May 13, 1947. W. F. McMAHON 2,420,437

DISK HARROW

Filed Feb. 17, 1944 4 Sheets-Sheet 1

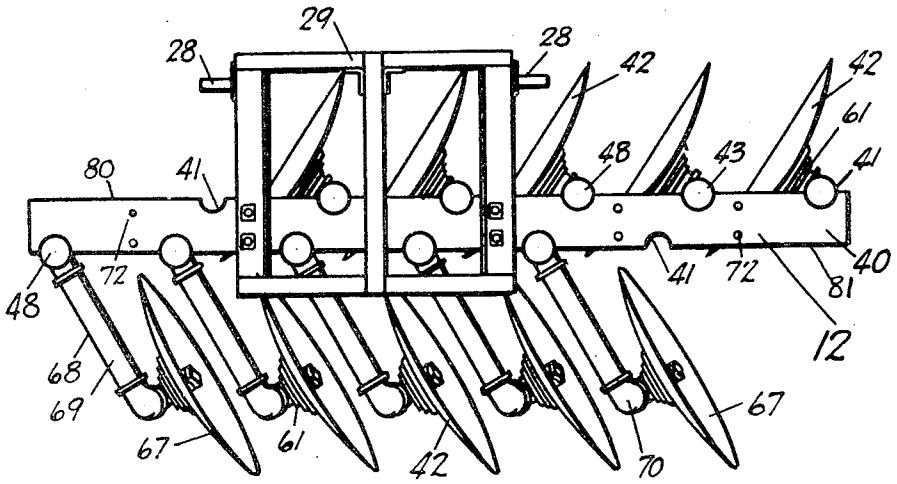


Fig. 1.

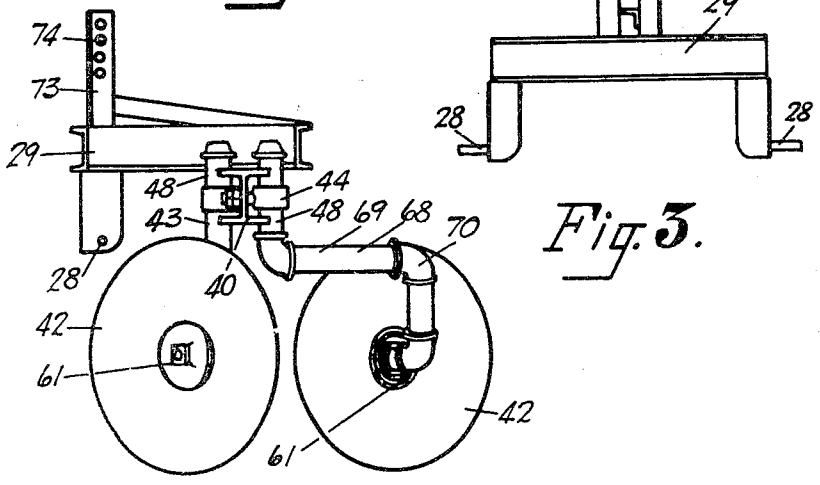


Fig. 2.

Fig. 3.

INVENTOR.

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DISK HARROW

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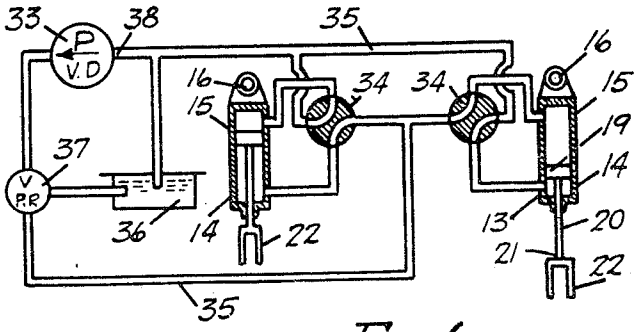


Fig. 6.

