

July 7, 1931.

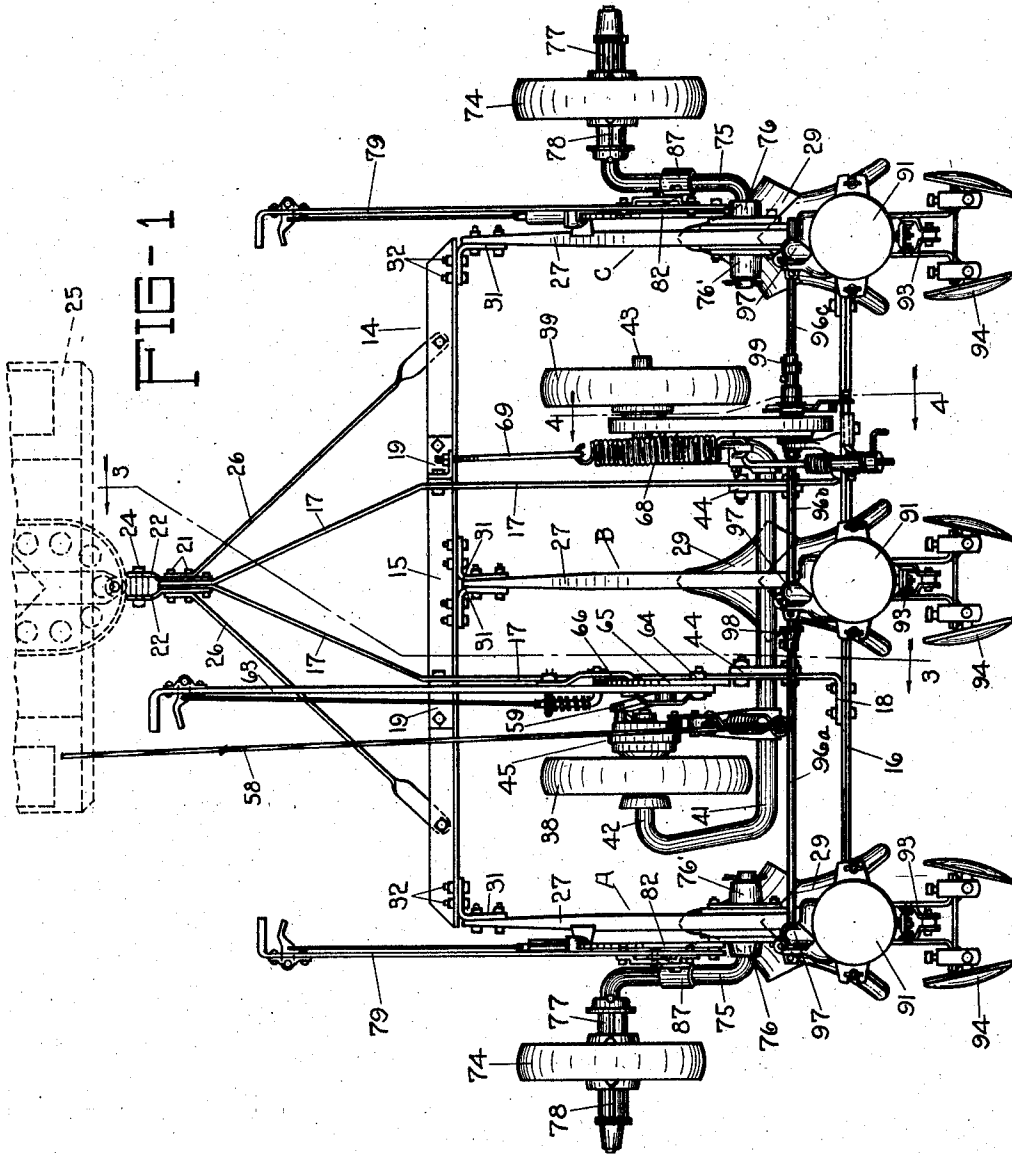
W. H. SILVER

1,813,207

LISTER

Filed March 15, 1928

5 Sheets-Sheet 1



WITNESS

Walter Ackman

INVENTOR

Walter H. Silver,

BY Brown, Janson, Bottcher & Diermer,

ATTORNEY

July 7, 1931.

