May 24, 1932. C. G. STRANDLUND 1,859,942

PLOW

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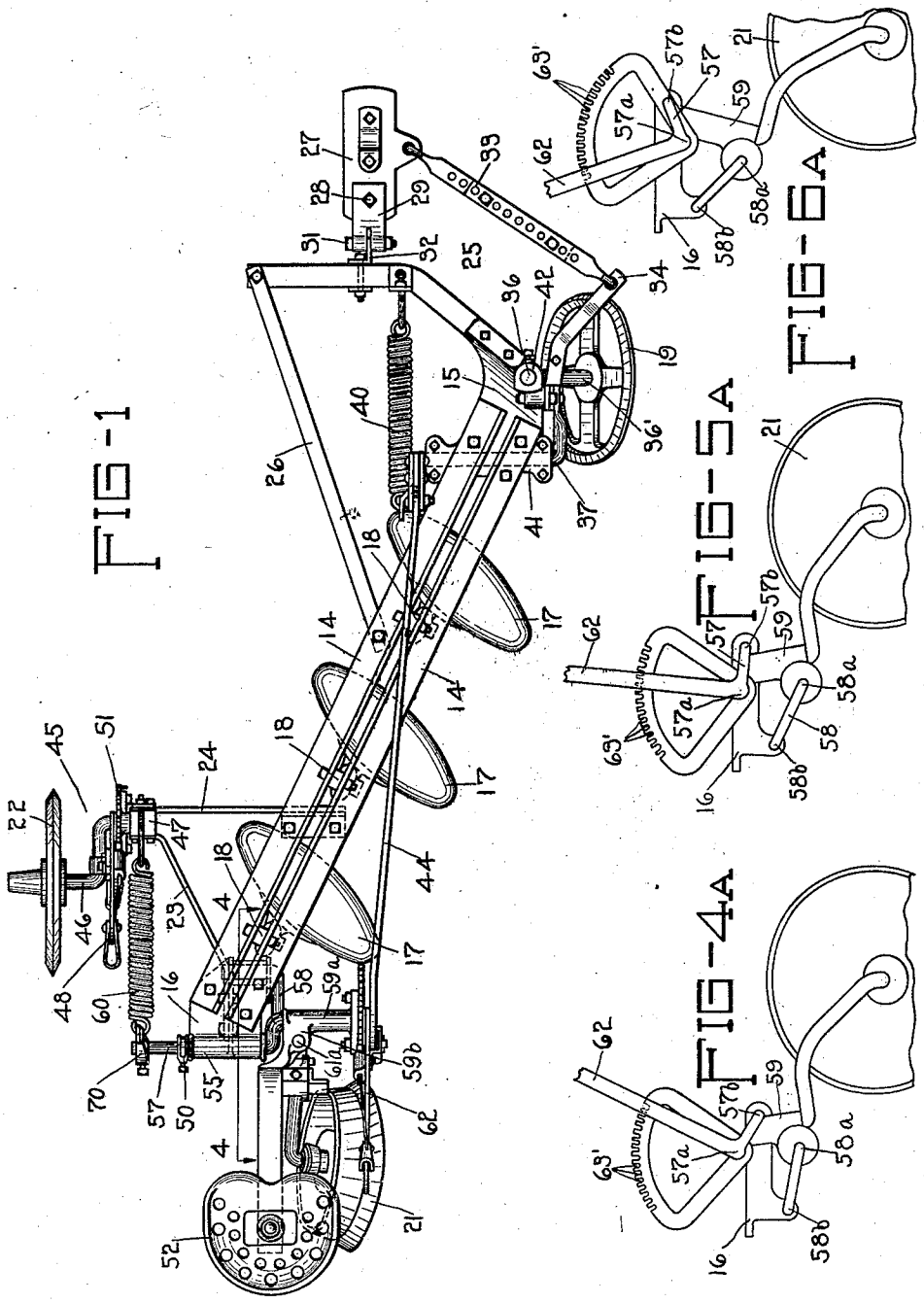