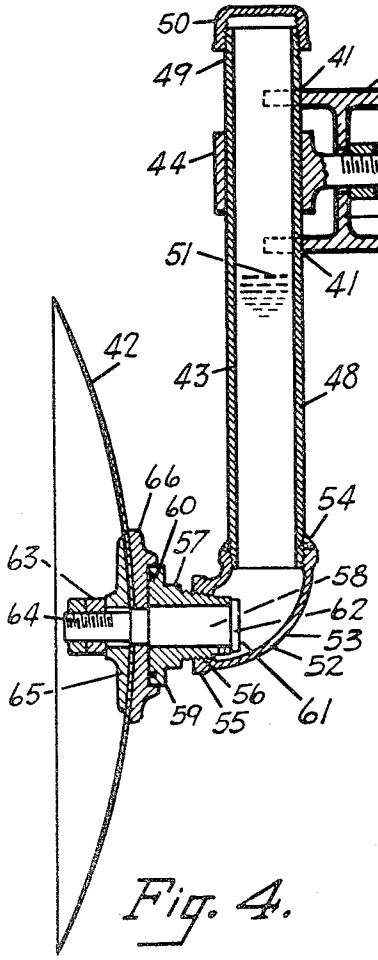


Fig. 4.

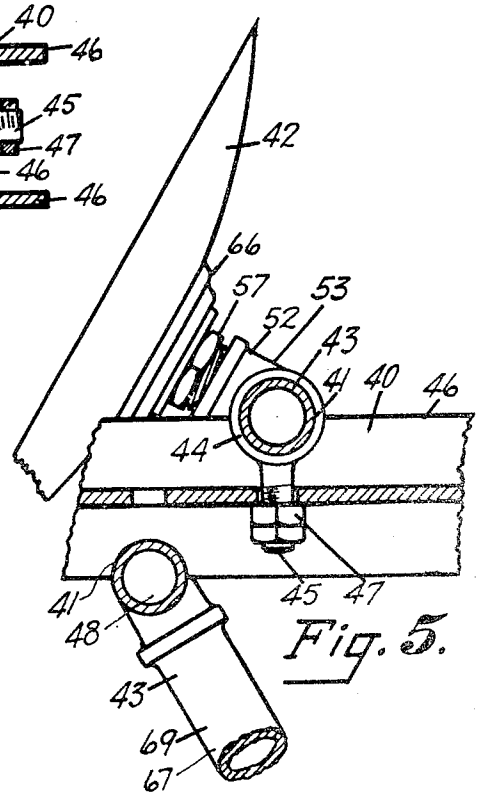


Fig. 5.

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DISK HARROW

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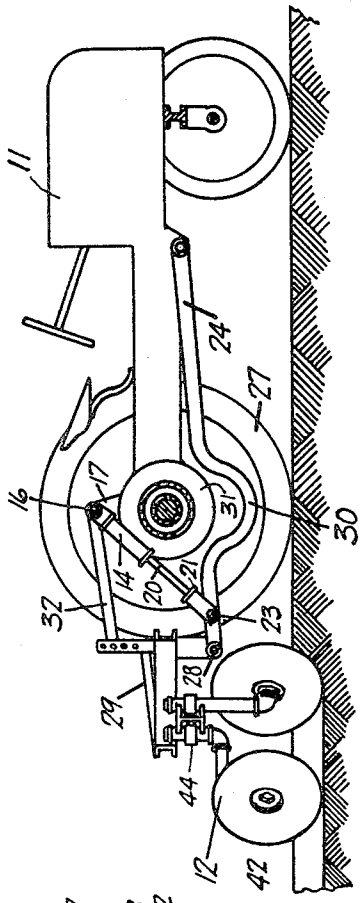


Fig. 7.

