Aug. 17, 1954 J. H. TAYLOR 2,686,395

DISK HARROW

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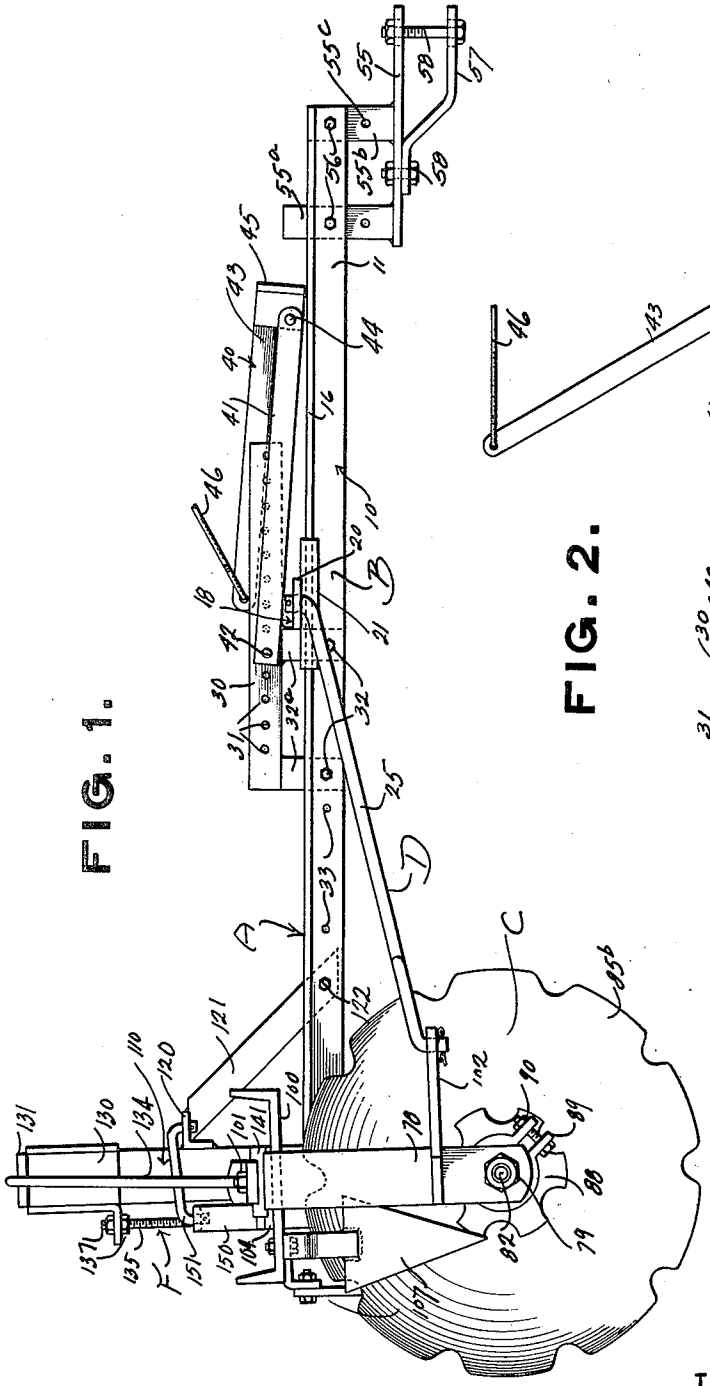


FIG. 1.



FIG. 2.

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FIG. 3.