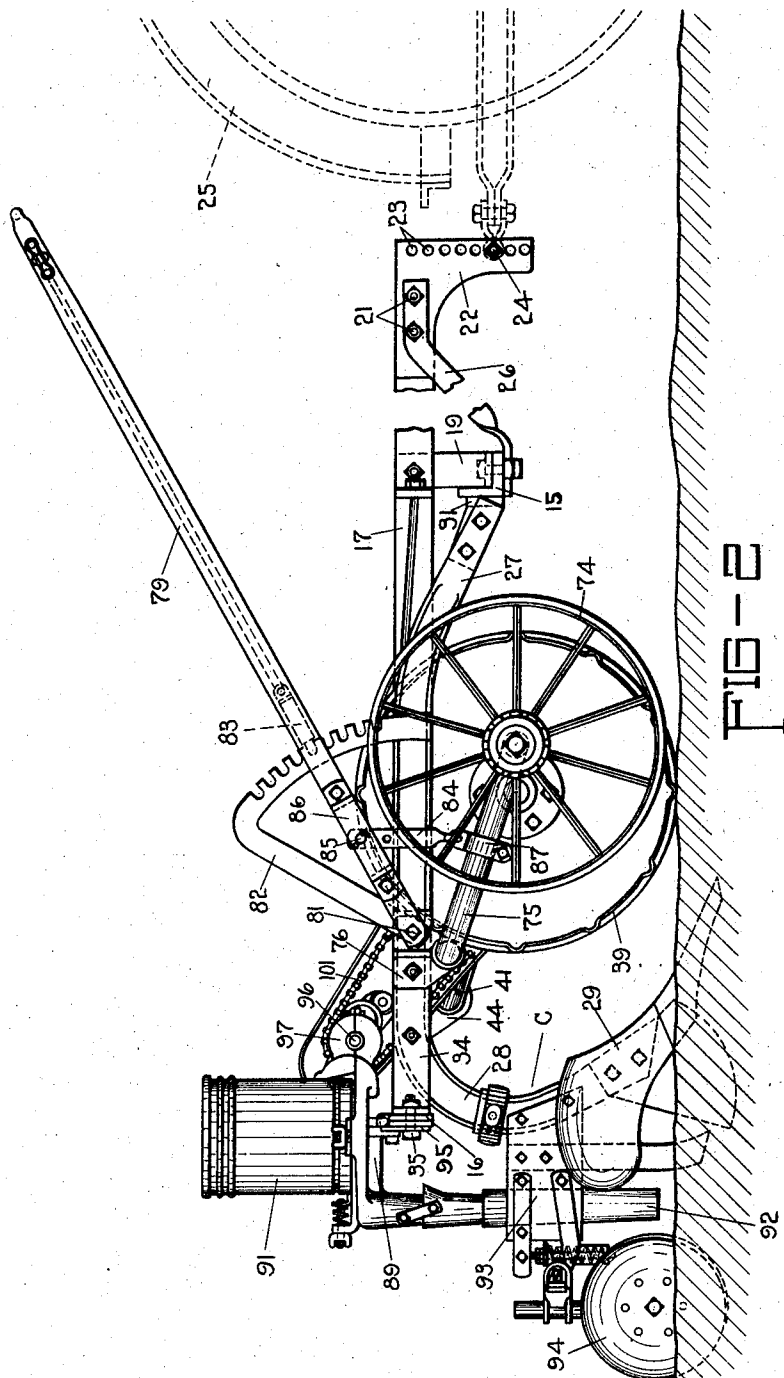
W. H. SILVER

1,813,207

LISTER

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5 Sheets-Sheet 2



WITNESS

Walter Ackerman

BY

INVENTOR
Walter H. Silver,
Brown, Jackson, Betteker and Diermer.
ATTORNEY

July 7, 1931.

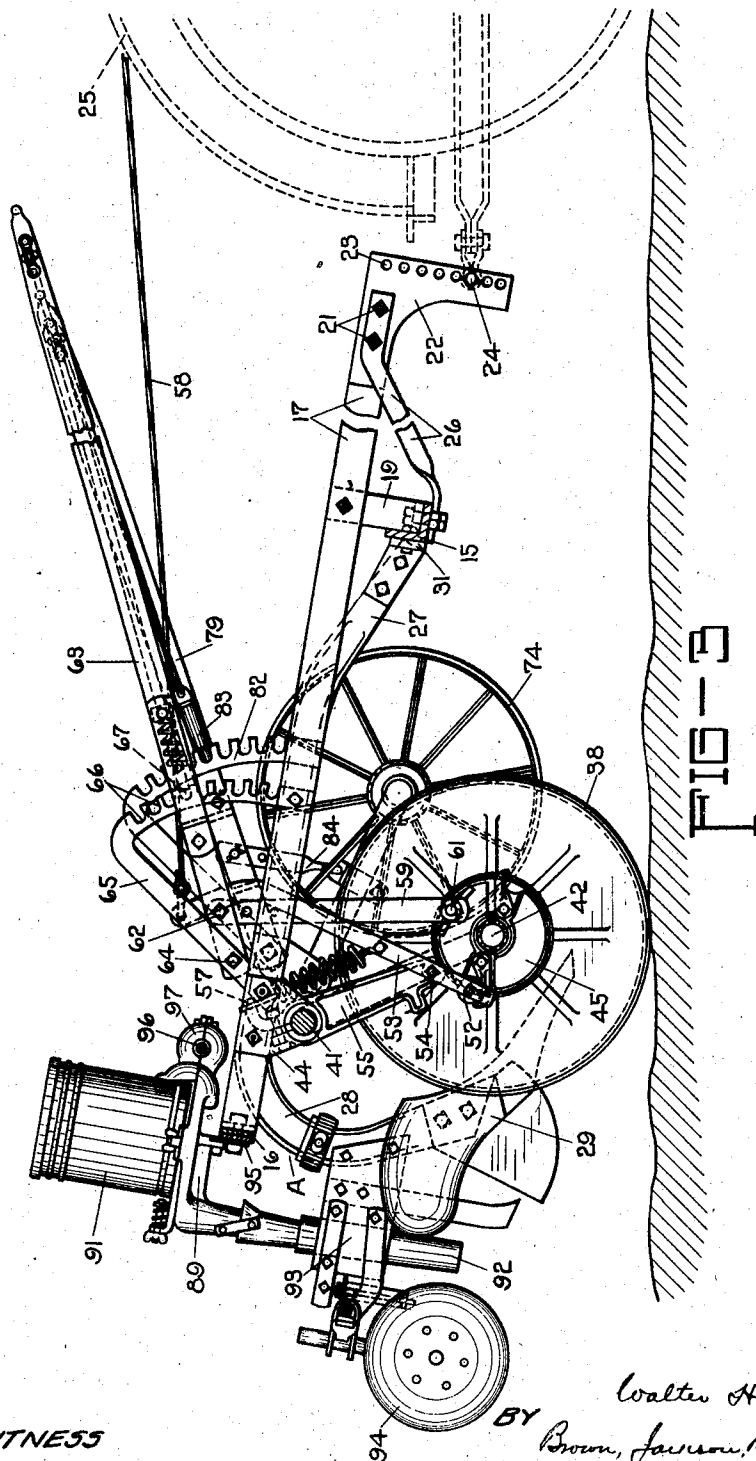
W. H. SILVER

1,813,207

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5 Sheets-Sheet 3



WITNESS

Walter Ackerman

BY

INVENTOR
Walter H. Silver,
Brown, Jackson, Betteker & Deussen.
ATTORNEY

July 7, 1931.

