

N. WEILER.  
WHEELED GANG PLOW.  
APPLICATION FILED JAN. 30, 1911.

1,055,583.

Patented Mar. 11, 1913.

6 SHEETS—SHEET 1.

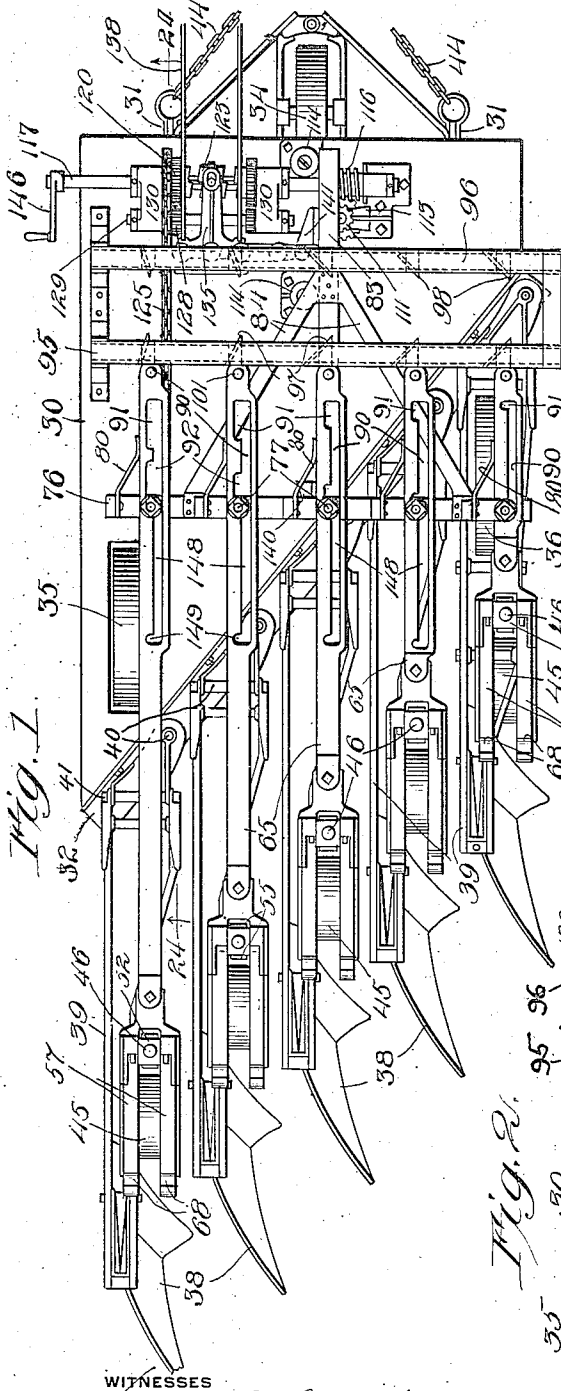
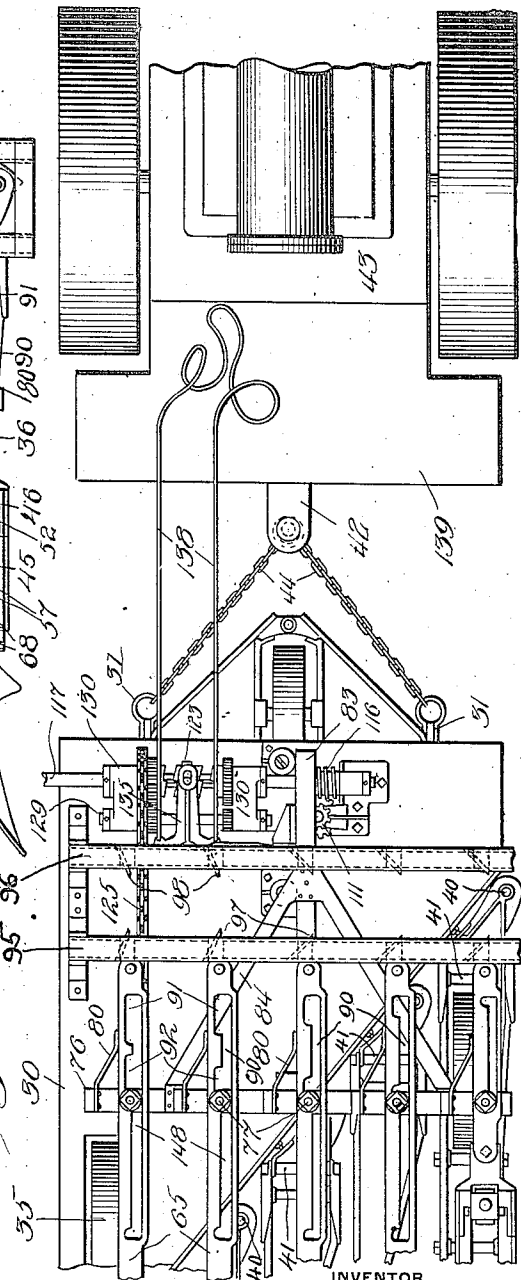


Fig. 1.

Fig. 2.