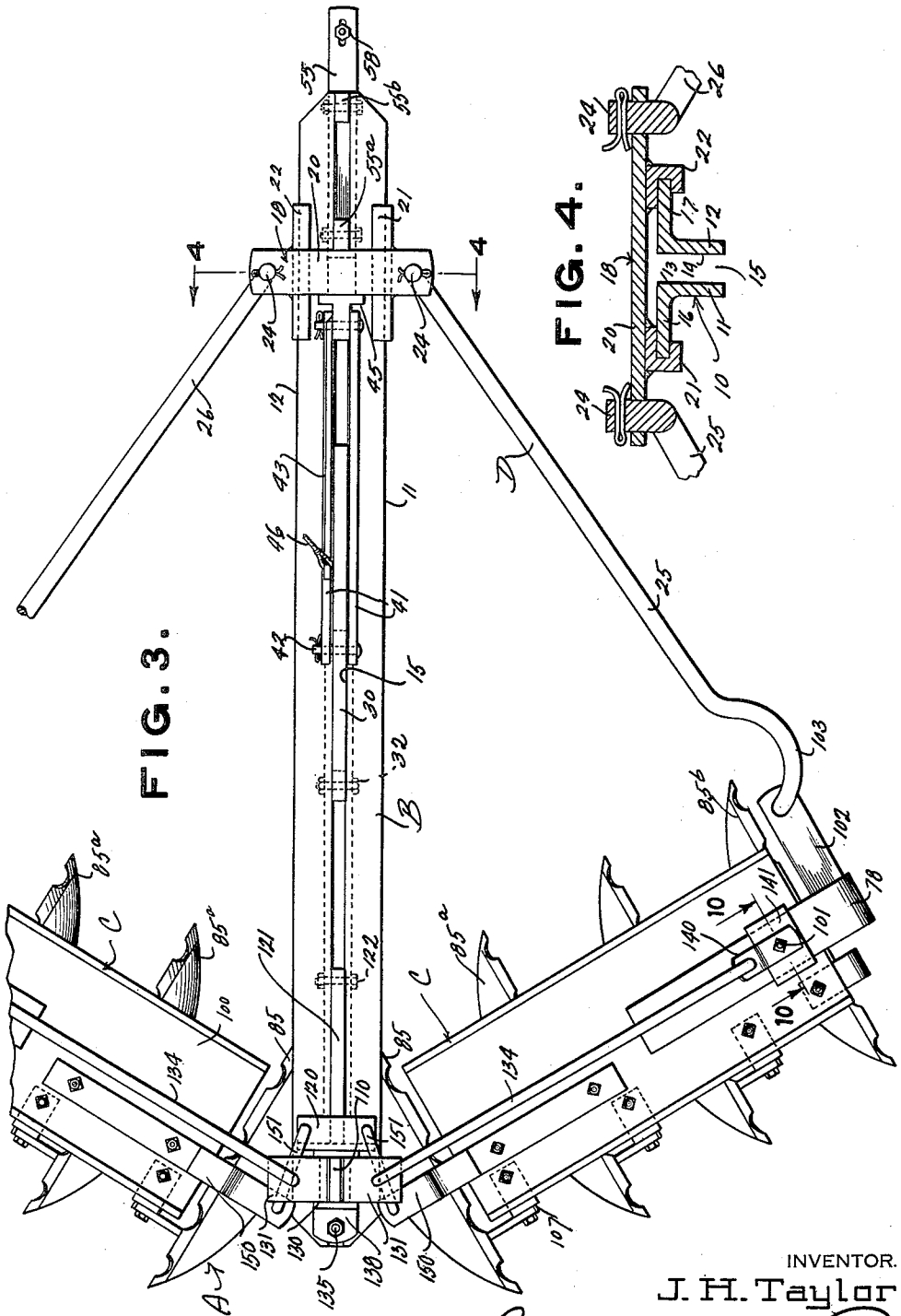


FIG. 4.



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FIG. 5

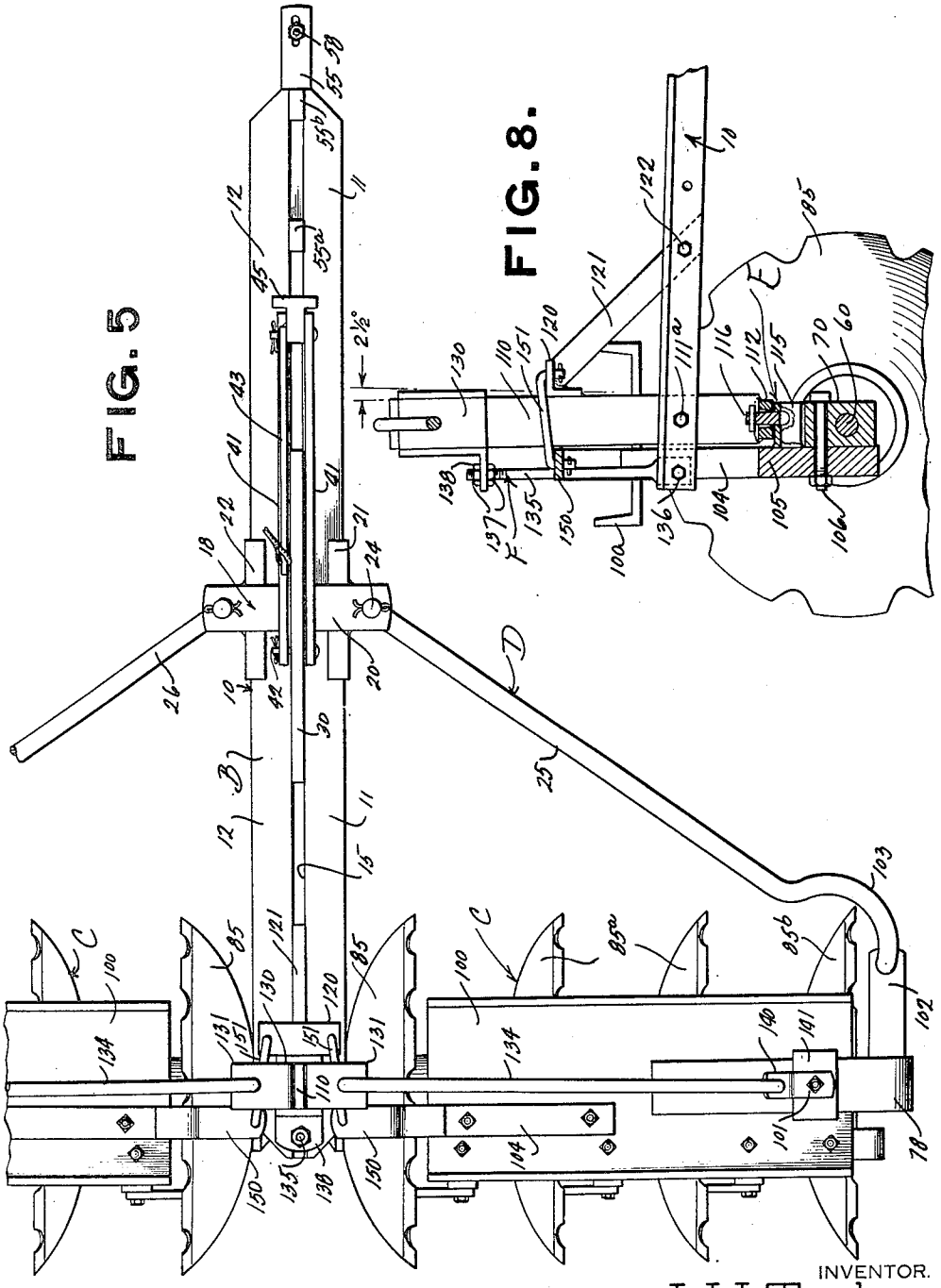


FIG. 8.



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FIG. 6.