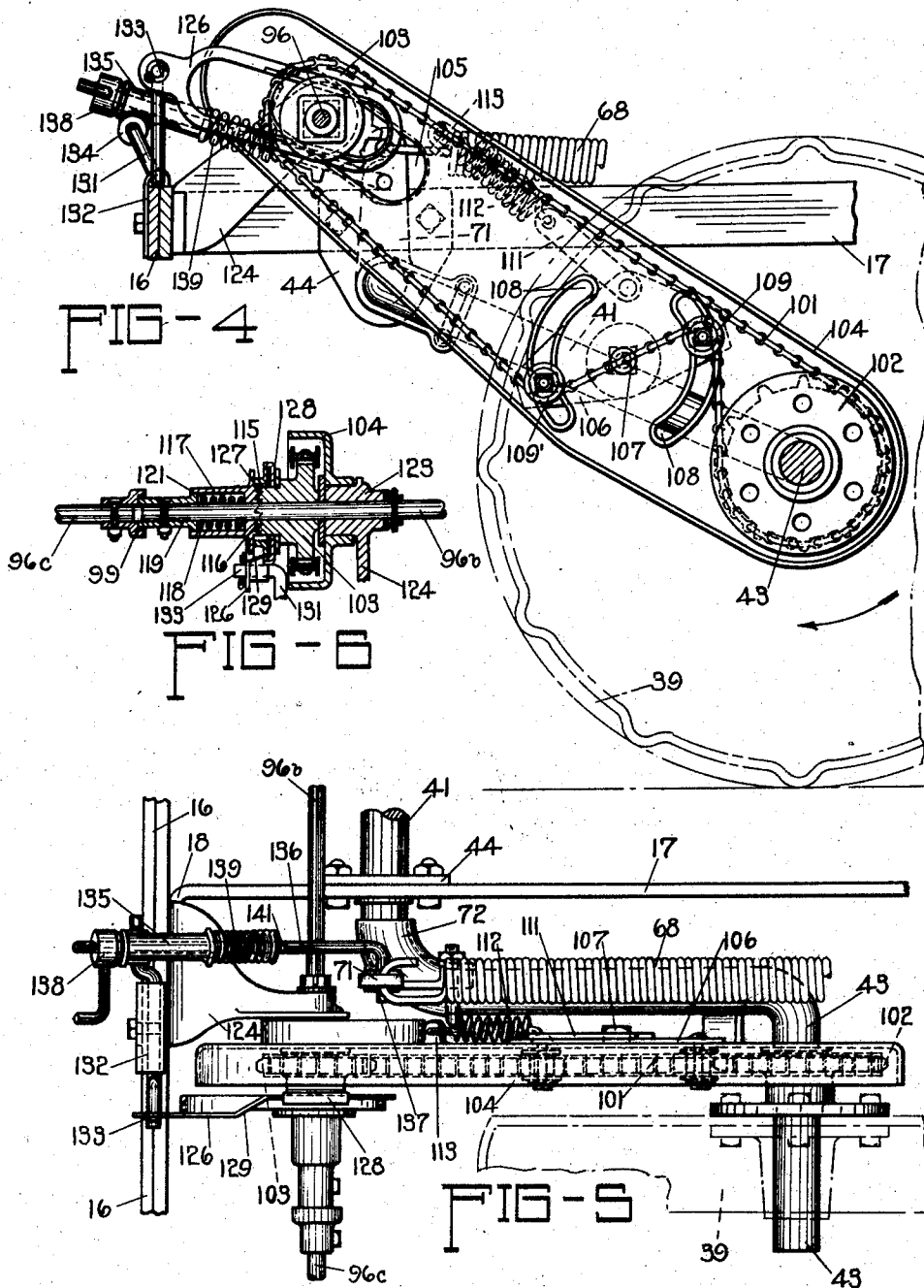
W. H. SILVER

1,813,207

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5 Sheets-Sheet 4



WITNESSES

Walter Ackerman

BY

Walter H. Silver,
Brown, Jackson, Boettcher and Jensen,
ATTORNEY

July 7, 1931.

W. H. SILVER

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5 Sheets-Sheet 5

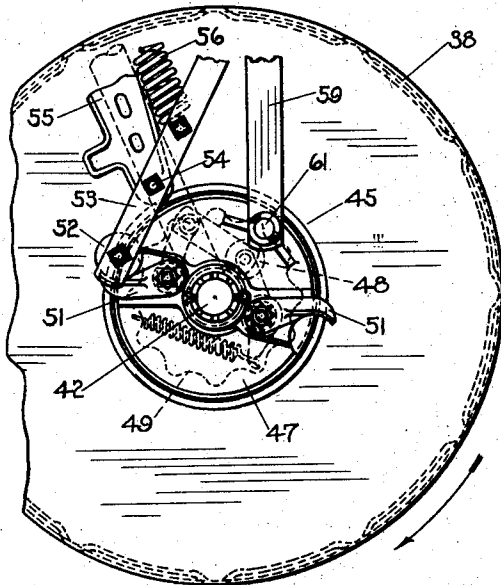


FIG-7

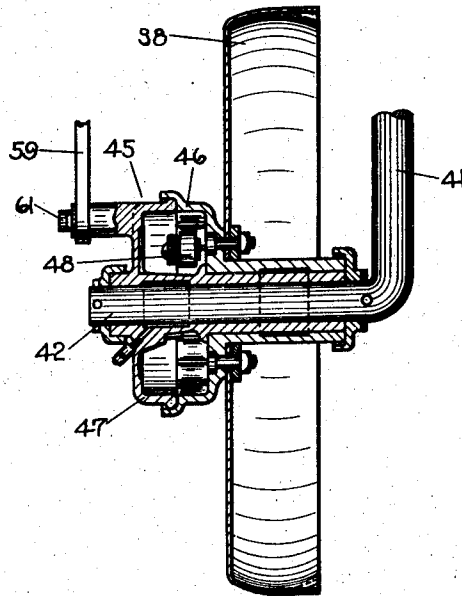


FIG-8

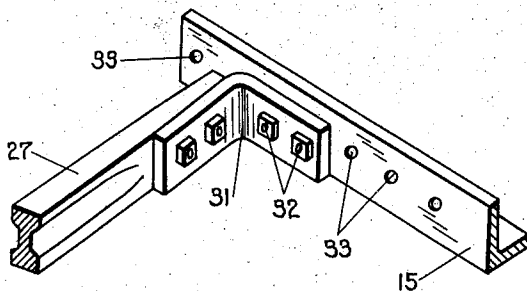


FIG-9

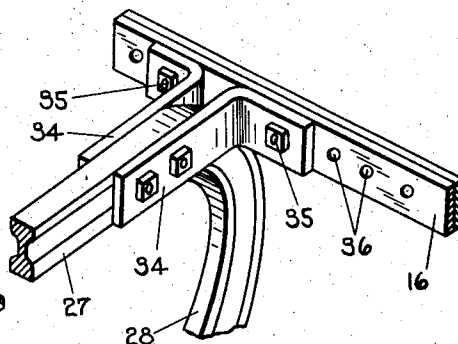


FIG-10

WITNESS

Walter Ackerman

INVENTOR
Walter H. Silver,
BY *Brown, Jackson, Boettcher & Deussen.*
ATTORNEY

UNITED STATES PATENT OFFICE

WALTER H. SILVER, OF MOLINE, ILLINOIS, ASSIGNOR TO DEERE & COMPANY, OF
MOLINE, ILLINOIS, A CORPORATION OF ILLINOIS

LISTER

Application filed March 15, 1928. Serial No. 261,719.

