies the same position relative to the middle one of the discs 11 that it occupies in the three disc plow relative to the rearmost of the discs, thus providing a plow in which the balance thereof, and the operation thereof in its entirety is the same whether it is provided with three discs as illustrated, or two discs as contemplated in its converted form.

Having thus described and explained my invention, I claim and desire to secure by Letters Patent:

1. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of furrow turning elements, and the forward end of which is bent inward toward the center of the plow and extends transverse to the path of travel thereof; wheels for supporting said bar from the ground; a brace member extending between the inner free end of said bent in portion and the middle portion of said supporting bar; and draft mechanism connected with said inwardly bent portion and with the front end of said supporting bar and through which the plow is drawn.

2. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of furrow turning elements, and the forward end of which is bent inward toward the center of the plow and extends transverse to the path of travel thereof; wheels for supporting said bar from the ground; a transversely extending draft frame the ends of which are fixedly secured relative to said inwardly bent portion, and through which tractive force may be applied to the plow to draw the same; and a brace member the forward end of which is secured to the inner end of said bent in portion and to said draft frame, and the rear end of which is connected with said supporting bar adjacent the middle thereof.

3. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of furrow turning elements, and the forward end of which is bent inward toward the center of the plow and extends transverse to the path of travel thereof; wheels for supporting said bar from the ground; a transversely extending draft frame having a horizontal portion disposed below the inwardly bent portion of said supporting bar, and upwardly extending arms at its two ends; a brace member extending forwardly from the middle portion of said supporting bar; means for securing the forward end of said brace member, the free end of the bent in portion of said frame member, and the inner of the upwardly extending arms of said draft frame together; and means for securing the outer of the arms of said draft frame to the front end of said supporting bar.

4. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of furrow turning elements, and the forward end of which is bent inward toward the center of the plow and extends transverse to the path of travel thereof; wheels for supporting said bar from the ground; a transversely extending draft frame located at the front end of said supporting bar and having a horizontal portion disposed below the inwardly bent portion of said bar, and upwardly extending arms at its two ends; a brace member extending forwardly from the middle portion of said supporting bar; and means for securing said supporting bar, said draft frame and said brace member together to thereby provide a unitary and rigid plow frame.

5. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of furrow turning elements, and the forward end of which is bent inward toward the center of the plow and extends transverse to the path of travel thereof; wheels for supporting said bar from the ground; a transversely extending draft frame located at the front end of said supporting bar and having a horizontal portion disposed below the inwardly bent portion of said bar, and upwardly extending arms at its two ends; a brace member extending forwardly from the middle portion of said supporting bar; means for securing said supporting bar, said draft frame and said brace member together to thereby provide a unitary and rigid plow frame; and a bracket support carried by and located at the upper end of the inner of the arms aforesaid of said draft frame.

6. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of plowing elements; wheels for supporting said bar from the ground; a transversely extending draft frame located at the front end of said supporting bar and the outer end of which is fixedly secured relative thereto; and a brace member the forward end of which is secured to the inner end of said draft frame, and the rear end of which is connected with said supporting bar adjacent the middle thereof.

7. In a plow of the class described; a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of plowing elements; wheels for supporting said bar from the ground; a transversely extending draft frame located adjacent the front end of said supporting bar and having a horizontal portion disposed below the level of said bar, and upwardly extending arms at the two ends thereof; a brace member extending forwardly from the middle portion of said supporting bar; means whereby the forward end of said brace member is connected with the inner of the upwardly extending arms of said draft frame; and means whereby the outer of the arms of said draft frame is connected with the front end of said supporting bar.

8. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of plowing elements; wheels for supporting said bar from the ground; a transversely extending draft frame located at the front end of said supporting bar and having a horizontal portion disposed below the level thereof, and upwardly extending arms at its two ends; a brace member extending forwardly from the middle portion of said supporting bar, and the forward end of which is secured to the inner of the arms of said draft frame; means for connecting the outer of the ends of said draft frame with the front end of said supporting bar; and a bracket carried by and located at the upper end of the inner of the arms aforesaid of said draft frame.

9. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of plowing elements; furrow wheels located at the front and rear ends of said supporting bar and relative to which said ends are movable vertically; a bracket carried by said bar adjacent the middle portion thereof and extending laterally therefrom, and adapted to support lifting mechanism for lifting said bar, and automatically operating lifting mechanism carried by said bracket and operatively connected with said bar, said lifting mechanism including a land wheel operated by engagement with the ground.

10. In a plow of the class described, a diagonally arranged bar extending fore and aft of the plow and adapted to support a plurality of plowing elements; furrow wheels located at the front and rear ends of said supporting bar; a bracket carried by said bar and extending laterally therefrom; an auxiliary frame carried by said bracket; a land wheel supported by said auxiliary frame, and lifting mechanism operated by said land wheel and whereby said bar may be lifted.

11. In a plow of the class described, a longitudinally extending supporting bar; a disc supporting member right angular in form and having an upper arm extending along said bar, and a depending arm; a disc supporting bracket carried by the lower end of said depending arm; a securing bolt extending through said disc supporting member and supporting bar adjacent the bend in said disc supporting member; and means for securing the free forward end of the upper arm of said disc supporting member to said supporting bar in various positions, to thereby vary the adjustment of the disc supported by said disc supporting member.

12. In a plow of the class described, a longitudinally extending supporting bar; a disc supporting member having an upper arm extending along said bar, and a depending arm; a disc supporting bracket secured to the lower end of said depending arm; a securing bolt extending through said disc supporting member and supporting bar adjacent the bend in said disc supporting member; and a securing bolt extending through said supporting bar and one of a plurality of vertically spaced holes adjacent the free forward end of the upper arm of said disc supporting member.

13. In a plow of the class described, a

longitudinally extending supporting bar; a disc supporting member having an upper arm extending along said bar, and a depending arm; securing means for fastening the upper arm aforesaid to said bar; a disc supporting bracket secured to the lower end of said depending arm and having a bearing recess, and an outwardly extending flange surrounding said recess; a disc supporting plate having a gudgeon rotatable in said recess; a holding ring engaging said flange and resting upon said disc supporting plate; a disc carried by said disc supporting plate; and bolts extending through said disc, said disc supporting plate and said holding ring for securing said parts together.

14. In a plow of the class described, a suitable supporting frame; a disc supporting member carried by said frame and having a depending arm; a disc supporting bracket secured to the lower end of said arm and having a bearing recess, and an outwardly extending flange surrounding said recess; a disc supporting plate having a gudgeon rotatable in said recess; a holding ring engaging said flange; a disc carried by said disc supporting plate; and means for securing said disc, said disc supporting plate and said holding ring together.

15. In a plow of the class described, a diagonally arranged and vertically movable bar extending fore and aft of the plow and provided with a plurality of supporting devices detachably secured thereto; a furrow turning element carried by each of said supporting devices; a rear furrow wheel bracket adjustable along said bar; a rear furrow wheel carried by said bracket; a forward furrow wheel supported from said bar adjacent the forward end thereof; and lifting mechanism whereby said bar may be moved vertically relative to said furrow wheels.

16. In a plow of the class described, a diagonally arranged supporting bar extending fore and aft of the plow; a plurality of supporting devices spaced along and removable from said bar; a plurality of furrow turning elements carried one by each of said supporting devices; a rear furrow wheel bracket; means whereby said bracket may be secured in a plurality of positions upon said bar; a front furrow wheel bracket carried by said bar; and two furrow wheels one supported by said front furrow wheel bracket and the other by said rear furrow wheel bracket.

In testimony whereof I affix my signature.

ALVARO S. KROTZ.