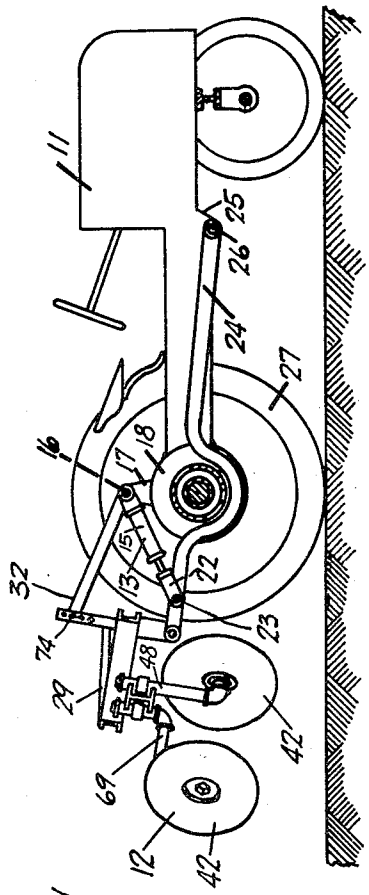


Fig. 8

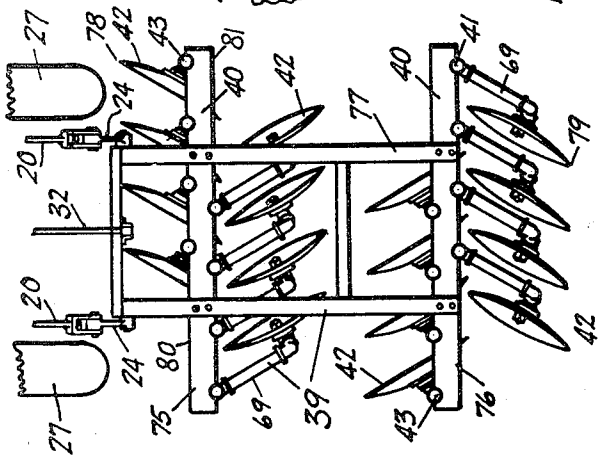


Fig. 9.

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DISK HARROW

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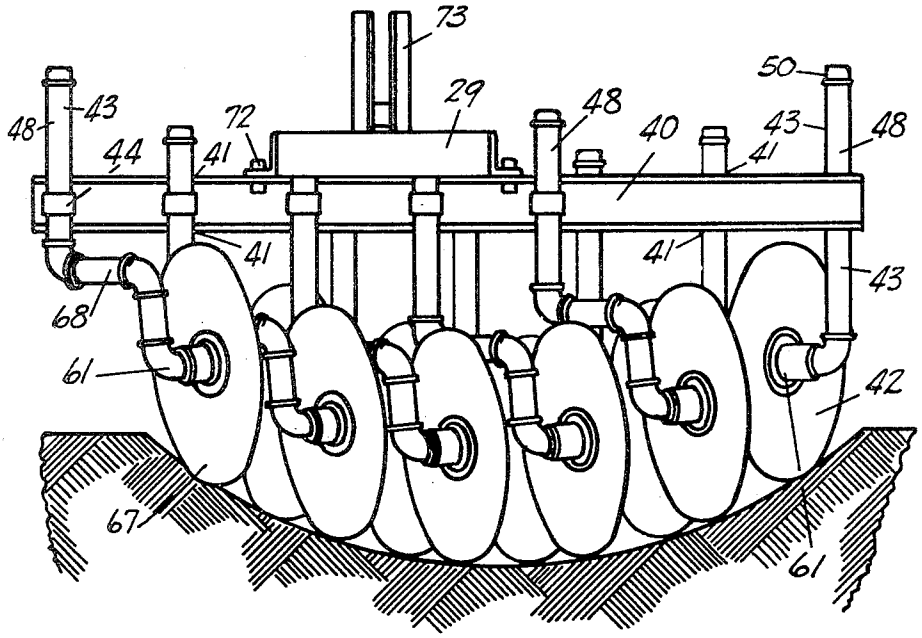


Fig. 10.

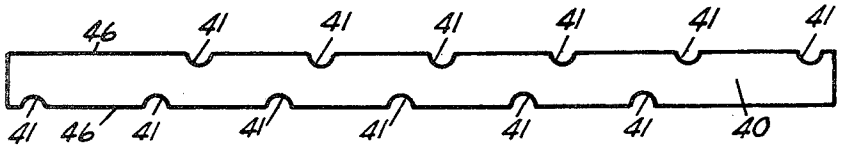


Fig. 11.

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Patented May 13, 1947 2,420,437

UNITED STATES PATENT OFFICE

2,420,437

DISK HARROW

William Frederick McMahon, Riverside, Calif.

Application February 17, 1944, Serial No. 522,809

9 Claims. (Cl. 55—73)

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This invention relates to offset disk harrows, and has for its object to provide for their better operation when working on different formations of the earth and in different types of soils namely, sandy soil, corn stubble, wheat stubble, blue grass soil, clover sod, clay soil, prairie sod, virgin soil and gumbo.