The present invention relates to listers and embodies improvements having particular reference to three row listers adapted for tractor propulsion.

One of the particular features of the invention is concerned with the manner of supporting the lister frame on its ground wheels, and with the manner of effecting the depth adjustments of the frame relative to said ground wheels. The downwardly acting forces set up in the frame of a three row lister are severe, owing to the inherent tendency of the lister plow bottoms to run deeper into the soil, and to the relatively wide spacing between the three plow bottoms corresponding to the spacing between listing rows. When it is attempted to support this frame at its different depth adjustments through two ground wheels which are disposed outside of the outermost lister units, the points of support are placed so far apart that the aggregate suction of the three plow bottoms tends to flex or spring the frame downwardly in the center. I have avoided this difficulty by providing two ground wheels which are disposed at intermediate points of the frames, on opposite sides of the central lister unit. Mechanism is associated with these intermediate or centrally disposed wheels so that they will have the dual function of depth adjusting wheels and also of power lift wheels. The location of these wheels relative to the frame and to the plow bottoms enables them to sustain the downwardly acting forces without the possibility of the frame being distorted or warped downwardly. Associated with these intermediate wheels is a pair of outer wheels which are disposed outside of the two lateral lister units in the relation above described. Such outer wheels, however, merely function as gauge wheels, and are set to conform to the depth adjustment established by the intermediate wheels.

Another object of the invention is to provide a three row lister in which the two outer lister units can be shifted inwardly or outwardly transversely of the frame for adapting the implement to different spacings between the listing rows. As hereinafter described, the implement comprises planter

mechanism associated with each lister plow bottom, and, in this regard, it is a further object of the invention to so construct the driving mechanism for the three planter devices that this inward or outward shifting of the two outer lister units can be readily accomplished without disturbing the driving relations to the planter mechanisms and without necessitating extensive changes in the driving mechanism to accommodate said shifting of the lister units.

A further object of the invention is to provide a three row lister in which the three lister units are substantial duplicates, thereby avoiding the necessity of special constructions in the case of one or more of the lister units, and hence reducing the cost of the implement.

Further objects are to provide an improved means for stopping and starting the planter drive mechanism with the raising and lowering of the plow bottoms between their inoperative and operative positions; to provide improved means for taking slack out of the drive chain which transmits power from one of the intermediate supporting wheels to the planter drive shaft, whereby the chain is made to accommodate automatically a variable spacing which occurs between said supporting wheel and the planter drive shaft as the implement is raised and lowered to different positions; and to improve upon the construction of these implements in other particulars, as will hereinafter appear in the following description of a preferred embodiment of the invention. In the accompanying drawings illustrating such embodiment,

Figure 1 is a plan view of the implement.

Figure 2 is a fragmentary side elevational view of the implement, showing the plow bottoms in their lower operative positions.

Figure 3 is a longitudinal sectional view showing the implement raised to its transport position, this figure corresponding to a section taken approximately on the plane of the line 3—3 of Figure 1.

Figure 4 is a longitudinal sectional view taken approximately on the plane of the line 4—4, Figure 1, and illustrating the chain drive mechanism between one of the intermediate wheels and the planter drive shaft.

Figure 5 is a plan view of this part of the structure.

Figure 6 is a detailed sectional view of the clutch mechanism for automatically interrupting the planter drive when the implement is raised to transport position.

Figure 7 is a fragmentary side elevational view of the power lift wheel.

Figure 8 is an axial sectional view through this wheel and through the clutch mechanism associated therewith.

Figure 9 is a detail view showing the adjustable relation between outer lister units and the front frame bar; and,

Figure 10 is a similar view showing the adjustable relation between the outer lister units and the rear frame bar.

The three lister units, designated in their entireties A, B and C are preferably disposed in transverse alignment, and are connected to, or form a part of, a main frame designated 14 in its entirety. This frame comprises a transversely extending front frame bar 15, a similarly extending rear frame bar 16, and two longitudinally extending frame bars 17—17. The rear frame bar 15 preferably consists of two bars bolted together for additional strength, and the longitudinally extending frame bars 17—17 have their rear ends bent outwardly for bolting to the frame bar 16, as indicated at 18 in Figure 1. As shown in Figures 2 and 3, the front frame bar 15, which is preferably an angle section, is disposed in a lower plane than the rear frame bar 16, and the longitudinally extending frame bars 17 extend forwardly over the front frame bar in spaced relation thereto. Angle brackets 19 are bolted to the sides of the longitudinal frame bars 17 and extend downwardly for bolting to the horizontal flange of the front frame bar 15. The forward ends of the longitudinal frame bars 17 are converged and are secured together by bolts 21 between two plates 22 which form a draft attachment for the front end of the implement. The plates 22 are of angular form, and the vertically extending portions thereof are spaced and are provided with aligned holes 23 for receiving at different heights a coupling pin 24 through which draft connection may be made in a well known manner with the tractor 25. Referring to Figure 1, two diagonal brace bars or links 26—26 are secured at their forward ends to the outward sides of the plate 22, and extend rearwardly and outwardly for attachment to the underside of the front frame bar 15, preferably at points adjacent to the outer ends thereof.

Each lister unit A, B and C comprises a plow beam 27 having secured to the downwardly curved standard portion 28 thereof a lister plow bottom 29. The beams and plow bodies of the three lister units are all substantial duplicates, and the three beams make up

a part of the implement frame 14. The downly inclined front ends of the beams are secured to the front frame bar 13 by angle brackets 31. As shown in Fig. 1, the beam of the intermediate unit B is secured to the frame bar by arranging such angle brackets on opposite sides of the beam and bolting the same to the beam and to the frame bar, and the beams of the two lateral units A and C are similarly secured to the frame bar by bolting this same form of bracket to the inner side of each beam and to the frame bar. Referring to Fig. 9, it will be seen that the bracket 31 of each lateral beam is secured to the front frame bar 15 by two bolts 32 which pass through holes 33 in the vertical flange of the frame bar. There are a considerable number of these holes 33 placed equidistantly along each end portion of the frame bar, so that the points of attachment of the front ends of the lateral beams can be shifted inwardly or outwardly in adapting the implement to different spacings of the listing rows, the construction shown illustrating the required number of holes for obtaining four different adjustments of each lateral plow beam.