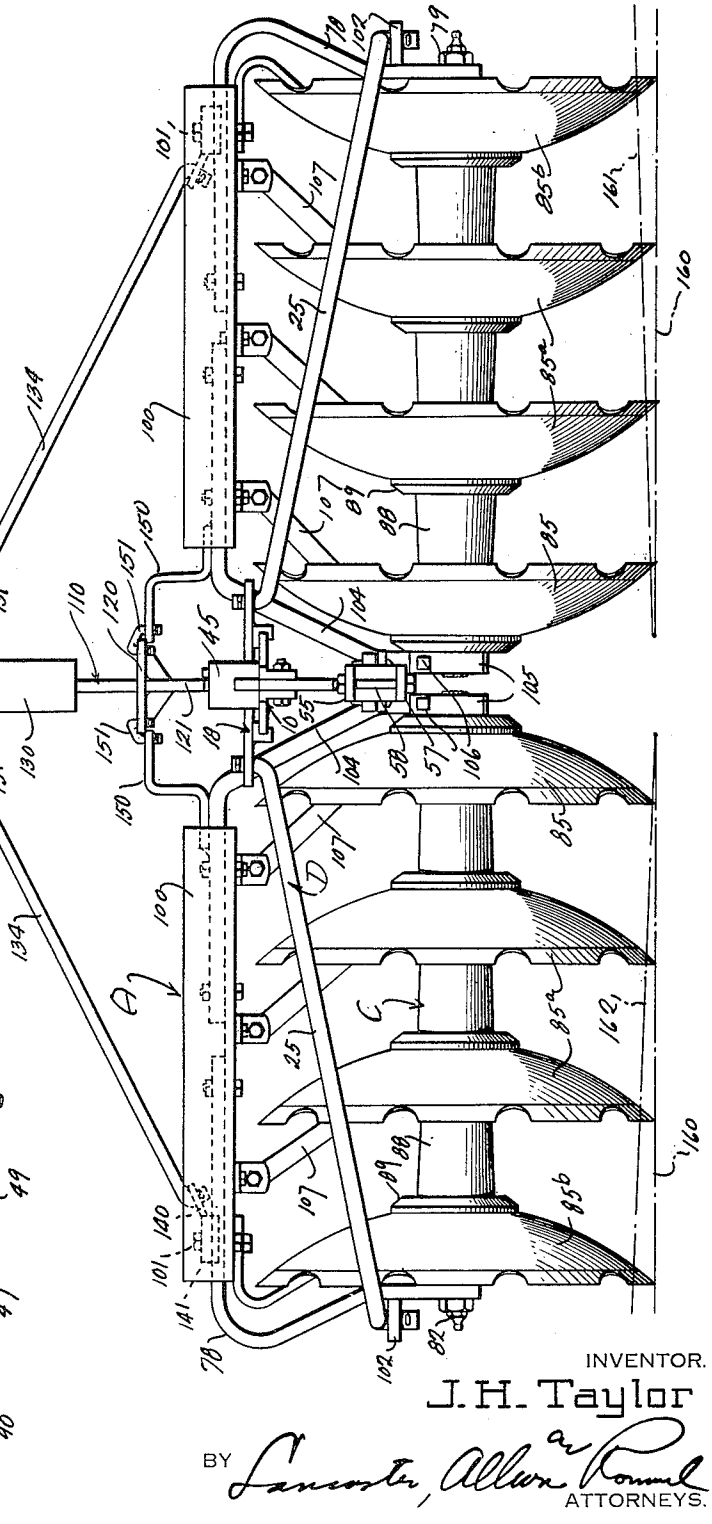
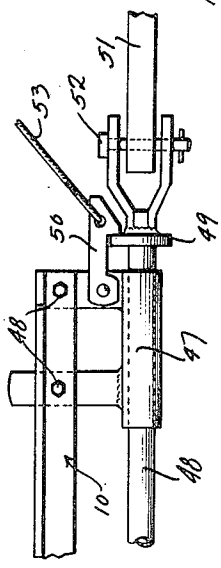


FIG. 13.