Its chief object is to improve the construction and operation of disk harrows, especially in disk harrows operated by tractors having mechanical or hydraulic lifts, as illustrated by Letters Patent to William Frederick McMahon, on disk implements, issued November 23, 1943, No. 2,335,156.

Heretofore all offset disk harrows, whether lift type or otherwise, had, broadly speaking, coaxial disk blade relationship. This coaxial disk blade relationship existed either directly by the use of a common axle upon which several disk blades were mounted or by the use of a frame structure comprising wheels which said wheels indirectly provided a coaxial relationship to the disk blades used therein, regardless of how these disks blades could be adjusted individually.

(Hereinafter for convenience I will use the term angle of disk blade or blades to denote the respective disk blade's inclination on a horizontal and/or vertical plane.)

This hitherto use of a coaxial disk blade relational-construction limited or restricted the contact of the disk harrow, as a whole, to do effective work in the wide variety of soil conditions that exist. In other words, for example, take the problem of harrowing a cross section of land, having a concave or convex formation, the width of the harrow, and it is desired to retain these respective concave or convex formations for the purpose of preventing erosion or the blowing away of the top soil, and with the land, on either side of these formations, being of a rolling formation in a longitudinal direction. The final job, taking the convex condition for example, is a convex cross section of earth substantially level in its longitudinal direction. (The width across the chord of the arc of the convex cross section of earth is the width of the harrow.) Another condition is that in which a part of the longitudinal length of the soil to be harrowed is gumbo and another part is sandy soil.

As time is the true essence of the efficiency of a tool to do a job, it would be absolutely impossible to do this harrowing job in any reasonable time, if at all, with any of the heretofore constructed disk harrows because;

1. In the event the hitherto disk harrow used a frame with wheels, or was secured to the tractor wheels, these wheels would automatically raise and lower the disk harrow blades in accordance with the contact of the said wheels with the rolling formation of the earth, in the longitudinal direction, and would obviously leave an uneven

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job in the convex cross section of earth. (It would be a reductio ad absurdum conclusion to say that the farmer could stop at each rising bump, in the earth's surface, in his longitudinal path and stop his tractor and adjust his disk harrow in order to do a level job of harrowing.) Yet this is just what the farmer would have to do with the heretofore disk harrow constructions in order to do a level job in the above mentioned problem of harrowing.

2. To properly harrow the convex arc of the earth each disk blade would have to be set at a different angle from that of the adjacent disk blade, for example, in one gang of disk blades, one blade would be set at a thirty degree angle, the next adjacent blade would be set at a twenty-five degree angle, the next adjacent blade would be set at a twenty degree angle and so on. This means that no coaxial disk blade construction can be used to do this.

Therefore it is an object of this invention to provide a non-coaxial disk blade constructed harrow, wherein each disk blade thereof can be individually adjusted on a vertical plane and on a horizontal plane. A construction in which the disk harrow will float when working, in the earth, independent of any elements such as wheels or the like, and this includes the tractor wheels also. In other words, a free-floating, non-coaxial disk blade, disk harrow. To provide this free-floating feature the disk blades must ride on their outer diameter edges and not on their convex surface or otherwise. Otherwise the harrow would not penetrate and the harrow would just slide along on the surface of the earth.

This non-coaxial disk blade construction of harrow with its individual disk blade adjustment permits certain plowing or cutting angles of degrees to each disk blade in order to provide a harmonious draft in the harrow to meet with the sandy soil condition and the gumbo condition set forth in the above mentioned problem.

A chief feature of this improvement is to provide an efficient disk harrow construction. The true test of any efficient disk harrow construction is low maintenance costs.

One of the outstanding detrimental features of heretofore disk harrows was due to the lack of proper lubrication facilities or provisions. This resulted in reducing the average length of life of the disk harrows, in many constructions, by about fifty percent or more. The result was high maintenance costs. The average heretofore disk harrow had to be lubricated, in many cases by a grease gun which had to be carried as extra equipment, several times each day during the period of operation. This practice required loss of time and its corresponding shut down of operations. It is well known that many farmers neglected to lubricate their disk harrow properly

and in many cases did not lubricate it at all. As a matter of fact, proper lubrication facilities are just as essential an element to insure the practicability of the disk harrow as any other element used therein.

A notable feature of this improvement is the provision of a supporting arm or bracket, for each respective disk blade bearing, being formed a lubricator with sufficient capacity to hold enough oil or grease, capable for lubricating the disk blade bearing and shaft for about one year's requirement.