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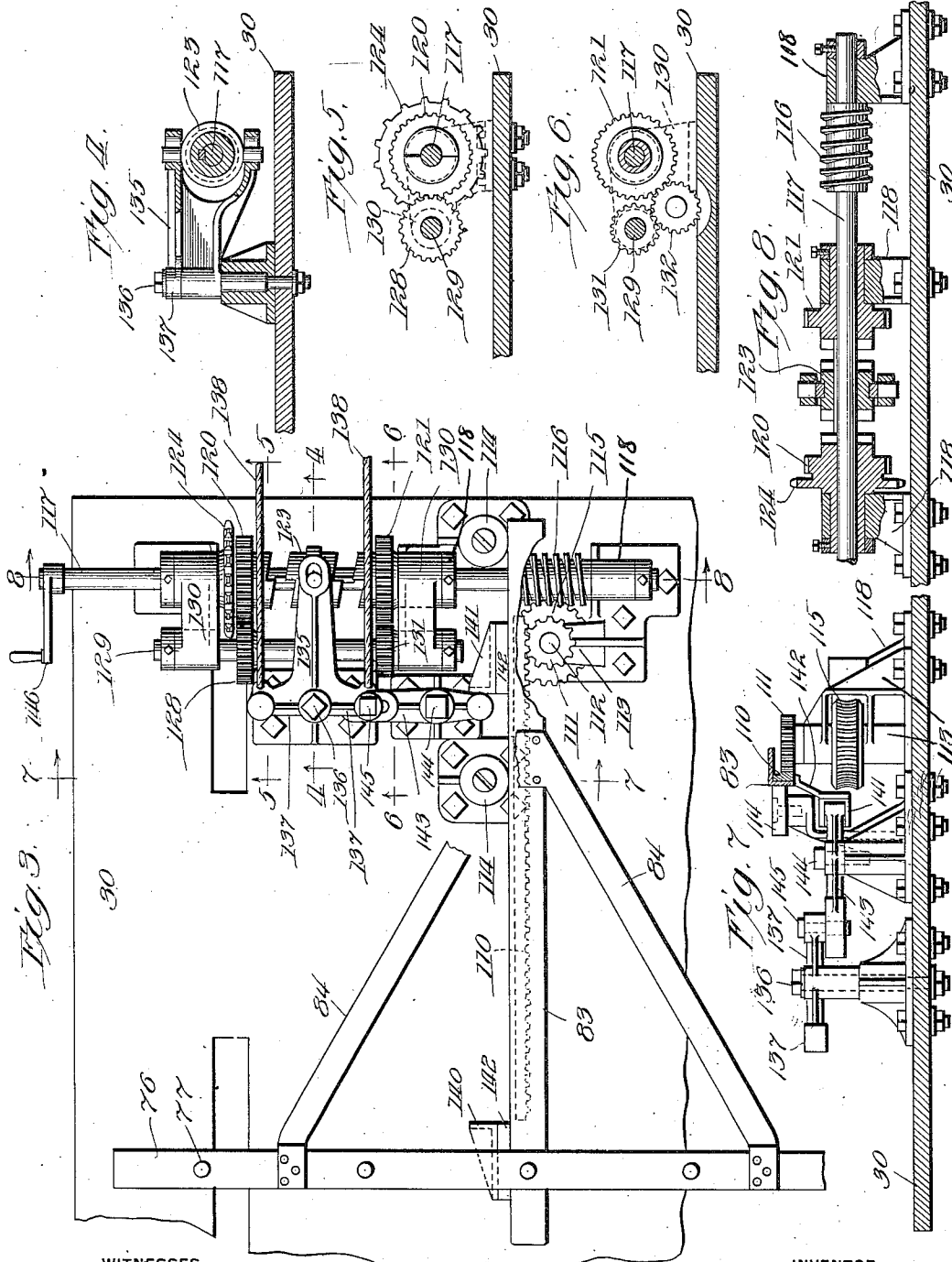
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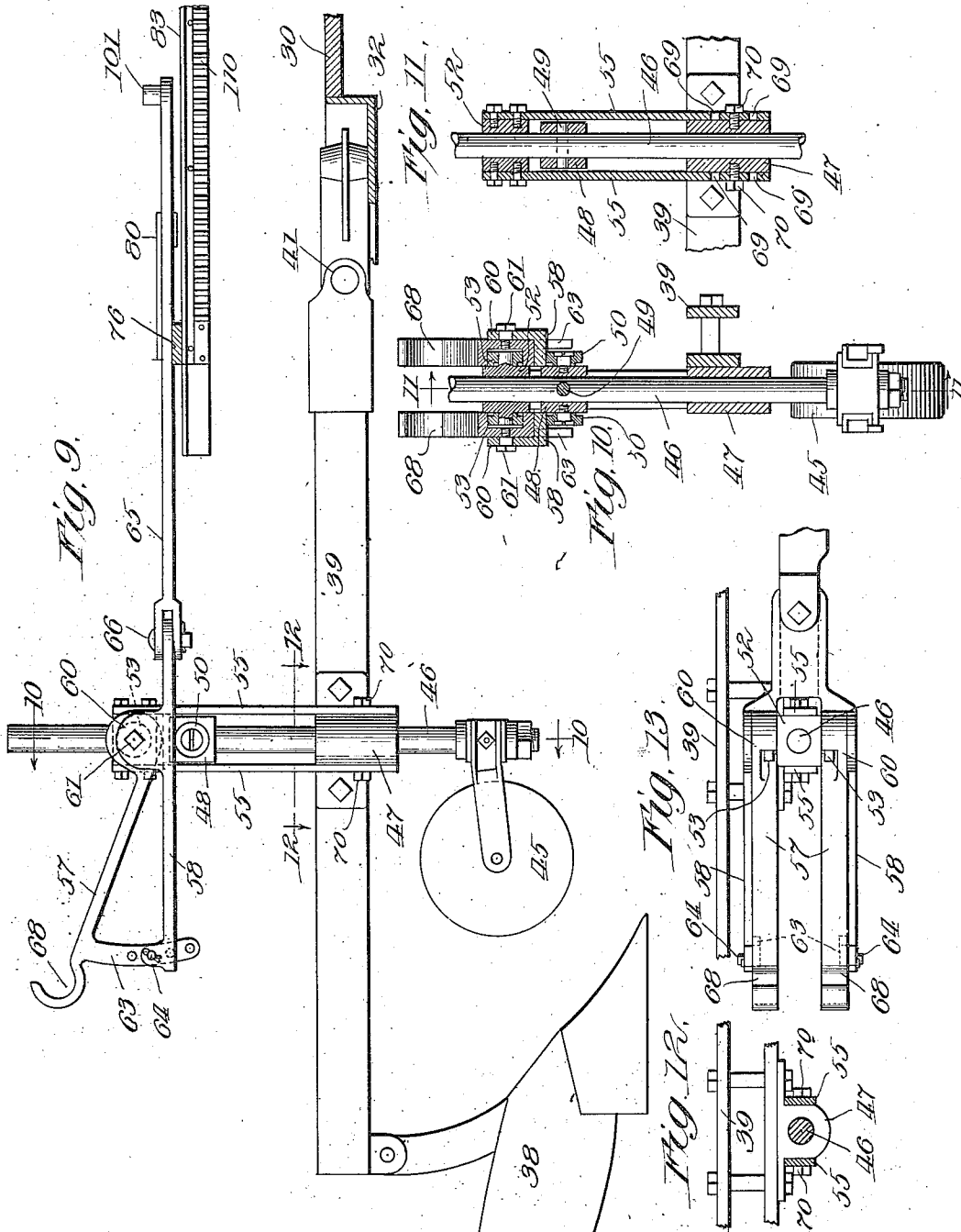
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6 SHEETS—SHEET 3.



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6 SHEETS—SHEET 4.



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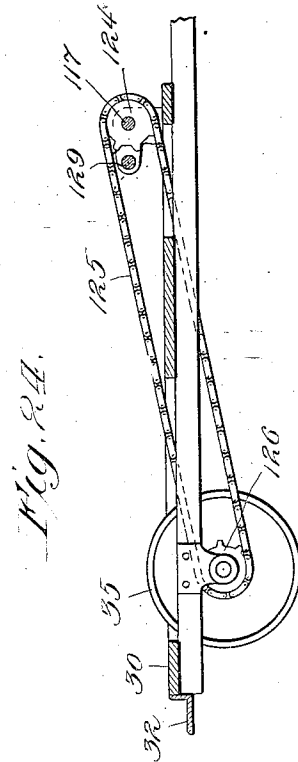
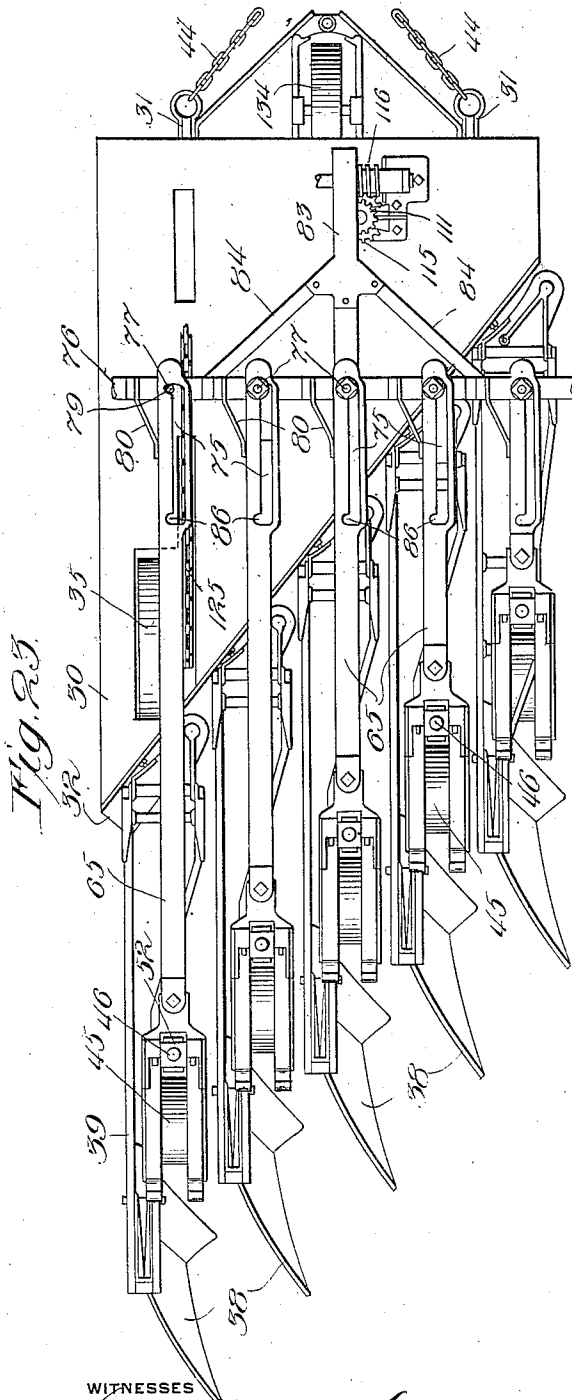
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6 SHEETS—SHEET 5.