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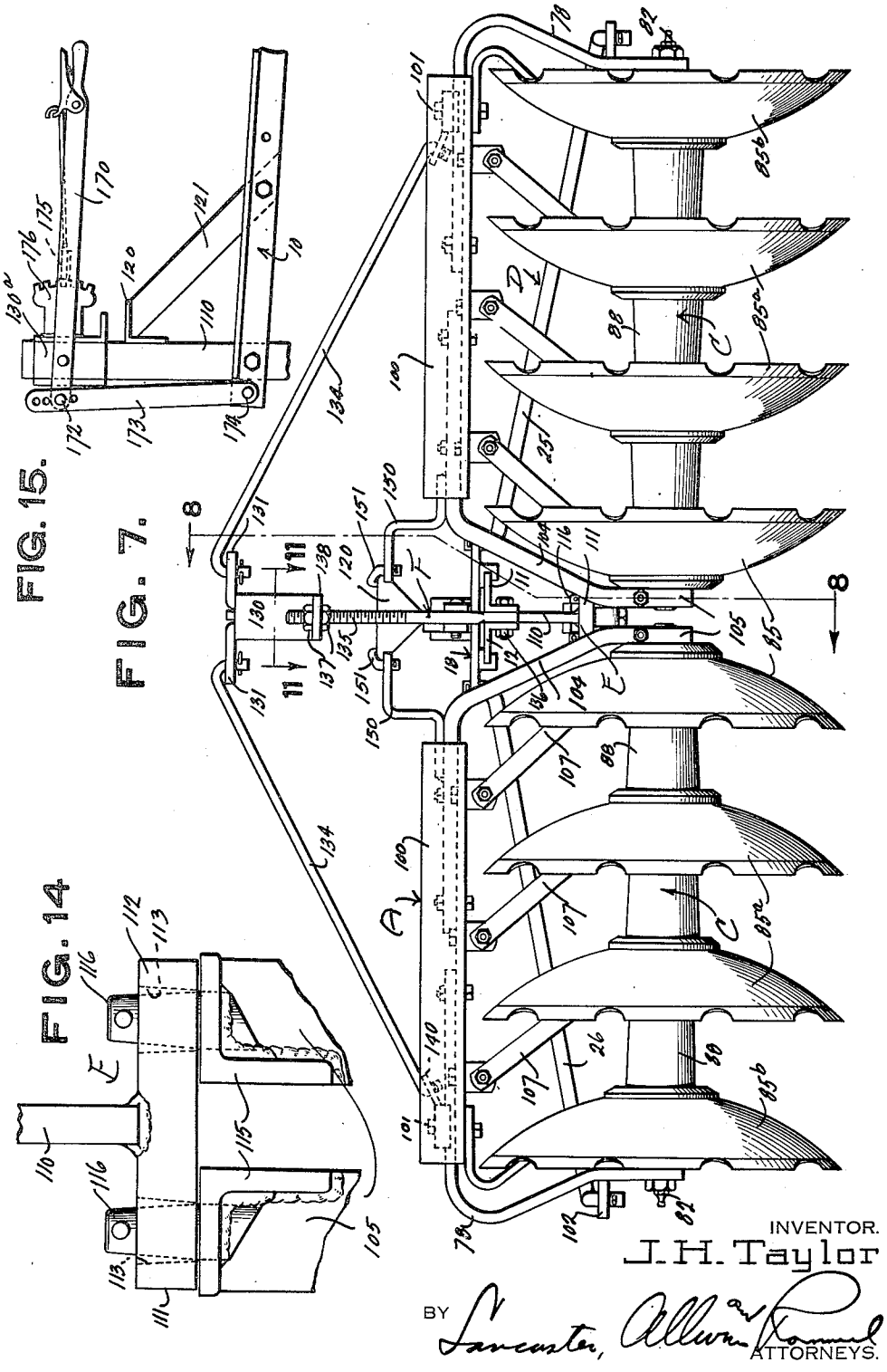


FIG. 15.

FIG. 7.

FIG. 14

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FIG. 11.

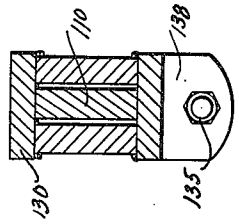



FIG. 10.

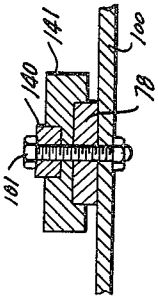



FIG. 12.

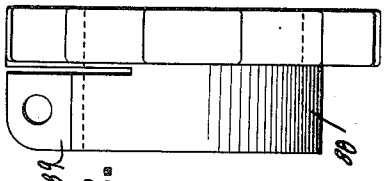
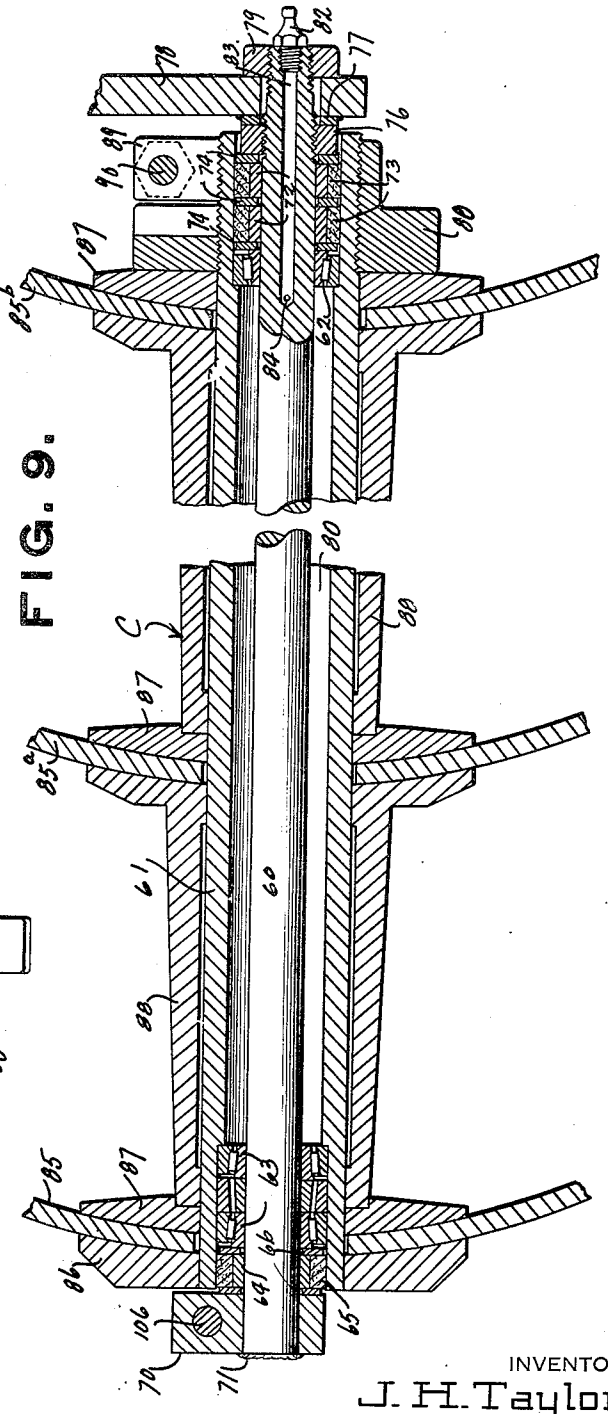



FIG. 9.




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# UNITED STATES PATENT OFFICE

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## DISK HARROW

Joseph H. Taylor, Athens, Tenn.