FIG-1

FIG-6A

FIG-5A

FIG-4A

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PLOW

Filed Aug. 8, 1928 4 Sheets-Sheet 2

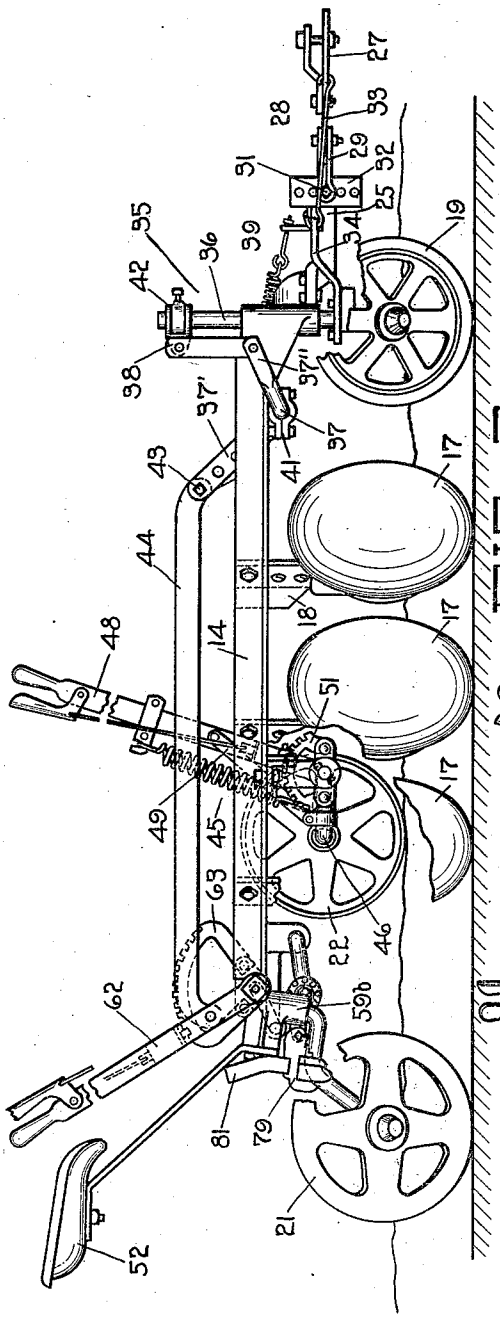

FIG-2

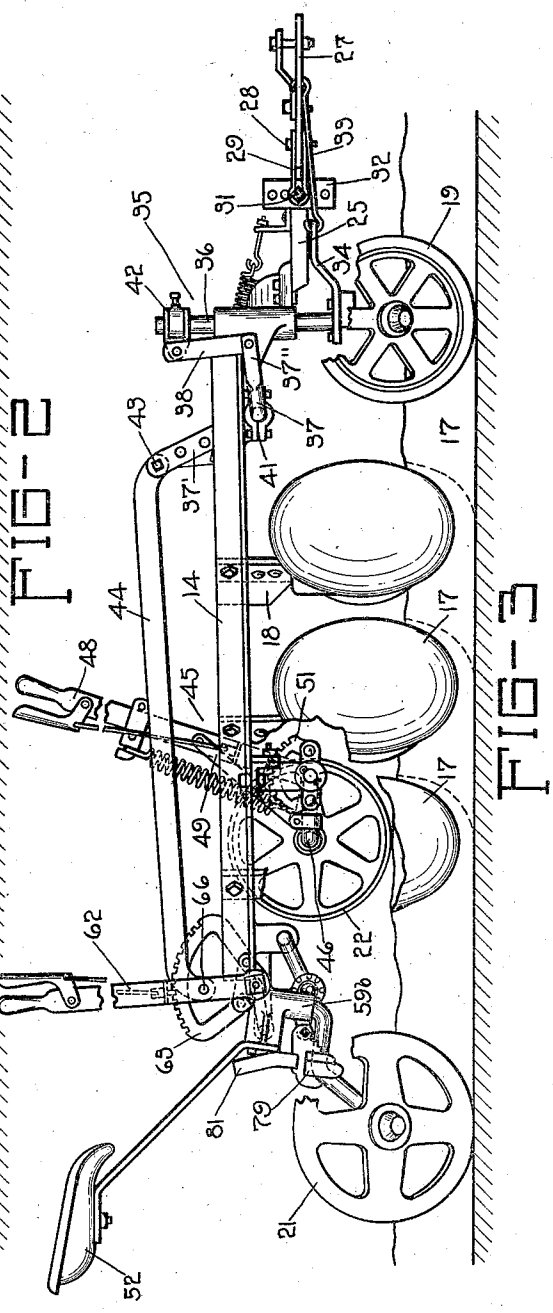

FIG-3

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PLOW

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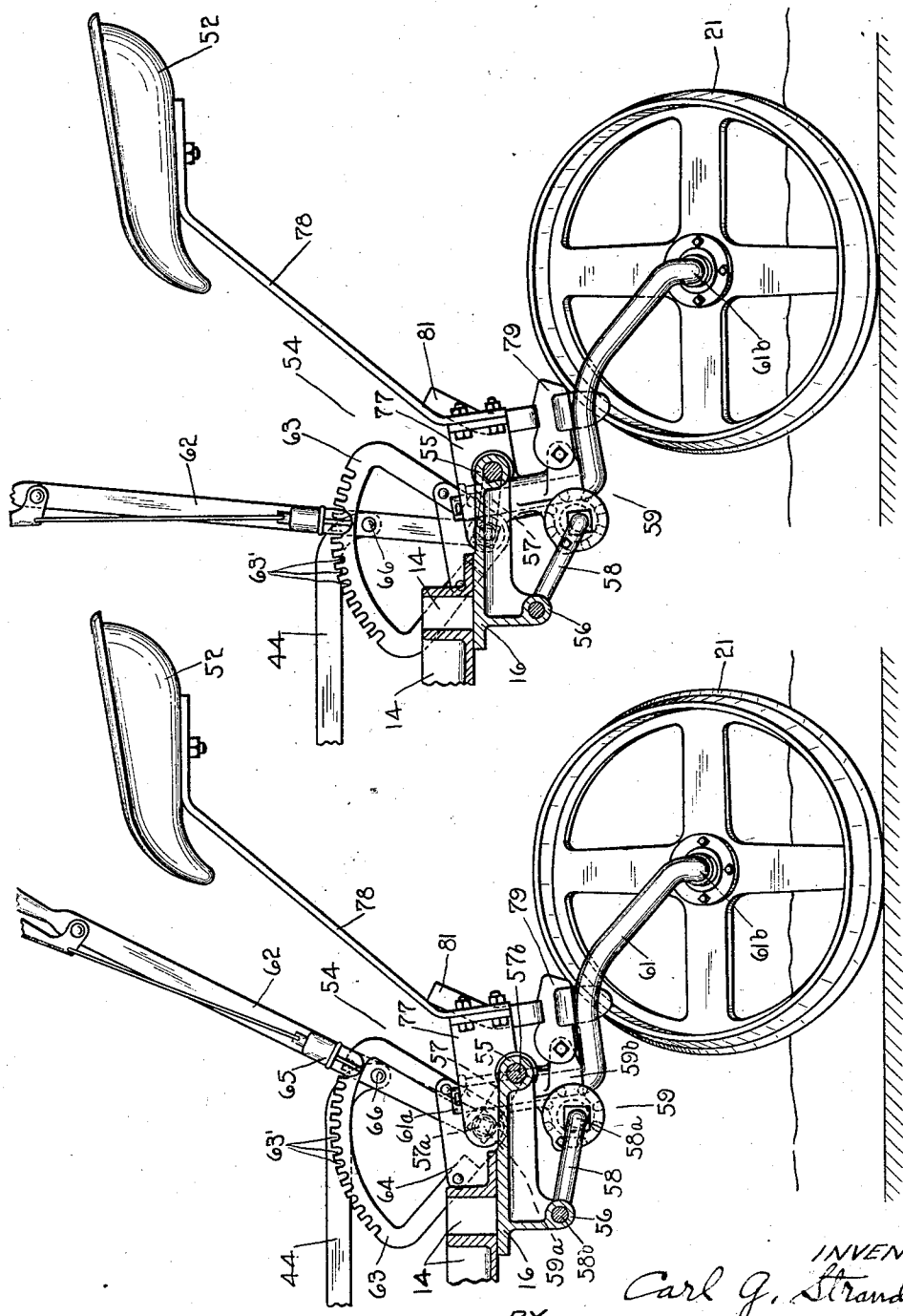