Another object of this improvement is to provide a hydraulic lift mechanism operated by the tractor engine to raise and/or lower the disk harrow.

Heretofore it was common practice to run the disk harrow over corn or wheat stubble and then to repeat the operation in order to cultivate the soil to a higher state of pulverization. It is an object of my invention to provide a disk harrow which will pulverize the soil in one operation to a degree of pulveriaztion that formerly took two operations.

It is well known that the hitherto methods of cultivating the soil and the relevant farm machinery constructed for that particular method of cultivation has resulted, in many sections of the country, in destruction of the top soil, by dust storms carrying away the top soil, and in other sections, by erosion due to floods and heavy rains.

It is a main object of my invention to provide a new result and/or method of cultivation to eliminate the future destruction of the top soil by providing a disk harrow of a simple efficient construction and method of operation which will enable the farmer to depart from his usual method of level field working of the top soil and to introduce a new concave or convex formation, of the earth's surface, method of cultivation. The final appearance of a field cultivated this way and ready for seeding, will appear like a series of parallel concave ditches running in a longitudinal direction lengthwise of the field or on a contour on the sides of a hill, for example, the width of the chord of the arc of the said concave formation will be, in many cases, the width of the disk harrow.

With these and other objects in view, the invention resides and consists in the construction and novel combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion, design, size and minor details of construction may be resorted to by those skilled in the art without departure from the spirit or intent of this invention.

Similar characters of reference denote like or corresponding parts throughout the several figures of the accompanying drawings forming a part of this specification and upon which;

Figure 1 is a plan view of the disk harrow, showing a uniform setting of the disk blades;

Figure 2 is a side elevation view of the disk harrow;

Figure 3 is a front elevation of the hitch;

Figure 4 is sectional elevation of the disk arm or bracket lubricator assembly including the disk blade bearing;

Figure 5 is a transverse section through the disk frame, showing in detail the construction provided to permit the setting and resetting of the various positions of the disk blades;

Figure 6 is a diagrammatic flow chart illustrative of the hydraulic lifting mechanism;

Figure 7 is a side elevation of the disk harrow and tractor, showing the position of the harrow when working in the earth;

Figure 8 is a side elevation of the disk harrow and tractor, showing the relative position of the harrow when being conveyed;

Figure 9 is a plan view of a free-floating disk harrow;

Figure 10 is a rear elevation of the disk harrow showing it working in a concave formation and its adaptability for such work.

Figure 11 is a detailed plan view of the main beam showing the brake seats for the disk blade supports or arms.

Referring in detail to the characters of reference marked upon the drawings, 11 represents a conventional tractor.

The well known elements comprising the operating mechanisms of a conventional tractor, viz., the engine, gear transmission, differential gearing, drive shafts and the other various and well known elements thereof, are not shown nor described because it is thought that further illustration and/or description would be superfluous.

While my improved disk harrow 12 may be drawn by any type or make of conventional tractor 11, it is especially adapted for use with a conventional lift type tractor.

In a hydraulic lifting mechanism 13 formed or constructed to be part of a conventional tractor 11, I have provided a telescopic lever 14 comprising a hydraulic cylinder 15 pivotally mounted 16 on a fulcrum support 17 secured to the top of the rear wheel axle housing 18 of the upper portion of the tractor 11. A piston 19 and piston rod 20 will have a reciprocable movement in the hydraulic cylinder 15. On the outer end portion 21 of the piston rod 20, I provide a forked yoke 22 which, through means of a pin 23 secured therein, I attach the said piston rod 20 to the lifting lever 24.

Lifting lever 24 is a bar having a fulcrum support mounting 25, through means of a pin 26, secured to the under or lower portion of the tractor 11 at a place forward of the rear wheel 27. This lever 24 is pivotally mounted on said support 25. This lever 24 extends lengthwise from the fulcrum mounting 25 to a pin 28 secured in the cantilever hitch 29 of the disk harrow 12. A short distance from pin 28 provision is made in the lever 24 for connecting the yoke 22, of a telescopic lever 14 comprising a piston and cylinder mechanism including a piston 19 with its piston rod 20 and a hydraulic cylinder 15 in which the piston reciprocates. The reciprocable movement of the piston 19 and piston rod 20, in the hydraulic cylinder 15, moves the lever 24 upward and/or downward. As the disk harrow 12 is directly connected with this lever 24, the said upward and downward movement of lever 24 is directly transmitted to said disk harrow 12 and moves it accordantly. At the place where lever 24 comes in contact with the rear axle housing 31, of the tractor 11, a concave formation or shape 30 is made in lever 24 in order to permit it to have more upward movement. This concave shape 30 is an important construction detail.