Application April 5, 1948, Serial No. 19,119

6 Claims. (Cl. 55—81)

1

This invention relates to improvements in harrow construction.

The primary object of this invention is the provision of a heavy duty type of plowing harrow having improved means to regulate the gangs of plowing discs.

A further object of this invention is the provision of an efficient easily operated type of disc harrow having improved means for attachment with a power unit.

A further object of this invention is the provision of an improved frame structure for harrows.

A further object of this invention is the provision of a harrow having improved means for angling the disc gangs.

A further object of this invention is the provision of a harrow having improved supporting and bearing means for the discs forming the gangs.

A further object of this invention is the provision of a very durable type of disc harrow having safety factors which will adapt the same for harrowing and plowing under a wide variety of conditions.

Other objects and advantages of this invention will be apparent from the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts thruout the several views,

Figure 1 is a side elevation showing the discs of the gangs in axial alignment, with the draft tongue horizontally positioned.

Figure 2 is a view showing an improved type of angling latch.

Figure 3 is a fragmentary plan view of the harrow with the disc gangs in plowing and harrowing positions.

Figure 4 is a cross sectional view taken substantially on the line 4—4 of Figure 3.

Figure 5 is a fragmentary plan view of the harrow with the disc gangs in axial alignment.

Figure 6 is a front elevation of the harrow with the gangs in the position shown in Figure 5.

Figure 7 is a rear elevation of the harrow with the disc gang axes in alignment.

Figure 8 is a cross sectional view taken substantially on the line 8—8 of Figure 7 and showing more particularly the rear draft connections for the gangs.

Figure 9 is a fragmentary cross sectional view taken in a vertical plane axially of a disc gang; showing more particularly the supporting and bearing arrangement thereof.

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Figure 10 is a cross sectional view taken substantially on the line 10—10 of Figure 3.

Figure 11 is a cross sectional view taken substantially on the line 11—11 of Figure 7.

Figure 12 is a detailed view of a split clamp type nut structure for the rotatable tubing of one of the disc gangs.

Figure 13 is a modification showing means for quick release of a draft connection with the harrow tongue.

Figure 14 is a fragmentary view showing the inner draft connections of the gangs with the rear frame structure of the harrow.

Figure 15 is a fragmentary view showing modified means for quick adjustment of the outer ends of the disc gangs for the purpose of varying the vertical angle thereof.

In the drawings, wherein for the purpose of illustration are shown preferred and modified forms of the invention, the letter A may generally designate the improved harrow. It includes a frame B having a plurality of gangs C connected therewith by forward draft connection D and rear draft connections E. Means F is provided for adjusting the vertical working angle of the gangs.

Referring to the frame structure B, the same includes a tongue 10 formed of a pair of angle irons 11 and 12, positioned as shown in Fig. 4 with the vertically positioned leg portions 13 and 14 thereof spaced to provide way 15. Upper legs 16 and 17 thereof lie in the same plane and are adapted to slidably receive the front draft connection box structure 18.

Broadly it is old to forwardly angle harrow gangs. The specific improvements with respect to the outer end draft connection consists of the box 18 above described. It includes a top plate 20 having welded at the under side thereof guide channels 21 and 22 which respectively slide on the outer margins of the tongue flanges 16 and 17, as shown in Figure 4. To the laterally projecting ends of the box plate 20 are pivotally connected the upstanding ends 24 of draft links 25 and 26, in any approved manner, such as by stud ends and cotter pins. The slide box will move along the tongue structure, as is quite apparent.

The disc gang angle varies widely in degree according to the type of work desired. The structure mainly includes an adjustment bar 30 having a series of pin receiving openings 31 therein. The bar 30 is provided with a pair of attaching studs $32^a$, in spaced relation, which may be detachably connected by bolts 32 with the vertical leg portions of the angles 11 and 12 in any of a

series of appropriately spaced openings 33 provided therefor. This constitutes a major adjustment for angling. For minor angling adjustments a latch structure 40 is provided. It includes an attaching bar 41 having a detachable pin connection 42 with any of the series of openings 31, and at its opposite end having pivoted thereto a latch lever 43 by means of a pivot pin 44.

The latch lever 43 is provided with a stop plate 45 adapted to receive thereagainst the plate 20 of the slide box 18, when the details of the latching arrangement are in the position shown in Figure 3, for the purpose of holding the gangs at an angle. In order to release the slide box it is merely necessary for the operator thru the latching cord 46 to pull the latch lever to the position shown in Figure 2, and the slide box can move past the stop plate 45, thru a camming action which will be perfectly apparent.

When stalled or stuck the operator may release the angling latch. This will temporarily free the tractor entirely from the load. The power unit will then be able to move to firm soil and pull the harrow out of working angle until freed from the stalled position. Upon reversing the power unit, the working angle will be automatically set, since (assuming the parts are then in the position shown in Figure 1) the tongue will slide thru the slide box with a camming action along the sloping under edge of the bar 41 until the slide box moves past the stop plate 45, and the positions are automatically set.

Independent of the angling latch arrangement for freeing the power unit, I may provide a modified feature, such as shown in Figure 13, for accomplishing the same purpose. This consists of attaching to the tongue structure 10 a barrel type casing 47, as at 48. The barrel or sleeve casing 47 slidably receives a rod 48 having a telescoping action therewith. It is provided with a head 49 adapted to be latched by a latch 50 in position against forward movement with respect to the tongue 10. The power unit draft connection 51 has a detachable connection 52 with a clevis arrangement secured to the slide bar 43. The latch 50 is controlled by the operator from the power unit thru a line 53. Unlatching thru pulling on the line will permit the rod 48 to move through the sleeve 47 and of course the power unit or tractor is then temporarily disconnected from the load of the harrow. The power unit can move ahead to firm soil and when the harrow is pulled out of position after the working angles of the discs have been straightened the power unit can be reversely moved and the telescoping action and latch securement will be automatic. Both this type of connection and the angling latch connection above described can be incorporated in the same harrow.