Referring to Figures 2 and 10, the rear portion of each plow beam is secured to the rear frame bar 16 by a pair of angle brackets 34 which are bolted to the opposite sides of the horizontal portion of the plow beam and extend rearwardly in prolongation thereof. The outwardly bent ends of these brackets are secured to the frame bar 16 by bolts 35. As shown in Figure 10, the end portions of the frame bar 16 are provided with a plurality of equidistantly placed holes 36 for receiving these bolts 35, so that the rear ends of the two lateral beams can be shifted inwardly or outwardly to correspond to the settings given the front ends of the beams.

The two intermediate wheels previously referred to are indicated at 38 and 39, these wheels being located between the sides of the frame and substantially equidistantly between the central lister unit B and the two lateral units A and C. Such wheels are mounted on the crank ends 42 and 43 of a crank axle 41 which has bearing support in brackets 44 extending downwardly from the two longitudinal frame bars 17 (see Figures 2 and 4). These wheels serve to lift the entire frame bodily to transport position (Figure 3) and to adjust the depth of plowing; the wheel 39 at the right hand side also serving to transmit a drive to the planter mechanism associated with each lister unit, as will be presently described. The power lift mechanism and the depth adjusting lever are associated with the left hand wheel 38, the power lift clutch being of a standard well-known construction (Figures 7 and 8) and hence it will not be necessary to describe this lift clutch in detail. It will suffice to say that

the lift clutch designated 45, comprises a driving clutch element 46 and a driven clutch element 47, both of which are preferably formed with coaxial sleeves which have bearing support on the crank axle 42. The driving clutch element is bolted to the wheel 38 to rotate therewith, and is adapted to transmit rotation to the driven clutch element 47 through the instrumentality of a roller 48 which is adapted to move into and out of engagement with notches 49 formed internally in the driving clutch element. The roller 48 is mounted on the pivot of two connected links illustrated in dotted lines in Figure 7, which links have operative connection with diametrically opposite dogs 51 rotatably supported in the outer side wall of the driven clutch element 47. Spring means connected with the aforesaid links normally tends to swing the roller 48 out into clutching engagement with the notches 49, such tendency of the spring being overcome when one of the tripping dogs 51 is engaging a roller 52 which is mounted on the lower end of a tripping lever 53. Such lever is pivoted at 54 to an arm 55 which is clamped to and extends downwardly from the upper portion of the crank axle 41. A tension spring 56 has its lower end attached to the tripping lever 53, at a point above the pivot 54, and has its upper end connected to a hook extension 57 (Figure 3) projecting from the upper clamping portion of the arm 55. The tendency of this spring is normally to swing the roller 52 into the path of one or the other of the tripping dogs 51 for holding the lift clutch disengaged. The upper end of the lever 53 has connected to it a rope 58 which leads forwardly to a point adjacent to the operator's seat on the tractor 25, and it will be evident that by jerking on this rope the operator can disengage the roller 52 from the tripping dog 51 with which it is then engaging, thereby resulting in a half revolution of the driven clutch element 47, or until the other tripping dog 51 engages the roller 52 and releases the clutch. The half revolution of the driven clutch element is operative to raise or lower the implement through a lifting link or bar 59 which is pivotally connected at its lower end to a pivot stud 61 projecting outwardly from the side of the driven clutch element. Referring to Figure 3, the upper end of said lifting bar is pivotally connected at 62 to a depth adjusting lever 63 adapted to be manually operated from the driver's position on the tractor. The rear end of the adjusting lever 63 is pivoted at 64 to a bracket 65 which is rigidly secured to the adjacent longitudinal frame bar 17, the downwardly curved forward portion of the bracket 65 having quadrant notches 66 formed therein for receiving a well known type of latching dog 67 carried on the adjusting lever 63.

It will be evident from the foregoing that

by merely pulling on the trip rope 58 the operator can raise the implement to transport position, or can lower it to plowing position. The rotation of the crank pin 61 will react through the lifting bar 59, the upper end of which may be assumed as having a fixed pivot at the point 62, and the reaction through this lifting bar will either cause the crank axle 41 to swing downwardly and rearwardly, or to swing upwardly and forwardly, depending upon which half of the cycle the driven clutch member is operating in. The concurrent swinging movement of both wheels 38 and 39 will thus raise or lower the implement in an obvious manner. When the operator desires to adjust the depth of penetration of the plow bottoms he merely swings the adjusting lever 63 either upwardly or downwardly, and this operates through the lifting bar 59 to swing the crank axle 41 and the two wheels 38 and 39 either upwardly or downwardly for securing the desired depth adjustment. The relatching of the adjusting lever 63 to its quadrant 66 locks the pivot point 62 in stationary relation for any subsequent lifting and lowering operations effected by the power lift clutch 45. The weight of the implement frame and of the plows etcetera, is counterbalanced to some extent by a tension spring 68 which is connected at its front end to a tie rod 69 having adjustable attachment to the front portion of the frame, the rear end of the spring 68 being coupled to an arm 71 extending upwardly from an elbow bracket 72 secured to the crank axle 41. Disposed beyond the sides of the frame are gauge wheels 74—74 which are mounted on the spindle portions of crank axles 75. The upper end of each crank axle 75 has bearing support in two bearing brackets 76—76' which are bolted to the angle brackets 34 on opposite sides of the plow beam of the outer lister unit, the journal portion of the axle extending between said bearing brackets below the plow beam. The journal portion of each crank axle has a sleeve 77 rotatably supported thereon and the gauge wheel 74 is adjustable lengthwise along this bearing sleeve or skein, in order to permit inward or outward shifting of the two gauge wheels to adapt the implement to different spacings between the listing rows. The gauge wheel is held in any shifted position along the sleeve 77 by a suitable set screw, and the sleeve may be provided with a rib or spline 78 engaging in a corresponding key way in the hub of the wheel to compel the rotation of the sleeve with the wheel. Each of these outer wheels is provided with an independent adjusting lever 79 which is pivotally connected at 81 to a latching quadrant 82 secured to the side of the plow beam 27 of the adjacent lister unit. The lever is provided with the usual latch mechanism 83 for engaging its latching