FIG-5

FIG-4

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Filed Aug. 8, 1928 4 Sheets-Sheet 4

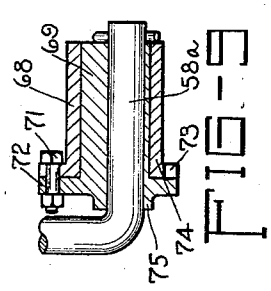

FIG-5

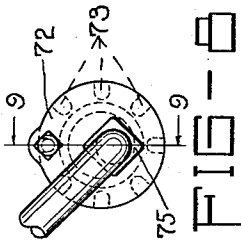

FIG-8

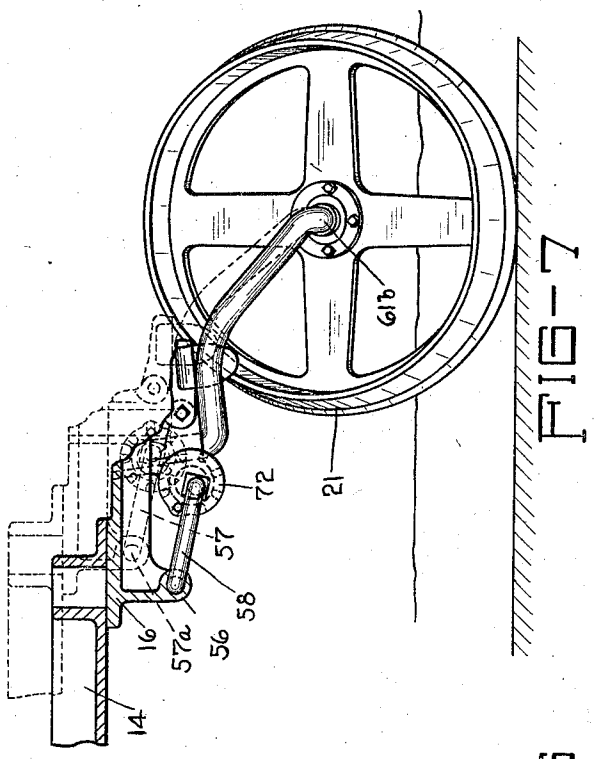

FIG-7

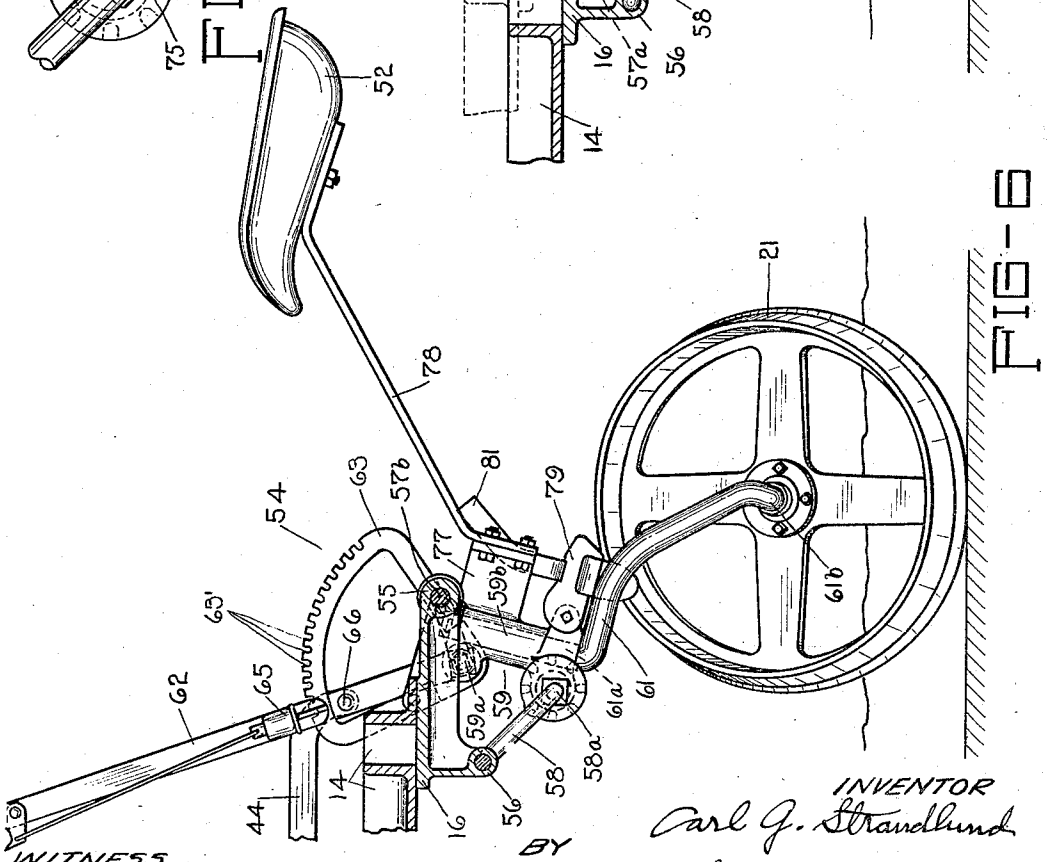

FIG-6

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UNITED STATES PATENT OFFICE

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PLOW

Application filed August 8, 1928. Serial No. 298,197.

The present invention relates generally to plows, and more specifically to an improved construction of lifting mechanism for gang plows, such as gang plows of the disk type.

More particularly, the invention pertains to that type of lifting mechanism which operates on both the front and rear furrow wheels for effecting the depth adjustment in controlling the depth of plowing and also for lifting all of the plows clear of the ground to transport position. In the depth adjusting range of operation, the major portion of the lifting and lowering motion must be transmitted to the front end of the frame, because it is the height of adjustment of the frame relatively to the front furrow wheel that determines the depth of plowing. As is well known, the depth of the furrows cut by the plows determines the depth at which the rear furrow wheel runs, and hence this rear wheel cannot ordinarily serve as a gauge element for determining the depth adjustment.