Referring to the power unit clevis type of connection for the tongue, the same includes an upper supporting part 55 detachably connected as at 56 to the tongue angles through risers 55a and 55b, the former of which constitutes a stop for slide plate 20. The clevis can be vertically adjusted thru bolt connection on selected openings 55c. The lower part 57 is pivotally connected at 58 to the stationary tongue connected part 55. The parts 55 and 57 are spaced at their fore ends and receive a detachable draft connecting pin or bolt 58. When the latter is removed the part 57 may be swung sideways. This clevis arrangement prevents shimming, running sideways, dipping, digging in, and running at an uneven depth, and enables smooth, even mulching of the soil. The simplicity of connection and disconnection is obvious, allowing the harrow tongue to be raised or lowered without moving the power unit. It is sufficiently flexible to permit the power unit and harrow to be driven over seams, ditches and uneven land contours.

Referring to the assemblage of the gangs C, each of the same includes a dead axle 60 upon which the disc tube or cylinder 61 rotates; being supported at its ends upon the dead axle 60 by tapered thrust bearings. The outer end is supported upon a double thrust bearing 63, as shown in Figure 9. The outer bearing structure includes a steel sleeve 64 having a ground fit on the dead end of the axle and adapted to receive bearing thrust. Outwardly the sleeve is encased in a conventional seal ring 65 having washers 66 at each side thereof to prevent lubricant leakage. The inner end of the dead axle 60 is provided with a draft connecting block 70 which may be welded as at 71. The outer end of the cylinder is provided with a pair of steel spacer rings or sleeves 72 having thereabout conventional seal rings 73 and provided with intermediate and end washers 74, one of which abuts against the thrust bearing 62. The bearing 62 is held in place upon the outer end of the axle by means of a nut 76 threaded upon the axle and engaging against one of the washers 74. This nut 76 is kerfed at its outer side for receiving certain rib portions 77 welded upon bracket arm 78; the latter being attached to the outer end of the axle by means of a nut 79 threaded upon the outer end of the axle, as shown in Figure 9. Oil or lubricant is supplied to the space 80 between the axle and the rotating cylinder 61 thru a fitting 82 secured upon the outer end of the axle. This feeds lubricant thru a passageway 83 and a lateral duct 84 into the space 80.

It is quite obvious that the axles may vary in length, for receiving the desired number of plowing discs. To that end, the assemblage is accomplished from the outer end of the axle. The innermost disc 85 abuts against a plate 86 which may be welded or otherwise secured upon the extreme inner end of the tube 61. The disc assemblages from thereon are detachable (from the outer end of the tube 61). Seating plates 87 are located at the inner sides of the discs for receiving the smaller ends of the tapered spacer sleeves 88; the latter at the outer ends thereof being provided with flanged portions 89 for receiving the adjacent disc 85a in socketed engagement thereagainst. The outermost disc 85b at the concaved side thereof may have a ring 87 against which a disc retaining nut 88 engages. The nut 88 is threaded upon the externally threaded outer end of the cylinder 61, as shown in Figure 9 of the drawings. It has a bifurcated split portion 89 adapted to receive a clamping bolt 90 for the purpose of clamping the nut in proper position against accidental movement after its position has been set upon the screw threaded portion of the cylinder.

The facility with which the disc assemblage may be tightened is obvious. The nut 88 eliminates the necessity of special wrenching, since the clamp bolt 90 can be moved with a common wrench and the proper adjustment made by hammering the nut 88 upon its external lug provided surfacing, as will be noted from Figures 1 and 12.

The gang structure C each include a weight box 100, of channel formation. They swing with the gang arrangement. Individual weighing of the

gangs permits desired weight adjustment in order to secure equal penetration of the gang on plowed surfacing while the other gang is operating on rough or unplowed surfacing, and the advantages of which will be apparent to those skilled in the art. The outside frame bracket 78 of each gang is properly bowed to make provision for turning of the outside discs. It is inturned over the top of the bottom of the weight box 100 and bolted at 101 to the weight box, as shown in Figure 10. Each bracket 78 may have a welded forward extension 102, for attachment of the rear ends of the draft links 26 and 27. These draft links are convexed at their outer ends adjacent the pivotal connections with the bracket extension 102, as shown at 103, for the purpose of warding off objects which may get in the way of the harrow and for striking glancing blows off shrubs, fences, etc.

The inner ends of the channel-shaped weight boxes 100 are provided with detachable connecting brackets 104, best shown in Figure 7 of the drawings. They have lower vertically positioned end portions 105, also shown in cross section in Figure 8. These portions 105 of the brackets 104 have bolts 106 pivotally connecting them to the upper ends of the attaching blocks 70 at the inner ends of the gang shafts, as shown in Figure 8.

The under sides of the weight boxes 100 are provided with suitable detachable scrapers 107 for the concaved sides of the discs. The weight boxes serve not only as frame structures for reinforcing the disc cylinders and the gangs, but also provide means for adding weight in a balanced condition to the gangs, and afford means for support of the scrapers.

Referring to the inner draft connection E for the gangs, a standard 110 is provided. It is sturdy and extends thru the space between the tongue angles at the rear of the tongue 10, as shown in Figure 8, and is bolted thereto at 111a. The standard 110 at its lower end is provided with lateral extensions 111 and 112 (see Figure 14) provided with vertically disposed openings 113 therethru which are flared with an upward divergence. The gang bracket arms 104 of the two independent gang structures are each provided with forwardly disposed welded extensions 115 and provided with upwardly disposed spindles or studs 116 adapted to seat in the bearing openings 113. These spindles 116 are upwardly flared in convergent shape so that they may have a rocking action in their bearing openings 113; as will occur when the gangs are lifted in a vertical plane for varying the vertical angle at the outer ends of the gangs, under circumstances to be subsequently described.