quadrant, and has pivotal connection with the adjacent crank axle 75 through a link 84 (Figure 2). The upper end of this link is pivoted on a pin 85 which extends from the side of the lever 79 and has its outer end supported in a strap 86 spaced outwardly from the side of the lever. The lower end of the link 84 is coupled to a collar 87 which is clamped to the forwardly extending portion of the crank axle. It will be evident that by swinging the two levers 79—79 upwardly or downwardly the two outer wheels 74—74 will be correspondingly raised or lowered and will be held at any fixed setting given the levers 79. These outer wheels merely function as gauge wheels, as for the purpose of leveling the plow and maintaining the same at the proper balance, it being understood that the desired depth adjustment is first established by adjustment of the two intermediate wheels 38—39, and that thereafter the gauge wheels 74—74 are set to conform to this desired depth adjustment. Attention is directed to the fact that each outer wheel 74, together with its crank axle 75 and adjusting lever 79 is mounted as a unit upon the plow beam of the adjacent lister unit, so that in any inward or outward shifting adjustment of the lister units, transversely of the frame, the gauge wheels will be shifted directly therewith and there will be no necessity of disassembling or modifying the relation of the gauge wheels with reference to the implement.

Associated with each lister unit is a planter mechanism comprising a mounting bracket 89 on which a seed hopper 91 is supported. The seed is discharged from the hopper through the operation of a conventional seed plate or other feeding mechanism to a seed spout 92 extending downwardly and rearwardly of plow body 29 for dropping seed into the lister furrow opened by the plow. The spout 92 is carried in a bracket 93 consisting of a pair of spaced attachment plates bolted to the opposite sides of the plow beam standard 28. The rear end of the bracket 93 may be arranged to carry any desired combination of covering discs or shovels 94 for turning the soil back into the furrow over the seed. The upper mounting bracket 89 of each planter mechanism is bolted or otherwise secured to a mounting plate 95 which is adapted to receive the two bolts 35 which secure each plow beam to the rear frame bar 16. When the two lateral lister units A and C are shifted inwardly or outwardly, as previously described, the two mounting plates 95 associated with these lister units are shifted along with the bolts 35 so that the planter mechanisms of these two lister units are shifted correspondingly with the units.

The feeding plates of the three hoppers 91 are all driven from a transversely extending drive shaft 96 which extends through a

forwardly projecting housing portion 97 at each planter mechanism, in which housing portion the shaft has suitable geared connection with the feeding plate. Referring to Figure 1, it will be seen that the drive shaft 96 is divided into three sections 96^a, 96^b and 96^c, each shaft section having bearing support in the housing portion 97 of its individual planter, and the three sections being connected together by coupling joints 98 and 99 which permit slight disalignment of the shaft sections while compelling simultaneous rotation of all of the sections. When the two lateral lister units A and C are shifted inwardly or outwardly to adjust the row spacing the planter mechanisms of these units slide lengthwise along their respective shaft sections 96^a and 96^c, provision being made for permitting this sliding adjustment without interrupting the drive to the feeding plates of these planter mechanisms.

Referring to Figures 4 and 5, the shaft 96 is driven from the wheel 39 through a chain 101 which passes over a sprocket wheel 102 on said ground wheel, and over a sprocket wheel 103 mounted on the planter drive shaft. The chain is enclosed in a shield or guard 104 which is supported at its lower end on the spindle portion 43 of the crank axle 41. The upper end of the shield is provided with a relatively long slot 105 through which the drive shaft 96 extends, this slot being necessary to permit of the endwise shifting movement of the upper end of the shield incident to raising and lowering movement of the implement, since the crank axle 41 swings about a center which is disposed below and forwardly of the axis of the drive shaft 96. To accommodate this eccentricity of swinging movement of the driving sprocket wheel 102 with respect to the driven sprocket wheel 103 I have provided resilient means coacting with the chain 101 for taking up slack from the chain as the sprocket wheels approach each other and for supplying an additional amount of chain as the sprocket wheels recede from each other, this resilient means also tending to retain the drive chain taut at all times and thereby taking up wear in the chain. Such resilient means comprises a plate 106 which is pivoted substantially at its center on a pivot bolt 107 mounted in the shield 104, the plate being disposed on the outer side of the shield. The two arms of this plate carry pivot studs which extend into the shield through arcuate slots 108 which are curved concentrically of the pivot bolt 107. Mounted on these studs within the shield are rollers or sheaves 109—109', and the lower flight of the chain is trained upwardly over the upper roller 109 and down under the lower roller 109'. A link 111 is pivotally connected to the upper portion of the plate 106 and is attached to a tension spring 112, the other end of which is con-

nected to a lug 113 projecting from the outer
 side of the shield 104. The tension of the
 spring 112 tends constantly to swing the
 rollers 109—109' in a direction to maintain
 5 the drive chain under a resilient tension
 whereby the effective length of the chain be-
 tween the two sprocket wheels 102 and 103
 will increase and diminish as the sprocket
 wheels separate or move towards each other.
 10 Attention is directed to the fact that the
 driving energy is transmitted through the
 upper flight of the chain, and hence the re-
 sili-ent tension imposed on the lower return
 flight thereof will not affect the driving rela-
 15 tion. When it is desired to change the drill-
 ing distances of the seed the feeding plates
 in the bottoms of the hoppers 91 may be sub-
 stituted by plates having a greater or lesser
 number of cells; and, to the end of providing
 20 an additional adjustment for these drilling
 distances I have made provision for substi-
 tuting the driven sprocket wheel 103 by larger
 or smaller sprocket wheels for varying the
 speed of rotation of the planter drive shaft
 25 96. It will be evident that the action of the
 rollers 109—109' in taking up or letting out
 a portion of the drive chain 101 will permit
 of this substitution of the sprocket wheel 103
 without necessitating any adjustment of the
 30 parts.