It therefore follows that in effecting a depth adjustment, a differential relation must be maintained between the lift effective at the front and rear ends of the frame, that is to say, the major portion of the lifting or lowering motion must be effective at the front end of the frame with very little, if any, of this lifting or lowering motion effective at the rear end of the frame. However, when the plows are lifted to transport position, it is desirable that both ends of the frame be raised to approximately the same height and, accordingly, during this range of the operation of the lifting mechanism, it is necessary that a large part of the lifting motion be effective at the rear end of the frame to raise this end up to approximately the same height as the front end with the plows clear of the ground.

The principal object of the present invention is to provide improved lifting mechanism which will have this characteristic operation. The differential relation between the lift at the front and rear ends is obtained by a certain link mounting of the rear portion of the frame on the rear furrow wheel, whereby a progressively accelerated lifting motion occurs between this portion of the frame and the wheel. During the depth adjusting range, a slight vertical translatory motion occurs between the frame and wheel, which does not raise the rear end of the frame to any material extent, practically all of the lifting motion being transmitted, at this time, to the lifting mechanism at the front end of the frame. During that part of the range of actuation for raising the plow to transport position, the rear furrow wheel is caused to oscillate forwardly at a rapidly increasing rate so that the rearwardly extending axle on which said wheel is mounted operates as a lifting crank for quickly raising the rear end of the frame to transport position.

Another object of the invention is to provide improved adjusting means for adjusting the working height of the rear furrow wheel relatively to the plows, to compensate for wear of the plow disks, the substitution of larger or smaller disks, and different soil conditions. This adjusting means is preferably arranged to vary the effective length or to shift the pivot center of one of the links which governs the oscillatory movement of the rear furrow wheel.

Other objects and advantages of the invention will appear in the following description of a preferred embodiment thereof. In the accompanying drawings illustrating such embodiment:

Figure 1 is a plan view of the present plow;

Figure 2 is a side elevational view thereof, illustrating the lifting mechanism in the position of maximum plowing depth;

Figure 3 is a similar view, illustrating the lifting mechanism in a position for decreasing the plowing depth;

Figure 4 is a fragmentary sectional view through the rear lift mechanism taken on the plane of the line 4—4 of Figure 1, showing the position of the parts at maximum plowing depth, and Figure 4ª is a simplified complementary view diagrammatically illustrating the relation of the pivots and links at such time;

Figures 5 and 5ª correspond to Figures 4 and 4ª, except that they show the lifting

mechanism actuated to one of its depth adjusting positions;

Figures 6 and 6ª are similar to the preceding figures, except that they show the lifting mechanism actuated to its transport position;

Figure 7 is a fragmentary sectional view, illustrating the action of the adjusting means associated with the rear lifting mechanism;

Figure 8 is a fragmentary end view of the eccentric bushing through which this adjustment is effected; and

Figure 9 is a longitudinal sectional view through such bushing, taken on the plane of the line 9—9 of Figure 8.

Referring to Figure 1, the frame of the plow is of any suitable construction, preferably comprising two angle bars 14—14 which are bolted at front and rear ends to bracket castings 15 and 16, respectively. The plows, represented by the disks 17, are supported on standards 18 which are secured between the vertical flanges of the two frame bars 14. The frame is supported on front and rear furrow wheels 19 and 21 and on a land wheel 22. Such land wheel has mounting on a frame extension comprising two bars 23 and 24 secured to brackets on the under sides of the beam bars 14 and extending laterally therefrom.

Draft is transmitted to the plow through a draft bar 25 which is secured to and extends laterally from the front bracket casting 15, the outer end of said draft bar having bracing connection with one of the beam bars 14 through a brace bar 26.

A coupling or hitch member 27 has horizontal swinging movement about a vertical pivot 28 carried by a clevis 29, and the latter has vertical swinging movement about a horizontal pivot 31 which is carried by a bracket 32 mounted on the draft bar 25. An adjustable steering link 33 is connected between the hitch member 27 and a steering arm 34 which extends from the front furrow wheel 19.

Referring to Figures 2 and 3, the front end of the frame is raised and lowered with respect to the front furrow wheel 19 through the actuation of front lifting mechanism broadly designated 35.

Such mechanism comprises a vertical wheel standard 36, a bell crank lever 37, and a link 38 which is pivotally connected between one arm of said lever and the upper portion of the wheel standard. The front bracket casting 15 is formed with a long guide boss 39 which is mounted to slide up and down along the vertical portion of the standard 36, the standard also being free to swivel in the boss 39 under the steering guidance of the link 33 and steering arm 34. The furrow wheel is journalled on the outwardly and downwardly inclined spindle end 36′ of the wheel standard (Figure 1), and the steering arm 34 is suitably secured to this lower portion of the wheel standard to revolve the same and steer the furrow wheel under the actuation of the link 33. The bell crank lever 37 is formed with a relatively long bearing portion from the opposite ends of which the lever arms 37 and 37′ extend. This bearing portion is rotatably supported in a bearing bracket 41 which is bolted to the under sides of the frame bars 14. The outer arm 37″ of the lever is pivotally connected to the lower end of the link 38, the upper end thereof being pivotally connected to a collar 42 which is mounted on the wheel standard 36.

The construction and mounting of this collar is old and well known, being such that the collar cannot slide vertically on the standard, but the standard is free to swivel in the collar. Referring to Figure 2, it will be seen that when the inner arm 37′ of the bell crank lever is allowed to swing rearwardly, the front end of the frame is permitted to slide down along the wheel standard 36 to lower the plows into the ground and, referring to Figure 3, it will be seen that when this lever arm 37′ is thrust forwardly, the opposite arm 37″ exerts a downward pull on the link 38 and standard 36 which, reacting through the bearings 41, results in the front portion of the frame being raised upwardly along the standard for lifting the plows relatively to the ground.

A long link or bar 44 which is pivotally connected at 43 to the inner arm 37′ of the bell crank lever extends back to the rear lifting mechanism and functions as a motion transmitting device for actuating the front lifting mechanism 35, as will hereinafter appear. A counterbalancing spring 40 is suitably connected to the arm 37′ to aid in lifting the plow.

The mechanism for lifting the frame relatively to the land wheel 22 is generally indicated at 45 in Figures 1, 2 and 3, and shown as being of the manually operated type, although it will be understood that power lift mechanism may be associated with this wheel and operatively connected with the front and rear lift mechanisms when a power lift is desired. In the embodiment shown, the land wheel is journaled on the spindle end of a crank axle 46 which has bearing support for swinging movement in a bearing block 17 secured between the extension frame bars 23 and 24.