Attention is called to the fact that the standard 110 in addition to its bolting at 111a to the rear end of the frame tongue 10 is also secured in position by means of an angle piece 120, shown in Figures 6 and 8, by a forwardly and downwardly extending brace bar 121 connected detachably at 122 to the tongue 10. The standard 110 has a rearward inclination of 2½°.

Referring to angle adjusting means F, for further support of the outer ends of gangs C, and to insure proper angle inclination of the discs of the gangs under circumstances to be hereinafter described, I provide a vertically adjustable sleeve or box structure 130 non-rotatably slidable upon the upper end of the standard 110. It has laterally extending wings 131 to which the upper and inner ends of supporting and connecting rods 134 are connected, as shown in Figure 7. This adjusting sleeve or casing 130 is maintained in desired spaced adjustment with respect to the rear end of the tongue 10 by means of a supporting member 135, shown in Figure 8 as bolted or connected at 136 between the angles at the rear end of the tongue 10. The member 135 at its upper end is screw threaded and adjustably bolted as at 137 to a flanged portion 138 of the adjustable box or casing sleeve 130. The outer ends of the supporting and connecting rods 134 are pivotally connected to apertured ears of straps 140 which are attached in the recessed top surfaces of a rotation preventing channel 141 which straddles the top portion of the brace 78, as shown in Figure 10; the bolt 101 securing all of these pieces 140, 141, 78 and 100 together at this point. Brief reference at this time will be made to the fact that merely by adjusting the nut 137 the sleeve 130 may be moved along the standard to vary the position of the outer ends of the gangs, as will be quite apparent.

The box 130 is built up of welded pieces in the shape shown in the cross sectional view Figure 11.

The inner ends of the gangs at the weight boxes 110 are further connected and supported by means of bracket extensions 150 which are link connected at 151 with the angle piece 120 above described. These links provide proper support and draft for the gangs at the inner ends in addition to the lower connections above described and also permit of the outer ends of the gangs to gradually lift as they are swung from their axially aligned position into forward angled position. Of course this movement is enabled by reason of the off-vertical position of the standards 110, as shown in Figure 8, which always controls the position of the box 130, however adjusted on the standard, and likewise controls the pivot connections of the connecting rods 134 with respect to the pivot connections of the links 151.

Referring to Figure 6, it will be noted that when the gangs are in axial alignment as during normal inoperative travel of the harrow, the lower edges of the discs lie in the same horizontal plane designated by dot and dash line 160. However, due to the structure immediately above described, as the gangs are angled forwardly, the outer ends of the discs are gradually elevated until the lower edges of the discs lie in planes at an acute angle to the horizontal, as designated by the lines 161 and 162.

It will be noted that the mechanism which controls the vertical tilting of the gangs is centrally located. Means other than that described may be provided to regulate the degree of angling, such as shown in Figure 15 where the box or slide 130a, which corresponds to the slide box 130 above described, may be lifted by a regulating lever 170 pivoted thereto at 171. The lever 171 at its rear end, beyond the standard 110, may be provided with an adjustable pin connection 172 with a supporting rod 173 pivoted at 174 upon the rear end of the tongue structure 10. It is obvious that due to the spacing of the pivot connections 170 and 172, the box 130a may be raised or lowered. I may provide a suitable control pawl 175 upon the lever 170 operating over a detent segment 176 which may be attached to the box 130a; the same being provided with teeth between which the pawl 175 may seat to hold the proper adjustment of the slide box 130a. This leverage assemblage may

extend to the power unit if desired, and also other means may be used for securing quick adjustment of the tilting angle of the gangs, such, for instance, as thru conventional hydraulic mechanism, etc.

It is obvious that both gangs run at perfect level when the gangs are in axial alignment, thereby lessening danger of breakage to any individual discs when passing over rough, stony places or other hazardous objects or when being transported.

The ordinary method of use of the harrow will be to cut one gang thru already harrowed surfacing while the other gang section is operating on unplowed land. It is thus obvious that individual weighting of the gangs is very important otherwise the harrow would be subject to transverse sliding and cause uneven plowing, and at the same time causing the gangs on stalky or trashy unplowed soil to leave undesirable piles of debris. By adding additional weight to the gangs on the unplowed soil the debris is left in an even condition so that the opposite gang will not encounter difficulty in handling such. As the result of individual weighting of the gangs there is an even plowing and distribution of debris in the plowed soil.

With respect to the use of multiple bearings, compactness is provided, eliminating the necessity for special discs with large central openings. With multiple bearings the required amount of radial and thrust resistance is obtained and standardizing of bearing seals and bearings is provided. Also, the bearing assemblage is such as to permit the use of very light lubricant, much more so than with conventional power harrows, thereby providing more efficient lubrication. As to the bearing adjustment, such is accomplished with ease thru the nut structure at the outer end of the gang shaft. The assemblage provides for strength thru elimination of the necessity of cotter pins, holes in shafts, etc.

The unique angling effect permits the draft from the power unit to be applied at the farthest possible distance from the bearing weight and exert the largest possible amount of leverage on the cylinder gangs with given amount of energy.

As before stated, the common method of using the harrow will be to plow one-half of new soil with one gang while going over the previously plowed area with the other gang. The tendency in disc harrowing is to cause a lateral piling up of the soil at the outer end of the gang. Because the gangs when in forward angled position are also vertically angled so that the outer discs are higher than the inner discs such will compensate for this condition of plowing or harrowing by leaving the finely harrowed area in properly leveled condition.

The slide box 18 may be reversed, to compensate for wear.