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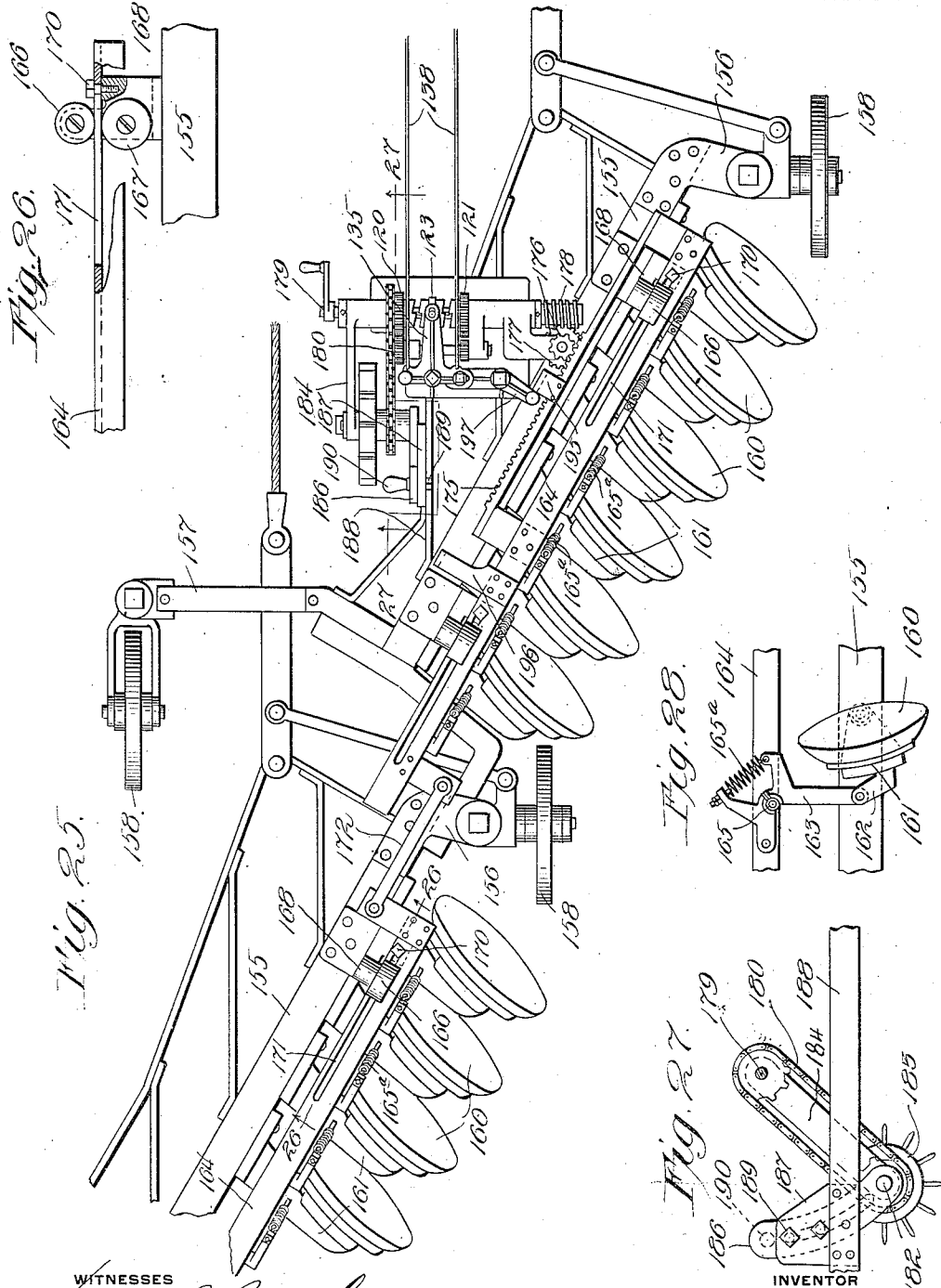
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6 SHEETS—SHEET 6.



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# UNITED STATES PATENT OFFICE.

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## WHEELED GANG-PLOW.

1,055,583.

Specification of Letters Patent.

Patented Mar. 11, 1913.

Application filed January 30, 1911. Serial No. 605,601.

*To all whom it may concern:*

Be it known that I, NICHOLAS WEILER, a citizen of the United States, and a resident of Fort Collins, in the county of Larimer and State of Colorado, have invented certain new and useful Improvements in Wheeled Gang-Plows; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in wheeled gang plows of that kind in which several plows, whether of the mold board or disk type, are arranged progressively one in front of the other and all adapted to be drawn forwardly by a suitable motor, as a traction engine.

Among the objects of my invention is to provide novel means for raising the several plows out of the ground at the end of a furrow or lowering them into the ground at the beginning of a furrow, so arranged that the power for lifting the plows is derived from one of the supporting wheels of the gang or from an analogous part associated therewith which treads upon the land side of the ground, and thereby effect the automatic lifting or lowering of the plows.

A further object of the invention is to provide mechanism for lifting or lowering the plows in the manner described, arranged to be set in operation from the position of a person on the motor or traction engine.

Another object of the invention is to provide means for automatically arresting the action of the raising and lowering mechanism as soon as all the plows have been lifted out of or lowered into the ground.

A still further object of the invention is to provide means for progressively raising the plows out of the ground or lowering them into the ground arranged to first raise (or lower) the forwardmost plow and to progressively raise (or lower) the plows in rear thereof, so that all of the plows will leave (or enter) the furrow at the same line and thus produce a square end furrow.

Another object of the invention is to provide a reversibly acting mechanism so arranged as to positively raise and positively lower the plows.

Another object of the invention is to provide novel means whereby the plows may

be raised by hand from the ground, either singly or collectively.

Other objects of the invention are to improve and simplify the plow raising and lowering means and the manner of operating or controlling the same.