Referring to the clutch means which is pro-
 vided for automatically interrupting the
 drive to the planter shaft 96 when the imple-
 ment is raised to transport position, it will be
 35 seen from Figure 6 that the driven sprocket
 wheel 103 is rotatably mounted on the shaft
 section 96^b and has a hub portion extending
 from one side thereof, in which are formed
 jaw teeth 115. These jaw teeth are adapted
 40 to engage with cooperating teeth 116 formed
 on one end of a shiftable clutch sleeve 117.
 The other end of said sleeve is formed with a
 polygonal socket 118 which engages slidably
 but non-rotatably over a polygonal head or
 45 flange formed on the end of a sleeve 119 which
 is bolted or keyed to the shaft section 96^b. A
 spring 121 is confined in the socket 118 and
 reacts against the sleeve 119 for normally
 50 holding the clutch teeth 115—116 in driving
 engagement. The other end of the sleeve 119
 is formed with a polygonal exterior which
 fits loosely in a correspondingly formed
 socket in the end of the coupling member 99
 55 which is secured to the shaft section 96^c, this
 coupling member permitting disalignment
 of the later shaft section with respect to the
 shaft section 96^b but compelling joint rotation
 of both shaft sections. The sprocket wheel
 60 103 is held against shifting along the shaft
 section 96^b by a bearing hub 123 against the
 end of which the sprocket wheel bears. This
 hub is formed on an arm 124 which is fixedly
 secured to the inner side of the rear frame bar
 65 15. The elongated slot 105 in the shield 104

slides on the outer surface of the bearing
 hub 123.

Disengagement of the clutch is effected by
 a reciprocating yoke 126 in the form of a long
 link having a longitudinally extending slot
 70 therein which slides upon the two elements
 of the clutch directly over the clutch teeth.
 The yoke is confined between the flange 127 on
 the clutch sleeve 117 and a laterally thrust-
 ing spring plate or washer 128 which bears
 75 against a shoulder on the hub of the sprocket
 wheel 103. The lower or forward end of the
 yoke member 126 is made comparatively nar-
 row, transversely of such member, so that
 when this portion of the yoke member is lying
 80 between the flange 127 and spring plate 128
 the two clutch parts are permitted to engage.
 The opposite end of the yoke member is made
 comparatively wide in this same dimension so
 that when this portion of the yoke member is
 85 thrust forwardly between the flange 127 and
 spring plate 128 the two clutch parts are
 forced apart for releasing the clutch. The
 top and bottom portions of the yoke member
 are formed with sloping cam surfaces 129 on
 90 one side thereof between the wide and narrow
 portions of the yoke, and these cam surfaces
 thrust laterally against the flange 127 for re-
 leasing the clutch when the yoke member is
 moved forwardly as above described. Such
 95 movement of the yoke member is made to oc-
 cur when the implement is raised to transport
 position through the swinging movement of a
 crank link or lever 131 which has pivotal
 100 mounting in a strap or bracket 132 secured to
 the rear frame bar 16. One arm of the lever
 131 is pivoted at 133 to the rear end of the
 shifter yoke 126. The other arm of such lever
 is pivotally connected at 134 to a sleeve 135
 105 which is mounted on a rod 136. Referring to
 Figure 5, it will be seen that the front end of
 this rod is bent laterally for making pivotal
 connection at 137 with the arm 71 which
 swings with the crank axle 41. The rod 136
 110 is arranged to slide freely through the sleeve
 135 and has its projecting rear end threaded
 for receiving a threaded crank or nut 138
 adapted to be screwed down against the end
 of the sleeve 135. A compression spring 139
 115 is confined between the other end of the sleeve
 135 and a pin or shoulder 141 carried by the
 rod 136. It will be apparent that by screw-
 ing the adjusting crank 138 downwardly
 along the rod the sleeve 135 will be shifted
 120 downwardly against the pressure of the
 spring 139 and by screwing the crank 138
 backwardly on the rod the sleeve 135 will
 move backwardly a corresponding distance
 under the pressure of the spring 139. Thus,
 the timed relation between the movement of
 125 the shifter yoke 126 and the movement of the
 crank axle 41 can be adjusted for varying the
 time of release of the drive clutch with refer-
 ence to the lifted position of the implement,
 it being understood that this release of the
 130

clutch should not occur while the implement is being adjusted between any of its working positions. It will be noted that as the yoke member 126 is being moved forwardly or backwardly it is free to swivel or rock around the annular surfaces of the clutch elements whereby the arcuate movement of the lever 131 is accommodated.

It will be seen from the foregoing that the present construction affords an arrangement of wheel supports which relieves the frame from distorting stresses, and which also results in an even running implement. Such will be apparent from the fact that by disposing the two intermediate wheels 38 and 39 in close proximity to each of the plow bottoms, and by establishing the depth adjustment of the implement through these wheels, all parts of the frame, and particularly the intermediate portion thereof, are well supported to carry the downwardly acting stresses of the plows. As before remarked, the two gauge wheels 74 serve to level the plow or to maintain the same in properly balanced relation with reference to the ground.

I claim:

1. In a lister, the combination of a frame, a plurality of plows carried by said frame, a supporting wheel disposed between the sides of said frame for normally supporting the frame between the sides thereof, power lift mechanism cooperating with said wheel for raising said frame, depth adjusting means connected with and operative through said wheel for establishing the depth adjustment of the implement, said wheel having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments, and a pair of gauge wheels at the sides of said frame for leveling the plows and maintaining the same at the proper balance.

2. In a lister, the combination of a frame, a plurality of plows carried thereby, a crank axle carried by said frame, a supporting wheel mounted on said crank axle for normally supporting the frame between the sides thereof, power lift mechanism cooperating with said wheel for raising said frame, depth adjusting means operatively connected with said wheel and coacting therewith for establishing the depth adjustment of the implement, said wheel having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments, a pair of gauge wheels at the sides of said frame for leveling the plows and maintaining the same at the proper balance and means for adjusting said gauge wheels vertically relatively to the frame.

3. In a lister, the combination of a frame,

a crank axle carried by said frame, supporting wheels mounted on the respective spindle portions of said crank axle and located between the sides of the frame for normally supporting the frame between the sides thereof, power lift mechanism associated with one of said wheels for raising said frame, depth adjusting means connected with one of said wheels and coacting therewith for establishing the depth adjustments of the implement, said wheels having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments, a pair of gauge wheels at the sides of said frame for leveling the plows and maintaining the same at the proper balance, and means for adjusting said gauge wheels vertically relatively to said frame.