An operating lever 48 is secured to the bearing portion of the axle and has braced connection with the crank portion thereof through a bracing link 49. Such lever carries the usual detent latch for engaging in the notched sector 51 which is rigidly secured to the stationary bearing block 47. The lever 48 is within convenient reach of the operator's position on the seat 52 at the rear end of the plow, and by moving such lever in one direction or the other the land side of the

frame can be raised or lowered relatively to the land wheel 22.

Referring now to the rear lift mechanism, which is designated 54 in its entirety, it will be seen from Figures 4, 5 and 6 that the rear bracket casting 16 is formed with a long bearing boss 55 at its rear end, which bearing boss extends transversely of the frame, said casting being also formed with a bearing boss 56 at its front end disposed in a plane below the boss 55. These two bosses define pivot centers which remain in fixed relation to the frame and relatively to which the rear furrow wheel 21 swings in the operation of the lifting mechanism. A crank 57 is journalled for swinging movement in the boss 55, and a link 58 has its front end pivotally mounted for rotative movement in the other boss 56. The crank is held against endwise movement in the boss 55 by a collar 50 which is detachably secured to the crank at the end of the boss (Figure 1). Pivotally connected between the swinging ends of the crank 57 and link 58 is a casting 59 which functions as a wheel carrying member, that is to say, it serves to mount the rear furrow wheel 21 on the frame of the plow through the instrumentality of the aforesaid crank and link.

As shown in Figure 1, such member is disposed on the furrowward side of the bracket casting 16, and comprises a long horizontally extending boss 59^a through which the offset swinging end 57^a of the crank 57 extends. Such wheel carrying member also comprises a substantially vertically extending boss 59^b formed integral with and extending downwardly from the inner end of the horizontal boss 59^a. Pivotally mounted in the upright boss 59^b, is the vertical upper end 61^a of an axle 61 which extends rearwardly and downwardly (Figure 4) and has an outwardly bent spindle portion 61^b on which the furrow wheel 21 is journalled.

The furrowward end 57^a of the crank or rock shaft 57 passes rotatably through the boss 59^a of the wheel carrying member and has a squared projecting end to which is rigidly secured an actuating member 62 in the form of a manually operating lever. A latching sector 63 is secured to a flange 64 which projects upwardly from the end of the boss 59^a, whereby the sector constitutes a rigid part of the wheel carrying member 59. The actuating lever 62 is provided with the usual latch mechanism 65 for engaging in the sector 63 and holding the lift mechanism in any desired position. The motion transmitting link 44 which extends rearwardly from the front lift mechanism 35 is pivotally connected to the actuating lever 62 at a pivot 66. It will be seen from the foregoing that the actuating lever 62 constitutes a rigid part of the crank 57, and that forward motion imparted to said lever will swing the crank tending to force the pivot axis 57^a downwardly and to force the other axis 57^b upwardly, which effects the raising of the rear end of the plow frame, as will be presently described.

Such raising of the rear end of the plow frame is aided by a counterbalancing spring 60 which pulls forwardly on an arm 70 extending upwardly from the land end of the crank 57, see Figure 1.

The rear end of the link 58 has a laterally bent pivot end 58^a which is pivotally connected to the lower portion of the wheel carrying member 59, at a point approximately directly below the pivot axis 57^a. Such pivotal connection between the link and the wheel carrying member is adjustable, as best shown in Figures 8 and 9, from which it will be seen that the lower portion of the vertical boss 59^b of the wheel carrying member is formed with a horizontal boss 68 in which a bearing bushing or sleeve 69 is rotatably mounted.

The pivot end 58^a of the link passes through this bushing eccentrically thereof, and it will be evident that by rotating the bushing, the pivot axis 58^a can be shifted towards or away from the wheel carrying member, thus producing the effect of increasing or decreasing the effective length of the link 58. The eccentric bushing is held in any desired angle of adjustment by a bolt 71 which passes through a flange 72 on the end of the boss 69 and is adapted to engage selectively in any one of a series of radial slots 73 formed in a collar 74 at the end of the adjustable bushing. Upon removing the bolt 71, the bushing may be turned by applying a wrench to the squared projection 75 extending from the end of the bushing, whereupon the bolt is replaced in the adjacent one of the notches 73 to hold the bushing in the desired adjustment. The purpose of this adjustment is to properly position the height of the rear furrow wheel 21 with respect to the plow disks 17 when the plow is in working position, in order to compensate for different sizes of disks, wear of disks, etc.

A flange 77 extending rearwardly from the wheel carrying member 59 has a seat bar 78 secured thereto, on the rear end of which the seat 52 is mounted. It will be noted that the seat is disposed at a point in rear of the axis of the rear furrow wheel 21 so that when the plow is being raised to transport position, the weight of the operator on the seat is effective through a lever arm tending to swing said rear wheel forwardly under the frame in a direction tending to aid in lifting the plow.

Suitable lock mechanism 79 may be provided on the wheel carrying member 59 to control the caster movement of the axle 61 relatively thereto, the details of which lock mechanism constitute no part of the present invention. It will suffice to say that in its preferred embodiment such lock mechanism holds the rear furrow wheel in definite working position for straightaway plowing, per-

mitting the wheel to caster automatically, however, when the implement is turning to the left. When turning to the right, the lock may be released by a suitable foot pedal 81 so as to permit the wheel to follow the turn.

The operation of the lift mechanism will be best understood by reference to Figures 4, 5 and 6 and to their complementary Figures 4ª, 5ª and 6ª, which diagrammatically illustrate the three positions illustrated in the first mentioned figures. It will be observed that the crank 57 together with the actuating lever 62 constitute a rigid operating member through which lifting motion is made effective between the wheel carrying member 59 and the frame. The crank portion 57 of such operating member functions as a link for governing the movement of the upper end of the wheel carrying member, it being noted that the pivot axis 57ᵇ between this link and the frame is disposed at a point approximately in rear of the wheel carrying member.