In the drawings,—Figure 1 is a plan view of a mold board gang plow equipped with my invention. Fig. 2 is a partial plan view of the plow and of the motor for pulling the same. Fig. 3 is a broken plan detail, showing the operating and reversing gear of the plow raising and lowering mechanism. Figs. 4, 5, 6, 7 and 8 are detail sections, taken on the lines 4—4, 5—5, 6—6, 7—7 and 8—8, respectively, of Fig. 3. Fig. 9 is a side elevation, with parts in section, of one plow and its beam, and the supporting or gaging roller therefor, showing also the mechanism for raising the plow out of the ground. Fig. 10 is a vertical sectional detail on the line 10—10 of Fig. 9. Fig. 11 is a vertical sectional detail on the line 11—11 of Fig. 10. Fig. 12 is a horizontal detail section on the line 12—12 of Fig. 9. Fig. 13 is a plan detail illustrating a portion of the plow beam and the raising and lowering means associated therewith. Fig. 14 is a diagrammatic plan view of the slotted bars for actuating the raising and lowering mechanisms when arranged to progressively raise and lower the plows, showing said bars in a position in advance of that illustrated in Fig. 1. Fig. 15 is a view similar to Fig. 14 illustrating the said parts in a further advanced position. Figs. 16 to 19, inclusive, are details illustrating the action of the tripping dogs on the slotted bars in a continuous advance movement of one bar, showing one lateral half of the channel bar which carries the dogs. Fig. 20 is a section on the line 20—20 of Fig. 16, showing the manner of pivotally mounting the tripping dogs. Fig. 21 is a detail illustrating the action of the tripping dogs on the slotted bars when moving rearwardly. Fig. 22 is a sectional detail of one of the stops on the plow raising mechanism for tripping out of action the raising and lowering mechanism. Fig. 23 is a plan view showing a modified arrangement of the plow raising mechanism. Fig. 24 is a sectional view of the plow platform, showing one of its supporting wheels, taken on the line 24—24 of Fig. 1, with parts omitted, to illustrate the manner of connecting the shaft

of the supporting wheel to the main operating shaft of the plow raising and lowering mechanism. Fig. 25 is a partial plan view of a disk form of plow showing my improvements applied thereto. Fig. 26 is a detail section on the line 26—26 of Fig. 25. Fig. 27 is a detail section on the line 27—27 of Fig. 25. Fig. 28 is a detail illustrating the spring mounting of the plow disks.

The plow gang frame comprises the platform 30 which is supported on a suitable frame work embracing the draft sills 31, 31, the rear plow attaching member 32 and other suitable frame construction (not shown) to give rigidity thereto. The said frame is supported on three wheels, one 34 at the front thereof, two 35, 36 at the side. Arranged in rear of said frame are a plurality of plows, shown as of the mold board type, said plows being arranged side by side, and one in advance of the other. The forward ends of the beams 39 of said plows are attached in any suitable manner at 40 to the rear attaching member 32 of the frame, and said beams are provided in rear of the attaching member with horizontal pivots 41 to permit the rear ends of the beams and plows to swing vertically. The gang frame is attached to the draw bar 42 of the engine or motor 43 by the draft chains 44 which diverge rearwardly from the draw bar and are attached to the eyes at the front ends of the draft sills 31. The said plows are supported and the depth of their cut gaged by gage wheels or rollers 45 (Figs. 9 and 10) arranged just in front of the plows and supported in brackets that are mounted on the lower ends of vertical posts 46 which extend loosely upwardly through bearings 47 attached to the plow beams (Figs. 9, 11 and 12). Said posts 46 are provided at their upper ends with blocks 48 attached thereto by means of the pins 49, and said blocks are provided at their laterally opposite sides with studs carrying bearing rollers 50, 50. Sliding loosely on the posts 46 above the block 48 are sleeves 52 which are also provided with oppositely extending studs that carry bearing rollers 53, 53. The said sleeves 52 are rigidly connected by means of the straps or bars 55, 55 to the lower bearings 47. The rollers 53 of the sleeves 52 are adapted to engage the upwardly facing surfaces of oblique or inclined members 57, (Figs. 9 and 13) the forward or lowermost ends of which terminate in pockets in which the said rollers 53 normally rest and which constitute stops to limit the rearward movement of the inclined members 57.

58, 58 designate horizontally arranged members below the oblique members 57, said members being adapted to rest on the rollers 50 of the fixed blocks 48. Said bars 58 are provided with upwardly extending ears

which overlap the outer sides of the forward ends of the oblique members 57 and are attached thereto by screw bolts 61, which screw bolts constitute a pivotal connection between the horizontal and oblique members 57 and 58. Said oblique members 57 are provided with apertured, arcuate arms 63 which overlap the rear apertured ends of the members 58 and are adapted to be locked in adjusted relation thereto by means of the pins 64. The said members 58 extend at their forward ends beyond the shafts 46 and are pivotally or otherwise joined to horizontally arranged bars 65, as by the pivot pins 66.

The upper and lower members 57 and 58, arranged as described constitute, in effect, bifurcated wedges, the upper or oblique members of which engage the rollers of the sleeves 52, and the lower or horizontal members of which engage the rollers of the block 48 whereby, when said wedges are drawn forwardly the rear ends of the plow beams are lifted, through the medium of the straps 55 and bearing block 47, so as to raise the plow out of the ground; the lifting stress being resisted by the blocks 48 fixed to the posts 46. The extent of such lifting movement, which may occur during the forward travel of the wedges, may be varied by adjusting the angle of the oblique members 57 to the horizontal members of the wedges, as permitted by the pivotal mounting of the oblique members and the adjusting pins 64. The said oblique members of the wedges are formed at their rear ends with notches or sockets 68 into which the bearing rollers 53 pass and by which they are held when the wedges are in their forwardmost positions so as to thereby lock the plows in their raised or lifted positions.

The depth to which the plows may be set into the ground may be regulated by providing the lower ends of the straps 55 with a series of apertures 69 to receive the screw bolts 70 by which they are attached to the lower bearings 47, as most clearly shown in Fig. 11.

The wedge actuating bars 65 of the entire gang or unit are adapted to be operated from a common source of power, arranged to advance said bars simultaneously so as to lift all the plows out of the ground at one time, or to draw the bars progressively forwardly so as to successively lift the plows in such manner that the plows will leave the ground on a given line transverse to the furrow to produce a square end furrow.

In Fig. 23 is shown an arrangement whereby the plows are all lifted simultaneously from the ground to produce a diagonal end furrow. In this construction all of said wedge actuating bars 65 extend forwardly over or toward the platform 30 and are provided at their forward ends with

slots 75. Arranged beneath the forward ends of said wedge actuating bars is a transverse universal bar 76 which is provided with a plurality of upstanding bolts or studs 77 which extend through the slots 75 and are screw-threaded at their upper ends to receive nuts. The forward ends of said slots 75 are provided with lateral notches 79, which the said studs 77 normally occupy when the plows are in the ground, the bars being held in position to engage said notches 79 with the studs by means of springs 80 attached to the transverse or universal bar 76 and bearing at their free ends against the sides of said wedge actuating bars. Attached to and extending forwardly from said universal bar is a draw bar 83, it having braced connection with the universal bar by means of the braces 84. The said draw bar is adapted to be drawn forwardly by any suitable mechanism, such for instance as the rack and pinion mechanism shown in Figs. 1, 2, 3, 7, 8 and 9, and hereinafter described. When said draw bar is thus drawn forwardly the engagement of the bolts or lugs 77 of the universal bar with the ends of the slots 75 serves to simultaneously draw all of said wedge actuating bars forwardly, and thereby draw the wedge devices, before described, forwardly between the upper and lower pairs of rollers 53 and 50, respectively, and thereby simultaneously withdraw all the plows from the ground. The said slots 75 are elongated so as to permit the plows to be separately raised, and the slots are provided at their rear ends with lateral notches 86 so that when each plow is raised by forward movements of its wedge device and wedge actuating bar 65, the notch of the latter bar will be forced by the spring 80 into engagement with the associated stud or bolt 77 so as to lock the plow in its raised position. Such raising of the plow may become desirable when it is necessary to repair one of the plows or to replace the plow share. In thus raising a plow the wedge actuating bar 65 is forced laterally to disengage the forward notch 79 from the stud or bolt 77, after which the plow may be raised by forcing forwardly the associated wedge device and simultaneously raising the plow beam, and when the rear notch 86 of the slot 75 is brought opposite said stud or bolt of the universal bar, said rear notch is forced into engagement with the stud or bolt to lock the plow in its raised position.