Various changes in the shape, size and arrangement of parts may be made to the forms of invention herein shown and described without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a power type plow harrow the combination of a frame including an elongated tongue structure, a pair of disc type gangs, a slide member movable along the tongue forwardly of the gangs, link means connecting the slide member with the outer ends of the gangs, means to releasably hold the position of the slide member in desired adjustment along the tongue to hold the angled positioning of the gangs, an upright standard fixedly connected with the tongue between said gangs, a vertically adjustable slide member upon said standard, link means connecting said last mentioned slide member with the outer ends of the gangs, means to adjust and hold the position of the slide member upon said standard to vary the outer end elevation of said gangs, and draft connecting means connecting the inner ends of said gangs to said frame, said upright being inclined at its upper end at a slight angle rearwardly to the vertical whereby upon forward movement of the outer ends of the gangs said outer ends of the gangs will elevate to limited degree with respect to the inner ends.

2. In a plow disc type harrow the combination of a supporting frame structure, a pair of gangs, means connecting said gangs to the frame structure on individual horizontal axes at their adjacent ends so that the outer end of the gangs can be swung upwardly for vertical angling, means connecting said gangs at their inner ends independently to the frame structure on substantially vertical axes so the gangs can be swung forwardly in substantially a horizontal plane for forward angling, and means connecting the gangs to the frame for synchronizing the movement of vertical angling with the movement of horizontal forward angling of the gangs so that as said gangs are swung forwardly they will be lifted slightly at their outer ends in a vertical direction and in proportion to the forward angling.

3. In a plow disc type harrow the combination of a supporting frame structure including a forwardly extending tongue and an upstanding standard rigidly connected at the rear end to the tongue, a pair of gangs, means independently mounting the gangs at their adjacent ends to the standard upon substantially vertical pivot axes so the gangs can be swung forwardly, said last mentioned means providing loose connections to permit the gangs at their outer ends to be also swung slightly upwardly in vertical direction, pivot means on the frame structure connecting each of the gangs adjacent to said vertical pivotal axes upon horizontal pivot axes to permit of vertical swinging of the gangs at their outer ends, and means connected to the upper end of the standard above the said pivot axes swivelly connecting the outer ends of the gangs to said standard.

4. In a plow disc type harrow the combination of a supporting frame structure including a forwardly extending tongue and an upstanding standard rigidly connected at the rear end to the tongue, a pair of gangs, means independently mounting the gangs at their adjacent ends to the standard upon substantially vertical pivot axes so the gangs can be swung forwardly, said last mentioned means providing a loose connection to permit the gangs at their outer ends to be swung slightly upwardly in vertical direction, means at the adjacent ends of said gangs mounting the same on horizontal pivot axes to permit of said upward swinging of the gangs at their outer ends in vertical direction, and means connected to the upper end of the standard above the pivot axes above mentioned for swivelly connecting the outer ends of the gangs thereto, said vertical and horizontal pivot axes of the gangs upon said standard bearing such re-

lation to each other and the upper swivel connections between the standard and the outer ends of the gangs that as the gangs are swung forwardly their outer ends will be slightly and proportionately lifted vertically.

5. In a plow disc harrow the combination of a supporting frame including a tongue, a pair of gang discs, means connecting the gang discs at their adjacent ends to the frame structure for forward swinging at their outer ends, a slide box slidable along the tongue, means connecting the slide box with the outer ends of said gangs, a member connected with the tongue providing a stop for receiving thereagainst the slide box in its rearmost position when the gangs are substantially axially aligned in their rearmost positions, a latch lever having means pivotally connected to the tongue and having a stop plate thereon located forwardly of said member in such relation that when the latch lever is in one position with respect to the tongue its stop plate will engage or receive thereagainst the slide box in a rearward movement limiting position to hold the gangs forwardly angled, the latch lever having means connected therewith to permit pivotal action thereof to change the position of the stop plate whereby the slide box will have a camming action thereon to permit the slide box to move rearwardly against the said member as an abutment.

6. In a plow disc harrow the combination of a main supporting frame including tongue, a pair of gang discs each including an elongated frame, means connecting the gang disc frames at their outer ends to the tongue for simultaneous forward and rearward movements, an upstanding standard rigidly connected to the rear of the frame, a pair of links connecting the adjacent ends of said gang frames to the main frame immediately forward of the said standard at a location above the gangs, each of said links being pivotally connected to its respective gang frame at a location immediately rearwardly of said standard, a member slidably mounted for vertical adjustment along said standard at a location above said links, a connecting rod for each of the gang frames connected to the outer end of the frame and extending therefrom and connected at their inner adjacent ends to said slidable member, means to adjustably hold the slidable member in a desired vertical adjustment upon said standard, and means swivelly connecting the adjacent ends of said gang frames to the main frame at a location below said links.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,124,028 | Jones et al. | Jan. 5, 1915 |
| 1,641,688 | Paul | Sept. 6, 1927 |
| 1,669,080 | Dewend | May 8, 1928 |
| 1,786,863 | Peterson | Dec. 30, 1930 |
| 1,769,162 | Peterson | July 1, 1930 |
| 1,945,882 | Collins | Feb. 6, 1934 |
| 2,020,545 | Goble | Nov. 12, 1935 |
| 2,102,822 | Viau | Dec. 21, 1937 |
| 2,163,818 | White | June 27, 1939 |
| 2,239,948 | Young | Apr. 29, 1941 |
| 2,266,590 | Dyrr | Dec. 16, 1941 |
| 2,385,637 | Mitchell et al. | Sept. 25, 1945 |
| 2,469,605 | McKay | May 10, 1949 |
| 2,538,594 | Rutter | Jan. 16, 1951 |
| 2,571,512 | Youngberg | Oct. 16, 1951 |