The other link 58 constitutes a control link for governing the translational and oscillatory movement of the wheel carrying member, it being noted that the pivot axis 58ª between such link and the wheel carrying member is disposed approximately directly below the upper pivot axis 57ª, and that the pivot axis 58ᵇ between this control link and the frame is disposed at a point in front of the wheel carrying member.

Thus, the crank 57 and link 58 form two oppositely mounted swinging links having their adjacent ends pivotally connected with the wheel carrying member and having their opposite ends pivotally connected with the frame. The adjacent ends swing through opposite arcs that intersect a line extending between the pivot centers of the opposite ends of the links.

Figures 4 and 4ª represent the position of the lifting mechanism when the plow is lowered to a maximum depth of plowing. It will be noted that, in this position, the two links 57 and 58 are disposed approximately on lines extending down through the center of the rear furrow wheel, which takes some of the stress off the lever 62. At this time, the front lift mechanism 35 is in the position illustrated in Figure 2, with the front end of the plow frame lowered to a position of maximum plowing depth along the wheel standard 36, the frame then being substantially level with the ground.

To reduce the depth of plowing the lever 62 is thrust forwardly a short distance, which movement of the pivot 66 acting through the most effective part of its arc, transmits motion through the link 44 to the bell crank lever 37, the two arms of which are also in positions effective to transmit rapid motion to the front end of the frame.

Hence, the motion of the actuating lever 62 through its depth adjusting range, represented by the first four or five notches 63′ in the sector 63, produces a rapid rise of the front end of the plow frame along the wheel standard 36, as illustrated in Figure 3. This same depth adjusting motion of the lever 62 has very little effect for raising the rear end of the frame relatively to the rear furrow wheel, which is desirable, as previously stated, since the depth gauge for the rear end of the plow is determined by the depth of furrow in which the rear furrow wheel tracks. Referring to Figures 5 and 5ª, such movement of the lever over the first few notches tends to swing the pivot center 57ª downwardly, actually resulting in the pivot center 57ᵇ rising slightly.

This tends to move the upper end of the wheel carrying member 59 forwardly to a slight extent relatively to the frame. However, the other link 58 in swinging downwardly at the center 58ª or upwardly at the center 58ᵇ also tends to move the lower portion of the wheel carrying member forwardly. Thus, there is a slight vertical translational motion between the frame and the wheel carrying member, and also a slight horizontal translational or shifting motion between these two parts, but there is no appreciable oscillation or forward swinging of the wheel carrying member under the frame. Hence, during this initial depth adjusting motion of the lever 62, the rear end of the frame is only elevated a comparatively short distance relatively to the rear furrow wheel 21, much less in degree than the elevation of the front end of the frame relatively to the front furrow wheel. It will be noted that in the position shown in Figure 4, or in moving from the position of Figure 4 to the position of Figure 5, the two links 57 and 58 assume positions in substantial parallelism.

Continued forward motion of the actuating lever 62, beyond the first few notches in sector 63 represents that range of lift for raising the implement to transport position for bringing the plows up out of the ground. During this range of movement, the wheel carying member 59 is given an oscillatory or forward swinging movement whereby the rear furrow wheel 21 is carried forwardly under the frame and the rearwardly extending axle 61 becomes effective as a lifting crank for raising the rear end of the frame with a rapid motion.

Referring to Figures 6 and 6ª, it will be seen that with this continued forward motion of the actuating lever 62, the further downward movement of the pivot center 57ª, or upward movement of the pivot center 57ᵇ, will continue the vertical translatory movement between the wheel carrying member and the frame, but in addition thereto will cause the upper end of the wheel carrying member (the pivot center 57ª) to swing rear-

wardly relatively to the frame in a counter-clockwise direction.

At the same time, the vertical displacement between the wheel carrying member and the frame is causing the control link 58 to swing in a clockwise direction, which draws the pivot 58ª forwardly and hence swings the lower end of the wheel carrying member forwardly in a clockwise direction. Thus, with the upper end of the wheel carrying member being swung rearwardly and the lower end being swung forwardly, the wheel carrying member has an oscillatory or rotative movement set up therein in a direction operating to swing the rear furrow wheel 21 forwardly under the frame. With such motion, the long rearwardly extending portion 61 of the axle becomes effective as a crank for forcing the rear end of the frame upwardly. The oscillatory or rotative movement of the wheel carrying member accelerates rapidly so that in the final movement of the actuating lever 62, the rear end of the frame is quickly raised to transport position. It will be noted that when the implement is fully raised to transport position, the two links 57 and 58 extend at a pronounced angle to each other. At the same time that the rear furrow wheel 21 is swinging forwardly under the frame, the front end of the frame is still being raised through continued actuation of the front lifting mechanism 35, but the front end of the frame is not rising as rapidly as the rear end.

Accordingly, when the lever 62 has been moved forwardly to approximately the last notch in the sector 63, both ends of the frame have been raised to approximately the same height. It will be understood that in the operation of raising the plow to transport position, the lever 48 is also actuated to raise the land side of the frame to transport position.

As previously remarked, by placing the weight of the operator at a point in rear of the axis of the rear furrow wheel 21, his weight is effective to aid in swinging the furrow wheel forwardly in lifting the plow to transport position, it being noted from Figure 6 that the seat 52, in swinging down as the wheel swings forwardly, increases the leverage through which this weight acts on the wheel carrying member and wheel for swinging the same forwardly.

In the lifting operation, the operator is pushing forwardly on the lever 62, and hence the additional reaction pressure of this effort is transmitted to the seat 52. In pulling the lever rearwardly to force the disks down into the ground, the operator can exert his weight on the lever to apply additional force thereto. When the invention is embodied in a power lift plow, the power lift mechanism is preferably connected to the actuating member 62, but in such instance said actuating member does not have latching engagement with a latching sector.

When the edges of the plow disks wear down or when disks of a different size are substituted therefor, the bottom of the rear furrow wheel 21 can be adjusted to maintain the proper relation to the bottom edges of the disks by rotating the eccentric bushing 69 in the boss 68. It will be evident that by rotating this bushing in one direction, the pivot center 58ª can be shifted to draw the lower end of the wheel carrying member 59 forwardly.