When it is desired to successively raise the plows at a time when the plow is being drawn forwardly so that all of the plows will be raised out of the ground at a transverse line of the furrow to produce a square end furrow, I may provide the construction illustrated more particularly in Figs. 1, 2, and 14 to 21, inclusive. In this construc-

tion there is provided a lost motion between the studs 77 of the universal bar 76 and certain of the slotted wedge actuating bars, so arranged that the wedge actuating bar associated with the forwardmost plow is at once actuated or drawn forwardly, when the raising mechanism is set in motion, to raise the forwardmost plow, and the other wedge actuating bars are progressively brought into action to successively raise the other plows; the amount of lost motion between said studs and said slotted actuating bars being such that all of the plows are lifted from the ground on the same transverse line of the furrow.

The wedge actuating bars 65 of the construction under consideration are provided with slots 90, similar to the slots 75 of the construction shown in Fig. 23, and said slots are formed at their ends with lateral notches 91, 92, the former being located at the forward ends of the slots and the latter at the rear ends thereof. Said notches 91, 92 are adapted for engagement by the studs or bolts 77 of the universal bar 76, the notched portions of the wedge actuating bars being held engaged with said studs by the springs 80. The notches 91, 92 associated with the forwardmost plow are made of a length to fit without substantial lost motion the associated lug 77 of the universal bar so that when said universal bar is drawn forwardly by the means hereinafter described the said actuating bar of the forwardmost plow will be at once drawn forwardly to raise its plow.

The notches 91 and 92 of the wedge actuating bars associated with the plows in rear of the forwardmost plow are made progressively longer, so that when the universal bar 76 moves forwardly and advances the wedge actuating bar of the forwardmost plow, there is a lost motion between the studs of the universal bar and the wedge actuating bars of the other plows so as to bring such other actuating bars progressively into action. The position of the studs in the rear notches 92 is illustrated in Figs. 1 and 2, wherein said studs occupy the rear-most parts of all the notches. The progressive increase of length of said notches bears the same relation to the distance between the plows, from front to rear of the machine, as the forward advanced speed of the shifting bar 83 bears to the forward advanced speed of the entire plow. If it be assumed that one plow is located twenty-four inches in advance of the next adjacent plow, and that the entire plow advances twenty-four inches in a given period, and that during such period the shifting bar 83 advances at one-twelfth the speed of the forward movement of the whole plow, the progressive increase in length of the notches 92 will be two inches or one-twelfth of the distance between

the plows from front to rear of the machine. With the arrangement described, therefore, the universal bar and the wedge actuating bar of the forwardmost plow will move two inches, during which time the machine is advancing two feet, before the wedge actuating bar of the next rearmost plow is shifted forwardly, and said last mentioned wedge actuating bar will be advanced two inches while the machine is advancing another two feet and so on until all of the wedge actuating bars are advanced to withdraw or lift the plows out of the ground.

It is desirable also that the plows be lowered into the ground in the same manner that they are lifted out of the ground, and for this reason the forwardmost notches 91 of the slots 90 are arranged progressively longer from the forwardmost to the rearmost plow, as are the rearmost notches 92. Furthermore it is necessary in the construction described to trip the studs 77 out of the rear notches 92 of the slots 90, as the universal bar is moved forwardly, so as to bring them into engagement with the forwardmost notches 91, and to in a like manner trip the studs out of engagement with the forward notches 91 as the universal bar is shifted backwardly. The mechanism which I have herein shown for effecting this result is made as follows:—95, 96 designate transversely arranged, parallel channel bars located in front of the normal positions of the forward ends of the wedge actuating bars and supported a distance above the same on the platform 30. Said bars are provided in line with the wedge actuating bars with tripping dogs 97, 98, shown best in Figs. 16 to 20, inclusive. Said tripping dogs are pivoted by the pins 99 to the flanges of the channel bars 95, 96 to swing laterally or in the planes of said flanges. The lower ends of said dogs are formed with widened portions 100 which are arranged obliquely to the paths of travel of the wedge actuating bars, to present oppositely facing oblique faces to projections or studs 101 which extend upwardly from the forward ends of the wedge actuating bars. Each of said dogs is provided at its upper end on one side of the vertical plane of its pivot with a flat surface or shoulder 102 which is adapted to engage the web of the channel bar to which it is pivoted so as to prevent the dog swinging in one direction. Each dog is likewise rounded at its upper end on the other side of its pivot, as shown at 103, so as to permit the dog to swing on its pivot in the other direction.

The rearwardly oblique faces of the dogs 97 of the rear bar 95 are presented to the projections 101 of the wedge actuating bars in such a way that the dogs swing laterally, as shown in Fig. 17, when said actuating bars move forwardly. The dogs 98 on the

forwardmost bar 96 have their rear oblique faces presented to the projections 101 in an opposite way so that said forward dogs remain stationary when the bars 65 move forwardly, with the result of deflecting the forward ends of the bars out of their path, (Figs. 18 and 21) as permitted by the pivotal connection of the bars 65 with the bars 58. Thereby the studs 77 of the universal bar 76 are brought into line with the slots 90 of the bars so deflected, the springs 80 permitting such lateral swinging of the bars 65. After the studs 77 are brought into line with the slots 90 the studs 101 pass by the dogs 98 and the said universal bar 76 moves forwardly relatively to the wedge actuating bars until the studs are brought into line with the forward notches 91, whereupon the springs 80 force said bars over or sidewise to engage the projections 77 with said forward notches 91. The movement of the universal bar is arrested at or before the time the studs 77 thereof are engaged with the front ends of said forward notches, as indicated in Fig. 15. Just before the bars are thus shifted sidewise to disengage the notches 92 from the studs 77, the hooks or seats 68 at the rear ends of the inclined or oblique members 57 are brought into engagement with the rollers 53, so that thereby the plows are held in their upper or lifted positions.

The parts are so proportioned that the studs 101 do not slip over the ends of the dogs 98 until the studs 77 are fairly released from the notches 92 so as to prevent the studs skipping back into said notches. Inasmuch as the universal bar 76 and the studs 77 continue their forward movement this difference in time need not be great. In order that the rollers 53 may enter the hooks 68 before the disengagement of the studs 77 with the notches 92, the said hooks may be formed on a somewhat greater radius than the rollers so as to thereby insure the engagement of the hooks with the rollers before forward movement of the bars 65 is discontinued. It will be noted that by reason of the different radii of the arcs through which the studs 101 at the forward ends of the bars 65 swing, as the construction herein shown is organized the angles of the dogs 97, 98 are correspondingly varied with respect to each other so as to deflect the swinging ends of said bars 65 only sufficiently to properly disengage the studs 77 from the notches 92 and 91. When the universal bar and the studs 77 pass from the rear notches 92 to the forward notches 91, therefore, they are thus moved forwardly relatively to the wedge actuating bars 65 and the plows 38.

The return movement of the draw bar 83 and the universal bar 76 attached thereto acts positively to shift the wedge actuating bars 65 rearwardly to lower the plows into

the ground in the same order in which they were lifted out of the ground. In the beginning of such rearward movement of the universal bar 76 the wedge actuating bar of the forwardmost plow begins to move rearwardly at once while said universal bar moves with a lost motion relatively to the other bars, and progressively moves the latter bars rearwardly. During the first part of the movement of said wedge actuating bars the projections 101 thereof freely pass the tripping dogs 98 of the forward bar 96 by reason of the fact that said dogs swing laterally out of the paths of said projections when engaged at their forward oblique faces by the studs 101; but when said studs are brought into engagement with the forward oblique faces of the dogs 97 of the rear bar 95, at which time the plows are lowered to the ground, the said wedge actuating bars are shifted laterally to disengage the forward notches 91 thereof from the universal bar studs 77 to permit the studs to move through the slots 90 back into engagement with the rear notches 92, under the action of the springs, in the continued movement of the universal bar, or to the position indicated in Figs. 1 and 2. The angle of the oblique members 57, as the construction herein shown is organized, is such that the weight of the plows will not, in themselves, shift the actuating bars 65 rearwardly; but said bars and the plows are retained under the influence of the rearwardly moving universal bar 76 and the studs thereof until the plows reach the ground, so that the beginning of the furrow will be square or on a right line to its length, instead of oblique, as where all the plows enter the ground at once.