4. In a lister, the combination of a frame, a plurality of lister plows carried by said frame, a crank axle carried by the frame intermediate the sides of the latter, supporting wheels mounted on the respective spindle portions of said crank axle between the sides of the frame for normally supporting the frame between the sides thereof, power lift mechanism operatively connected with one of said wheels for raising said frame through swinging motion of said crank axle, a depth adjusting lever operatively connected with one of said wheels for establishing the depth adjustment of the implement through swinging motion of said crank axle, said wheels having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments, a pair of crank axles mounted at the sides of said frame, gauge wheels journaled on the spindle portions of said latter crank axles for leveling the plows and maintaining the same at the proper balance, and adjusting means operatively connected to said latter crank axles for adjusting said gauge wheels vertically relatively to the frame.

5. In a lister, the combination of a frame, a plurality of lister plow bottoms carried by said frame and spaced laterally from each other transversely across said frame, a crank axle pivotally mounted on the rear portion of said frame intermediate the sides thereof, a pair of supporting wheels journaled on the spindle members of said crank axle and disposed between the sides of said frame for normally supporting the frame between the sides thereof, power lift mechanism associated with one of said wheels for raising said frame, said wheels having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments,

depth adjusting means connected to said power lift mechanism and operative there-through for establishing the depth adjustment of the implement, a pair of crank axles pivotally mounted at the sides of said frame, gauge wheels journaled on the spindle members of said latter crank axles for leveling the plows and maintaining the same at the proper balance, and adjusting means connected to said latter crank axles for adjusting said gauge wheels vertically relatively to the frame.

6. In a lister, the combination of a frame, a plurality of lister plow bottoms carried by said frame and spaced laterally from each other transversely across the frame, a crank axle pivotally mounted on the rear portion of said frame intermediate the sides thereof, a pair of supporting wheels journaled on the spindle members of said crank axle for normally supporting the frame between the sides thereof, a power lift clutch comprising a driving clutch element connected to one of said wheels and a driven clutch element adapted to be driven thereby, said wheels having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments, a lifting bar operatively connected with said driven clutchelement, depth adjusting means operatively connected with said lifting bar and effective to establish the depth adjustment of the implement through said bar, a pair of crank axles pivotally mounted at the sides of said frame, gauge wheels journaled on the spindle members of said latter crank axles for leveling the plows and maintaining the same at the proper balance, and adjusting means connecting with said latter crank axles for adjusting the gauge wheels vertically relatively to the frame.

7. In a lister, the combination of a frame, a plurality of plows carried by said frame, a wheel mounted on said frame intermediate the sides thereof for normally supporting the frame between the sides, depth adjusting means operatively connected with said wheel support for establishing the depth adjustment of the implement therethrough, said wheel having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments, and a pair of vertically adjustable gauge wheels mounted at the sides of said frame for leveling the plows and maintaining the same at the proper balance.

8. In a lister, the combination of a frame, a wheel disposed between the sides of the frame for normally supporting the frame between the sides, said wheel having frame supporting contact with the ground and bracing the frame between the sides against

downward stresses resulting from the action of the plows in the different depth adjustments, three lister units spaced transversely across the frame, each of said units including a lister plow vertically adjustable gauge wheels mounted on the two lateral units for leveling the plows and maintaining the same at the proper balance and means adjustably attaching the two lateral units to said frame for permitting inward or outward shifting of said lateral units relatively to the intermediate unit to vary the spacing between the lister rows, said gauge wheels and the planter mechanisms associated with said lateral units being movable bodily with said units in the shifting adjustment thereof, and said planter mechanisms remaining in operative relation to said driving means in the different shifted positions of said units.

9. In a lister, the combination of a frame, three lister plow units spaced transversely across said frame, a crank axle pivotally mounted on said frame intermediate the sides thereof, a pair of supporting wheels journaled on the spindle members of said crank axle intermediate the sides of said frame for normally supporting the frame between the sides thereof, power lift mechanism cooperating with one of said wheels for raising said frame, said wheels having frame supporting contact with the ground and bracing the frame between the sides against downward stresses resulting from the action of the plows in the different depth adjustments, depth adjusting means operative to swing said crank axle for establishing the depth adjustment of the implement, crank axles pivotally mounted on the two outwardly disposed plow units, gauge wheels journaled on the spindle members of said latter crank axles for leveling the plows and maintaining the same at the proper balance, adjusting means carried on said outwardly disposed units for adjusting said gauge wheels vertically relatively to the frame, and means adjustably attaching said outwardly disposed units to said frame for permitting inward or outward shifting of said units to vary the spacing between the lister rows, the associated crank axle, gauge wheel and adjusting means being carried bodily by each outwardly disposed unit in such lateral adjustment.

10. In a lister, the combination of a frame, a supporting wheel disposed between the sides of said frame, power lift mechanism cooperating with said wheel for raising said frame, depth adjusting means connected with and operative through said wheel for establishing the depth adjustment of the implement, and a pair of gauge wheels at the sides of said frame, said gauge wheels being positioned in substantially transverse alignment with said supporting wheel.

11. In a lister, the combination of a frame, a plurality of plows carried thereby, a crank

axle carried by said frame, a supporting wheel mounted on said crank axle, power lift mechanism cooperating with said wheel for raising said frame, depth adjusting means
5 operatively connected with said wheel and coacting therewith for establishing the depth adjustment of the implement, a pair of gauge wheels positioned at the sides of the frame and normally disposed in substantially transverse alignment with said supporting wheel,
10 and means for adjusting said gauge wheels vertically relatively to the frame.

12. In a lister, the combination of a frame, a plurality of plows carried by said frame,
15 a wheel supporting means mounted on said frame intermediate the sides thereof, supporting wheels carried thereby, depth adjusting means operatively connected with said wheel supporting means for establishing the
20 depth adjustment of the implement there-through, and a pair of vertically adjustable gauge wheels mounted at the sides of said frame in substantially transverse alignment with said supporting wheels.

25 In witness whereof, I hereunto subscribe my name this 1st day of March, 1928.

WALTER H. SILVER.

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