This will swing the furrow wheel downwardly relatively to the frame and to the disks, such adjusted relation being indicated in dotted lines in Figure 7. By rotating the bushing in the opposite direction, the wheel carrying member can be swung backwardly to raise the furrow wheel slightly relatively to the disks. Such bearing bushing may be given different settings to impose the weight of the rear furrow wheel on the plow elements, or to control the depth of penetration of the rear plow element, and may be utilized to adjust the implement to different soil conditions.

While the foregoing construction constitutes the preferred embodiment of my invention, nevertheless it will be understood that such embodiment is merely exemplary and the numerous modifications and rearrangements may be made therein without departing from the essence of the invention.

I claim:

1. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of the frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a member carrying said rear furrow wheel, oppositely mounted swinging links connecting said wheel carrying member with said frame, means operatively connecting both lifting mechanisms together, and means for actuating said lifting mechanisms, said actuating means comprising a lever pivoted on said wheel carrying a member and a cooperating latching sector secured to said wheel carrying member.

2. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of the frame relatively to said rear furrow wheel, means operatively connecting said lifting mechanisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow

wheel, a pair of oppositely mounted swinging links having their adjacent ends pivotally connected with said wheel carrying member and having their opposite ends pivotally connected with said frame, and means for actuating said lifting mechanisms, said actuating means comprising a lever pivoted on said wheel carrying member and a cooperating latching sector secured to said wheel carrying member.

3. In a wheeled plow, the combination of a frame, a plurality of furrow openers carried thereby, front and rear furrow wheels and a land wheel supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, means operatively connecting said lifting mechanisms, said means including a member pivotally connected to both the front lifting mechanism and the rear lifting mechanism, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, a link pivotally connected with said wheel carrying member and extending forwardly for pivotal connection with said frame, a second link pivotally connected with said wheel carrying member and extending rearwardly for pivotal connection with said frame, said links extending in opposite but rearwardly converging directions when the frame is substantially in its lowermost position, and means for actuating said lifting mechanisms.

4. In a wheeled gang plow, the combination of a frame, a plurality of plows carried by said frame, front and rear furrow wheels and a land wheel supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, connecting means pivotally connected to each of said two lifting mechanisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, a pair of oppositely mounted swinging links having their inner ends pivotally connected with said wheel carrying member on vertically spaced centers and their outer ends pivotally connected with said frame, said links being so angularly related that they are adapted to move through a position of substantial parallelism and are not operative to raise the rear end of the frame any substantial amount during the initial swinging movement of the links until said links have passed their parallel position, and actuating means for operating said lifting mechanisms and including a lever connected to one of said swinging links and pivoted on said wheel carrying member.

5. In a wheeled gang plow, the combination of a frame, a plurality of plow elements carried thereby, front and rear furrow wheels and a land wheel supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, connecting means extending between said front and rear lifting mechanisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, a pair of links movably connecting said wheel carrying member with said frame, said links swinging about pivot centers arranged whereby in normal operating position said links extend substantially in parallelism, and thereafter said links extend at a pronounced angle to each other, and actuating means for operating said lifting mechanisms.

6. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a wheel carrying member, an axle swiveled in said member and extending rearwardly therefrom, said rear furrow wheel being mounted on said axle, a crank having its front end pivotally connected with the upper portion of said wheel carrying member and having its rear end pivotally connected with said frame, a link having its rear end pivotally connected with said wheel carrying member at a pivot center spaced substantially directly below the pivotal connection of said said crank with said member when the frame is lowered, the front end of said link being pivotally connected with said frame, the angular relation of said crank and link being such that the upper portion of said wheel carrying member has a component of movement which is forward with respect to the lower pivotal connection during the initial part of the lifting stroke, an actuating lever extending from said crank, and motion transmitting means operatively connecting said actuating lever with said front lifting mechanism.

7. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, connecting means operatively connecting said lifting mecha-

nisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, oppositely mounted swinging links connecting said wheel carrying member with said frame, actuating means for operating said rear lifting mechanism, and means cooperating with one of said links and adapted to change the angular relation between one of said links and said wheel carrying member for relatively adjusting said rear furrow wheel and frame independently of said actuating means.

8. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, connecting means operatively connecting said lifting mechanisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, oppositely mounted swinging links connecting said wheel carrying member with said frame, an actuating member for operating said rear lifting mechanism, and means cooperating with one of said links and operative to increase or descrease the effective length thereof for adjusting said rear furrow wheel and frame independently of the operation of said actuating member.

9. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, connecting means operatively connecting said lifting mechanisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, oppositely mounted swinging links connecting said wheel carrying member with said frame, an actuating member for operating said rear lifting mechanism, and an adjustable eccentric bearing for one of said links operative to relatively adjust said rear furrow wheel and frame independently of the operation of said actuating member.

10. In a wheeled gang plow, the combination of a frame, a plurality of furrow openers carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a wheel carrying member having a rearwardly extending axle on which the rear furrow wheel is mounted, an upper link pivotally connected at its front end with said wheel carrying member and pivotally mounted at its rear end of said frame, a lower link pivotally connected at its rear end with said wheel carrying member and pivotally mounted at its front end on said frame, an actuating lever extending from one of said links, motion transmitting means connecting said actuating lever with said front lifting mechanism, and an eccentric bearing bushing interposed between the rear end of said lower link and said wheel carrying member for adjusting the rear furrow wheel relative to said furrow openers.

11. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, and lifting mechanism for raising and lowering said frame relatively to said wheels comprising means for causing substantially vertical translational motion of slight magnitude between said rear furrow wheel and said frame during the depth adjusting range of said lift mechanism and for thereafter causing a forward swinging motion of said rear furrow wheel relative to said frame for rapidly raising said frame to transport position, said front and rear furrow wheels moving substantially the same amount relative to the frame.

12. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels and a land wheel supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, connecting means operatively connecting said lifting mechanisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, links connecting said wheel carrying member with said frame for relative translational motion, and a seat mounted on said wheel carrying member effective to apply the operator's weight thereto in a direction tending to raise the frame relatively to said rear furrow wheel.

13. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels and a land wheel supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, oppositely mounted swinging

links connecting said wheel carrying member with said frame, a manually actuated lifting lever rigidly connected with one of said links and operative by forward movement to swing said links for raising said frame relatively to said rear furrow wheel, a latching sector and cooperative means on the lever for holding said lever in different positions, and means operatively connecting said lever with said front lifting mechanism.