The means herein shown for actuating the shifting bar 83 is best disclosed in Figs. 1 to 8, inclusive, and is made as follows:—The draw bar 83, which may consist of an angle bar, is provided with a vertically arranged toothed rack 110 which is engaged by a pinion 111 on a vertical, rotative shaft 112 that is mounted in a suitable bearing 113 on the platform 30. Said rack is held in engagement with the pinion by the bearing rollers 114 mounted in suitable bearings which rise from the platform 30 (Figs. 3 and 7). Fixed to said shaft below the pinion 111 is a worm gear 115 which is driven by a worm 116 mounted on a horizontal rotative shaft 117 which is mounted in bearings 118 carried by said platform 30. The said shaft 117 extends loosely through and has bearing in gear wheels 120, 121 (Fig. 8) that are rotatively mounted in said standards 118, said gear wheels having elongated hubs which form bearings therefor in said standards. Splined or otherwise non-rotatively fixed to the shaft 117, so as to slide endwise thereof, is a clutch collar

123 which is provided on its opposite ends with clutch teeth adapted to separately engage clutch teeth carried by the inner or adjacent ends of the hubs of the gear wheels 120, 121. Fixed to or made integral with the gear wheel 120 is a sprocket wheel 124 that is driven, through the medium of a chain 125 (Figs. 1, 2 and 24) which is trained about a second sprocket wheel 126 that is fixed to the shaft of the adjacent supporting wheel 35.

The gear wheel 120 meshes with a pinion 128 of a reversing gear mechanism that is fixed to one end of a shaft 129 mounted in the bearings 130, 130. To the opposite end of said shaft 129 is fixed a pinion 131 which meshes with an idler gear 132 (Fig. 6) that in turn meshes with the gear wheel 121. With the construction described when the clutch collar 123 is engaged with the gear wheel 120, the shaft 117 is driven forwardly to shift the draw bar 83 forwardly to raise the plows out of the ground; and when the clutch collar is engaged with the other gear wheel 121 the shaft 117 is rotated rearwardly to shift the draw bar 83 rearwardly and lower the plows into the ground.

The clutch collar may be shifted from one position to the other by means of a shifter lever 135 which is loosely connected at one end thereof to the collar in a familiar manner and is pivoted near its other end to a stud 136 that rises from the platform 30. The shifter lever is provided near its pivoted end with oppositely directed arms 137, 137 to which are adapted to be attached the actuating ropes or cables 138 which extend forwardly to the platform 139 of the engine motor 43 or by which the plow is drawn forwardly, so that the reversing gear may be actuated from the position of an operator on the engine.

Means are provided for automatically shifting the clutch collar 123 out of engagement with the cooperating gear wheels 120, 121 to its central or neutral position, so as to thereby arrest the actuating gear mechanism at the end of the travel of the plow lifting devices in either direction. The means herein shown for effecting this result are made as follows:—140, 141 designate tripping blocks which are carried by brackets 142 that are attached to the draw bar 83, one near the front and the other near the rear end thereof. The said tripping blocks are adjustably mounted on the brackets 142 by means of the bolts 142<sup>a</sup> (Fig. 22) that extend through bolt openings in the brackets and slots in the blocks, thereby permitting the blocks to be adjusted longitudinally of the draw bar. 143 designates a lever that is pivoted between its ends at 144 and is loosely connected at one end by a stud 145 with one arm 137 of the clutch shifter lever. The other end of said lever 143 extends into the

path of the tripping blocks 140, 141 so as to be separately engaged by said blocks at the limit of movement of the draw bar in either direction. The engagement of said tripping blocks with the tripping lever 143 serves to shift the clutch collar into its intermediate or neutral position and thereby arrest the movement of the plow actuating device. The blocks are so adjusted relatively to the travel of the wedge actuating bars that the movement of the lifting mechanism is arrested at either limit when the rearmost plow is raised out of or lowered into the ground. The adjustment of said tripping blocks 140, 141 on the draw bar 83 enables the mechanism to be adjusted to accurately arrest the mechanism when the plows have been lifted out of or inserted into the ground.

In order to raise the plows out of the ground by hand when the plow is standing still, I may provide the shaft 117 with a hand crank 146 by which said shaft may be rotated. Said hand crank may be employed to separately raise the forwardmost plow, or that which is first raised by the plow raising mechanism, when it is desired to repair said forwardmost plow, or it may be employed to raise all the plows. In order to separately raise the other plows I may provide the wedge actuating bars 65 in rear of the slots 90 with rearward prolongations 148 thereof provided at their rear ends with lateral notches 149. When thus arranged a plow may be raised from the position shown in Fig. 1 by first pressing the wedge actuating bar laterally to disengage the universal bar stud from the rearmost notch 92 thereof and thereafter force the lifting wedge forwardly until the notch 149 is brought opposite the universal bar stud to engage the notch and stud in a manner to lock the plow in its raised position.

In Figs. 25, 26 and 27 I have shown my improved reversible plow raising and lowering mechanism as applied to a disk plow of the general construction illustrated in my prior application for United States Letters Patent, No. 607,312 filed on the 8th day of February, 1911. In this construction the disks are mounted on pivotal brackets in a manner to be swung on the pivots of said brackets toward and away from the ground, and the brackets of each gang are connected to a reciprocable bar in such a way that when the bar is reciprocated in one direction the disks are raised from the ground and when reciprocated in the other direction are lowered toward the ground; the reciprocable bars of adjacent gangs being connected together so as to operate simultaneously. As shown in said drawings, each gang comprises a main frame bar 155 having the arms 156, 157 upon which are mounted the supporting wheels 158. The disk plows 160 are rotatively mounted on brackets 161

which may be pivoted to the frame bar 155 in the general manner illustrated in my said prior application. Each of said brackets is provided with a lug 162 which is connected by a link designated as a whole by 163 with a reciprocable bar 164 generally like the corresponding elements of the construction of my aforesaid application, said links being pivotally connected to the lug 162 and the reciprocable bar. In the present construction the link is composed of two members which are jointed at 165 by a knuckle joint and are maintained in the normal position shown in Fig. 28 by a spring 165<sup>a</sup>, said spring permitting the link members to break and the plow to yield out of the ground when the plow strikes a stone or like obstruction. The said reciprocable bar, which is preferably an angle bar, is guided between upper and lower rollers 166, 167 supported on standards 168 which rise from the gang frame bar, and said reciprocable bar is held laterally in place by means of screw bolts 170 which extend downwardly through slots 171 in said bar and engage screw-threaded openings in the standards 168. The slotted arrangement permits the bars to reciprocate relatively to the holding bolts. The reciprocable bars 164 of the adjacent gangs are connected by a link 172.

When the reciprocable bar 164 is moved in one direction it acts through the links 163 to swing the pivotal brackets 161 on their pivots to raise the plows out of the ground, and when said bar is moved in the other direction the brackets are swung on their pivots in the other direction to lower the plows into the ground. The mechanism for so reciprocating the bar 164 is made as follows:—175 designates a rack bar which is attached rigidly to and is located at the side of said reciprocable bar 164 of the forwardmost gang. The teeth of said rack bar are engaged by a pinion 176 of a vertical shaft which carries a worm gear 177 that meshes with a worm 178 of a horizontal, rotative shaft 179 which corresponds with the shaft 117 of the previously described construction. The driving and reversing gear parts of this mechanism are in all essential respects like that before described and similar parts bear like reference characters. In this construction the shaft is driven by a sprocket chain 180 which engages a sprocket wheel on the shaft 179 and a sprocket wheel on the shaft 182 of a spiked tread wheel 183 which is rotatively mounted on an adjustable frame member 184 that is pivotally supported on the shaft 179, whereby said wheel may be adjusted vertically while maintaining the proper tension on the driving chain. The wheel supporting member is locked in adjusted position by means of an arcuate arm 186 fixed to the inner end of the bearing for the shaft of the wheel

183 and said member is provided with a curved slot through which and a plate 187 fixed to a horizontal member 188 of the frame, extend clamping bolts 189. The said locking arm may be provided with a hand piece 190 by which the wheel supporting member may be conveniently raised and lowered. The arrangement described permits the operating wheel 183 to be accurately adjusted to the ground so as to thereby furnish power to operate the plow raising and lowering mechanism. The movement of the plow raising and lowering mechanism is automatically arrested at the end of the travel of the reciprocable bar by means of the tripping blocks 195, 196 fixed to the front and rear ends of the reciprocable bar of the forward gang and adapted to engage the tripping lever 197 that is connected with the shifter lever 135 and operating in the same manner as the tripping lever 143 of the construction previously described.

The other parts of the plow construction are generally like that illustrated in my aforesaid application and need not be herein specifically described.

In the operation of the plow described, when it is desired to progressively lift or raise the plows from the ground, (Figs. 1 to 23) one of the cables 138 is drawn forwardly by the operator standing on the platform 139 of the pulling engine 43 to throw the clutch collar 123 to the left from the position illustrated in Figs. 1, 2 and 3, and to thereby connect the shaft 117, which is normally stationary, with the gear wheel 120 so as to rotate said shaft forwardly. Said shaft, when rotating forwardly, operates through the worm 116, the worm gear 115, the pinion 111 and the rack 110 to shift the draw bar 83 and the universal bar 76 and to progressively draw the wedge actuating bars and the wedge devices forwardly. This movement of the wedge devices between the upper and lower bearing rollers 53 and 50 associated with the supporting shafts or posts 46 of the plow beams serves to progressively raise the plows, said wedge devices being drawn forwardly until the socketed or recessed extensions 68 thereof are brought into engagement with said bearing rollers 53 to thereby lock the plows in their raised positions. When the plow raising mechanism has completed its forward travel to raise all the plows, the rear tripping block 140 on the draw bar 83 engages the tripping lever 143 and acts on the shifter lever 135 to shift the clutch collar to its intermediate or neutral position and thereby arrest the movement of said wedge actuating devices. When the plows are to be lowered, at a time when the gang plow is moving forwardly, the other cable 138 is drawn forwardly to connect the clutch col-

lar with the right hand gear wheel 121 whereupon, through the reversing mechanism described, the shaft 117 is rotated rearwardly to shift the draw bar 83 and the wedge actuating devices rearwardly to lower the plows into the ground in a manner the reverse of that described.

The operation of the construction shown in Fig. 23 is essentially the same as that before described with the exception that all the plows are raised out of and lowered into the ground at the same time.

The operation above described applies generally to the construction illustrated in Fig. 25, with the exception that the rotation of the shaft 179 in either direction serves to shift the reciprocable bar 175 in one direction or the other, either to lift the plows out of the ground or to lower the plows into the ground.

It will be observed that in each of the constructions described there is provided a supporting or tracking wheel which rolls upon the unplowed ground and supports a part of the weight of the plow frame, and which is connected with the plow raising and lowering mechanism in such a manner that when the mechanism is set in position for operation to either raise or lower the plows, such raising or lowering function is completed, and the operation of the mechanism is automatically arrested without further attention on the part of the operator on the engine. In other words, the only manual operation required is to set the mechanism in operation, after the full operation of raising and lowering the plows is completed and the mechanism tripped out of operation.

In the construction shown in Figs. 1, 2, 3 and 24 the supporting wheel 35 will be provided with a roughened or spiked tread to insure proper engagement or traction on the ground to effect the desired result. That is to say, to positively operate the plow raising and lowering mechanism.

While I have herein shown wedge devices for controlling the raising and lowering movement of the plow, it will be obvious that, so far as the automatic feature of raising and lowering the plow is concerned, other devices may be employed. The terms wedge devices and wedge actuating bars are therefore to be regarded, in the broader statement of the invention, as terms of description rather than terms of limitation, except where such devices are specifically claimed.

It will furthermore be obvious that the construction described is otherwise capable of considerable variation without departure from the scope and spirit of the invention.

I claim as my invention:—

1. A wheeled gang plow comprising a frame having a supporting wheel which

travels on the ground, a series of plows connected to the frame, mechanism having a positively actuated to and fro rectilinear movement for lifting the plows out of and  
 5 lowering them into the ground, and operative connection between said raising and lowering mechanism and said supporting wheel.

2. A wheeled gang plow comprising a  
 10 frame having a supporting wheel which travels on the ground, a series of plows connected to the frame by pivotal connections arranged to permit the plows to be raised and lowered and mechanism operatively  
 15 connected to and actuated by said supporting wheel and having means for connecting the same with said plows, said mechanism embracing a rectilinearly movable reversible element arranged to act on the plows to lift  
 20 the same out of the ground and to control the plows to lower them into the ground.

3. A wheeled gang plow comprising a frame having a supporting wheel which travels on the ground, a series of plows connected to the frame, means for actuating  
 25 the plows to raise them from and lower them to the ground comprising a reciprocable rack bar, a pinion meshing with the rack bar, worm gear mechanism for rotating the  
 30 pinion, and operative connections between said worm gear mechanism and said supporting wheel for rotating the former, embracing a reversing mechanism arranged to rotate the worm gear mechanism in either  
 35 of two opposite directions.

4. A wheeled gang plow comprising a frame having a supporting wheel which travels on the ground, a series of plows connected to the frame and means for actuating  
 40 the plows to raise them from and lower them into the ground comprising a reciprocable rack bar, a pinion meshing with the rack bar, a worm wheel and worm for rotating the pinion, a shaft with which the worm  
 45 rotates, two opposing gear wheels loosely mounted on said shaft, a clutch collar slidable on and non-rotative on said shaft between said gear wheels and having means  
 50 for separately engaging the same with said gear wheels, one of said gear wheels being operatively connected to said supporting wheel and the other gear wheel being connected to the shaft through a reversing  
 55 mechanism, and means for shifting said clutch collar on the shaft into engagement with one or the other of said gear wheels.

5. A wheeled gang plow comprising a frame, a series of plows connected to the frame and means for actuating the plows to  
 60 raise them from and lower them to the ground comprising a reciprocable rack bar, a pinion meshing with the rack bar, a power actuated worm wheel and a worm for rotating the pinion, a shaft with which the

worm rotates, means for rotating said shaft, 65 embracing reversing means arranged to rotate the shaft in two opposite directions, and a crank on said shaft for rotating the same independently of the normal actuating means. 70

6. A wheeled gang plow comprising a frame having a supporting wheel which travels on the ground, a series of plows connected to the frame, mechanism having a positively actuated to and fro rectilinear  
 75 movement for lifting the plows out of and lowering them into the ground, operative connection between said raising and lowering mechanism and said supporting wheel, and means arranged to operate at the limit 80 of each to and fro movement of said mechanism for tripping the plow actuating mechanism out of action.

7. A gang plow comprising a frame, a series of gang plows connected to the frame 85 and means for actuating the plows to raise them from and lower them to the ground comprising a reciprocable rack bar, a pinion meshing with the rack bar, a worm wheel and a worm for rotating the pinion, a shaft 90 with which the worm rotates, and means for rotating said shaft embracing reversing means arranged to rotate the shaft in two opposite directions.