14. In a wheeled plow, the combination of a frame, a plurality of plow disks carried thereby, front and rear furrow wheels and a land wheel supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, means for steering said front furrow wheel, lifting mechanism cooperating with said land wheel for raising the land side of said frame relatively to said land wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a wheel carrying member, an axle swiveled in said member and having a rearwardly extending portion, said rear furrow wheel being mounted on said rearwardly extending portion, a crank having its front end pivotally mounted in the upper portion of said wheel carrying member and having its rear end pivotally mounted on said frame, a manually operated lifting lever connected with said crank and operable to swing the same, a latching sector for said lever mounted on said wheel carrying member, a control link having its rear end pivotally mounted in the lower portion of said wheel carrying member and having its front end pivotally connected with said frame, an eccentric bushing interposed between the rear end of said controlling link and said wheel carrying member for adjusting said rear furrow wheel relatively to the bottom edges of said disks, a seat bar extending rearwardly from said wheel carrying member, and a seat mounted thereon at a point in rear of the vertical axial plane of said rear furrow wheel.

15. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, connecting means operatively connecting said lifting mechanisms, said rear lifting mechanism comprising a wheel carrying member for said rear furrow wheel, oppositely mounted swinging links connecting said wheel carrying member with said frame, actuating means for operating said rear lifting mechanism and connected with one of said links, and means connected with the other of said links for relatively adjusting said rear furrow wheel and frame independently of said actuating means.

16. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of the frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a member carrying said rear furrow wheel, a pair of oppositely mounted swinging links connecting said wheel carrying member with said frame, said links being mounted in such angular relation that initial movement of the links imparts a forward tipping of the upper part of said member relative to the lower part, and means for actuating said lifting mechanisms.

17. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, front and rear furrow wheels supporting said frame, front lifting mechanism for raising and lowering the front portion of said frame relatively to said front furrow wheel, rear lifting mechanism for raising and lowering the rear portion of the frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a member carrying said rear furrow wheel, a pair of oppositely mounted swinging links connecting said wheel carrying member with said frame, said links being mounted in such angular relation that initial movement of the links imparts a rearward tipping of the lower part of said member relative to the upper part, and means for actuating said lifting mechanisms.

18. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, a rear furrow wheel supporting said frame, rear lifting mechanism for raising and lowering the rear portion of the frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a member carrying said rear furrow wheel, a pair of swinging links connecting said wheel carrying member with said frame, and means for actuating said lifting mechanism comprising a lever pivotally connected with the wheel carrying member and a cooperating sector carried by said wheel carrying member.

19. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, a rear furrow wheel supporting said frame, rear lifting mechanism for raising and lowering the rear portion of the frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a member carrying said rear furrow wheel, a pair

of oppositely mounted swinging links connecting said wheel carrying member with said frame, and means for actuating said lifting mechanism comprising a lever pivotally connected with the wheel carrying member and rigidly connected with one of said oppositely mounted links.

20. In a wheeled plow, the combination of a frame, a plurality of furrow openers carried thereby, means including a rear furrow wheel and a land wheel supporting said frame, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel comprising a wheel carrying member for said rear furrow wheel, a link pivotally connected with said wheel carrying member and extending forwardly for pivotal connection with said frame, a second link pivotally connected with said wheel carrying member and extending rearwardly for pivotal connection with said frame, said links extending in opposite but rearwardly converging directions when the frame is in its lowermost position, and means for actuating said lifting mechanism.

21. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, means including a rear furrow wheel for supporting said frame, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a wheel carrying member, an axle swiveled in said member and extending rearwardly therefrom, said rear furrow wheel being mounted on said axle, a crank having its front end pivotally connected with the upper portion of said wheel carrying member and having its rear end pivotally connected with said frame, and a link having its rear end pivotally connected with said wheel carrying member and its front end pivotally connected with said frame, the angular relation of said crank and link being such that the upper portion of said wheel carrying member has a component of movement which is forward with respect to the lower pivotal connection during the initial part of the lifting operation.

22. In a wheeled plow, the combination of a frame, furrow opening means carried thereby, means including a rear furrow wheel for supporting said frame, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel comprising a wheel carrying member for said rear furrow wheel, a pair of swinging links connecting said wheel carrying member with said frame, actuating means for operating said rear lifting mechanism, and means cooperating with one of said links and adapted to change the angular relation between one of said links and said wheel carrying member for relatively adjusting said rear furrow wheel and frame independently of said actuating means.

23. A wheeled plow comprising a frame, furrow opening means carried thereby, means including a rear furrow wheel supporting said frame, rear lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel comprising a wheel carrying member for said rear furrow wheel, a pair of swinging links connecting said wheel carrying member with said frame, an actuating member for operating said rear lifting mechanism, and an adjustable eccentric bearing in which one of said links is journaled, said bearing being operative to relatively adjust said rear furrow wheel and frame independently of the operation of said actuating member.

24. A plow comprising a frame, a plurality of furrow openers carried thereby, front and rear furrow wheels supporting said frame, near lifting mechanism for raising and lowering the rear portion of said frame relatively to said rear furrow wheel, said rear lifting mechanism comprising a wheel carrying member having a rearwardly extending axle on which the rear furrow wheel is mounted, an upper link pivotally connected at its front end with said wheel carrying member and pivotally mounted at its rear end on said frame, a lower link pivotally connected at its rear end with said wheel carrying member and pivotally mounted at its front end on said frame, an actuating lever extending from one of said links, and an eccentric bearing bushing interposed between the rear end of said lower link and said wheel carrying member for adjusting the rear furrow wheel relative to said furrow openers.

25. In a wheeled plow, the combination of frame, at least one plow carried by said frame, supporting means for said frame including a rear furrow wheel, and means for adjusting the position of said rear wheel relative to the frame, said means comprising pivoted upper and lower links oppositely mounted, a rear wheel carrying member carried by the links, the upper link being shorter than the lower link, and means for swinging one of the links to raise and lower the frame, said links being so angularly arranged that initial raising movement of the frame from its lowermost position is relatively slow and subsequent raising movement is relatively rapid.

In witness whereof I hereunto subscribe my name this 2d day of August, 1928.

CARL G. STRANDLUND.