8. A wheeled gang plow comprising a 95 frame, a series of plows connected to the frame by pivotal connections arranged to permit the plows to be raised and lowered, a motor for pulling the frame and plows forwardly, mechanism for raising and lowering the plows embracing a reversing element, means for throwing said mechanism  
 100 into action, embracing actuating means extending forwardly to the motor, said reversing element being normally in a neutral or 105 non-actuating position, and means movable with the plow actuating mechanism and operating at the limit of the movement thereof in either direction to adjust said reversing mechanism to its central or neutral po- 110 sition.

9. A wheeled gang plow comprising a frame provided with supporting wheels, a series of plows having forwardly extending, vertically swinging beams connected to said 115 frame, raising and lowering means connected to the plow beams, a reciprocable rack bar common to and connected with all of said raising and lowering means, and having progressive lost motion with respect to certain of said plows, and means for reciprocating the rack bar embracing a pinion meshing with the rack bar. 120

10. A wheeled gang plow comprising a frame provided with supporting wheels, a 125 series of plows having forwardly extending, vertically swinging beams connected to said frame, raising and lowering means connect-

ed to the plow beams comprising forwardly extending bars, a universal bar connected to the forwardly extending bars and positively actuated mechanism for giving forward and rearward movement to said universal bar.

11. A wheeled gang plow comprising a frame provided with supporting wheels, a series of plows having forwardly extending, vertically swinging beams connected to the frame, raising and lowering mechanism connected to the plow beams, embracing forwardly extending slotted bars, a universal bar having studs engaging the slots of the slotted bars and means for giving forward and rearward movement to said universal bar.

12. A wheeled gang plow comprising a frame provided with supporting wheels, a series of plows having forwardly extending, vertically swinging beams connected with the frame, wedge devices for raising and lowering the plows, bars extending forwardly from said wedge devices, said bars being longitudinally slotted at their forward ends, a universal bar extending transversely of the slotted bars and provided with studs engaging the slots of said bars and positively actuated means for giving forward and rearward movement to said universal bar.

13. A gang plow comprising a plurality of plows arranged side by side and one in front of the other and arranged to be raised and lowered, mechanism for raising and lowering the plows embracing means which act on the forwardmost plow to first raise, or lower, the same and to progressively act on the plows in rear thereof to raise, or lower, the same, said raising and lowering means embracing a reciprocable rack bar, a pinion meshing therewith and driving means for said pinion embracing a reversible element, whereby the pinion may be driven in opposite directions.

14. A gang plow comprising a frame, a series of plows trailing behind and connected to the frame and arranged side by side and one in front of the other and having rising and falling movement, an element having a positively actuated to and fro rectilinear movement and means connected with the plows and operatively connected with said element by means permitting lost motion therebetween for progressively raising and lowering the plows.

15. A gang plow comprising a frame, a plurality of plows arranged side by side and one in front of the other and having forwardly extending, vertically swinging beams connected to said frame, raising and lowering devices connected with the plow ends of said beams and extending forwardly therefrom, positively acting means extending backwardly over said beams and operatively

connected to said raising and lowering devices, there being a lost motion between said positively actuated means and the raising and lowering devices to progressively raise and lower said plows.

16. A gang plow comprising a frame, a plurality of plows arranged side by side and one in front of the other and provided with forwardly extending, vertically swingable beams connected to the frame, raising and lowering devices for the plow ends of the beams embracing forwardly extending slotted bars, a universal bar provided with studs adapted to engage the slots of said bars, means whereby the studs have progressively longer lost motion relatively to the slotted bars from the forward to the rearward plow and means for giving forward and rearward movement to said universal bar.

17. A gang plow comprising a frame, a plurality of plows arranged side by side and one in front of the other and provided with forwardly extending, vertically swingable beams connected to the frame, raising and lowering devices for the plow ends of the beams embracing forwardly extending slotted bars, a universal bar provided with studs adapted to engage the slots of said bars, a reciprocable rack bar connected to the universal bar, means for giving positive to and fro movement to the rack bar, embracing a pinion meshing with the rack bar, and means whereby the studs have progressively longer lost motion in said slots relatively to the slotted bars from the front of the rear plow.

18. A gang plow comprising a frame, a plurality of plows arranged side by side and one in front of the other and provided with forwardly extending, vertically swingable beams connected to the frame, raising and lowering devices for the plow ends of the beams embracing forwardly extending slotted bars, a universal bar provided with studs adapted to engage the slots of said bars, said slots being provided at their ends with lateral notches of progressively increasing length from the front to the rear plow adapted to receive the studs when the universal bar is at the limits of its movement, means for giving positive to and fro movement to the universal bar, and means operable in a prescribed part of the movement of said slotted bars for laterally disengaging the studs from said notches.

19. A gang plow comprising a frame, a plurality of plows arranged side by side and one in front of the other and provided with forwardly extending, horizontally swingable beams connected to the frame, raising and lowering devices for the plow ends of the beams embracing forwardly extending slotted bars, a universal bar provided with studs adapted to engage the slots of said bars, said slots being provided at

their ends with lateral notches of progressively increasing length from the front to the rear plow adapted to receive the studs when the universal bar is at the limits of its movement, means for giving positive to and fro movement to the universal bar and therethrough to the slotted bars, and tripping dogs for tripping the notched parts of the slotted bars out of engagement with said studs.

20. A gang plow comprising a frame, a plurality of plows arranged side by side and one in front of the other and provided with forwardly extending, horizontally swingable beams connected to the frame, raising and lowering devices for the plow ends of the beams embracing forwardly extending slotted bars the slots of which have lateral notches at their ends of progressively increasing lengths from the front to the rear plow, a universal bar provided with studs adapted to engage said slots and to rest in the notches at the limits of movement of the raising and lowering devices, means for giving positive to and fro movement to said universal bar and therethrough to the slotted bars and two sets of tripping dogs arranged with two dogs of different sets in line with each slotted bar, one adapted to trip the notched portion thereof out of engagement with its stud in one direction of movement of the bar and the other to effect such disengagement in the other direction of movement of said bar.

21. In a gang plow, the combination with a vertically swingable plow beam with means for raising and lowering the same, of a bar extending forwardly from the raising and lowering means and provided at its end with a slot, with lateral notches at the ends of the slot, a member having a stud to engage the slot and associated with means for positively moving it to and fro, and tripping dogs arranged in the path of said slotted bar to trip the notched portion of the slotted bar away from said studs, one of said dogs being in position to act when

the bar moves in one direction and the other dog in position to act when the bar moves in the opposite direction.

22. In a gang plow, the combination with a vertically swingable plow beam with means for raising and lowering the same, of a bar extending forwardly from the raising and lowering means and provided at its end with a slot, with lateral notches at the ends of the slot, a member having a stud to engage the slot and associated with means for positively moving it to and fro, and pivoted tripping dogs free to swing in one direction but immovable in the other direction; said dogs being arranged one in front of the other in the path of the bar and formed with oppositely directed oblique faces adapted to be engaged by a part carried by the bar, said oblique faces of one dog being reversely inclined relatively to the other dog.

23. A gang plow comprising a frame, a plurality of plows arranged side by side and one in front of the other and provided with forwardly extending, vertically swingable beams connected to the frame, raising and lowering devices for the plow ends of the beams embracing forwardly extending slotted bars, a universal bar provided with studs adapted to engage the slots of said bars, means whereby the studs have progressively longer lost motion relatively to the slotted bars from the forward to the rearward plow and means for giving forward and rearward movement to said universal bar, said slots of the bars being rearwardly extended to permit the plows to be separately raised.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 28th day of January A. D. 1911.

NICHOLAS WEILER.

Witnesses:

WILLIAM L. HALL,  
WILLIAM GOLDBERGER.