Telescopic levers 14 forming an upper set of levers and the levers 24 forming a lower set of levers will be mounted on the tractor 11 in pairs. The upper telescopic levers 14 are mounted and arranged to support the lower levers 24 in vertical spaced relationship. A single link 32 pivotally

mounted on the tractor 11 and pivotally secured to the hitch 29, of the disk harrow 12, will serve to position the harrow 12 in its upward and downward movements as illustrated in Figures 7 and 8 of the drawings.

Referring to Figure 6, of the drawings, the hydraulic lifting mechanism is operated as follows; a variable delivery pump 33 will be driven, through mechanism not shown, by the tractor engine. This pump 33 will supply motive or power fluid, indirectly by means of four-way valves 34, to the hydraulic cylinders 15, and induce reciprocable movements to the pistons 19 and piston rods 20. Suitable piping systems, 35 consistent with good piping practice, and further as illustrated in Figure 6 of the drawings, will be provided to convey the power fluid throughout the system. Interposed, in the piping system 35, will be an accumulator and reservoir 36 which will serve to provide the entire system with a reserve of fluid and will also receive all the power fluid discharged from the pressure relief valve 37, and it will also receive any surplus of fluid discharged from the hydraulic cylinders 15. Pump 33 is arranged to either draw fluid from this reservoir 36 and/or from any other portion of the piping system 35 which may happen to be connected, at the time, with the suction inlet 38 of the pump 33. A feature of this piping system 35 is that the entire system, (including the pump 33, accumulator and reservoir 36, relief valve 37, four-way valves 34 and the hydraulic cylinders 15), is in closed circuit.

The pair of four-way valves 34 will be interposed in the piping system 35 in such a manner (see Figure 6 of the drawings) so that the telescopic levers 14 may be operated as a unit or independent of each other, for example, by manipulating four-way valves 34 an operator may cause both of the levers 24 to raise or lower simultaneously or he may raise one and lower the other, independent of each other. Further, by certain manipulation of the four-way valves 34, the power fluid can be shut off from the telescopic levers 14 and the levers 24 will then be permitted to float-free, independent of the hydraulic lifting system. In other words, this latter manipulation of the four-way valves 34, will tend to convert the tractor 11 from a hydraulic lift type tractor into a typical draw-bar tractor.

This stated typical draw-bar tractor arrangement is for use when pulling my disk harrow construction as shown in Figure 9 of the drawings, while the hydraulic lift type tractor arrangement is used for pulling my disk harrow construction as shown in Figures 1 and 2 of the drawings.

Obviously, the said hydraulic lift type tractor arrangement may, at the operator's discretion, be also used to pull the disk harrow construction 39 as illustrated in Figure 9.

Referring in detail to Figures 1, 2, 3, 4, and 5, the disk harrow 12 is constructed as follows; a bar or beam 40, of any desired length, is provided with a series of semi-circular seats 41 which serve to receive vertically disposed disk blade-supporting arms or brackets 43 which are tubular in shape.

On both of the forward 80 and rearward 81 longitudinal sides, of the beam 40, these seats 41 will be incorporated in both flanges 46, of the beam 40, in vertical alinement.

It should be noted that the major part of the practicability of this whole disk harrow construction depends on the construction details of these seats 41, because, for example, it would be impossible to set up sufficient frictional resistance against a rotary movement of the tubular arms 43 in the event these arms 43 rested against a flat surface, in which the said flat surface would only provide one or two degrees of contact with the tubular arm 43, a similar non-frictional contact would exist if the arm 43 was simply bearing freely in the seat 41. Therefore instead of viewing this seating detail of construction as an apparent minor detail of construction, it is in fact a major feature of this improvement which draws a sharp line of demarcation between success and failure with the use of tubular arms 43 in this disk harrow construction.

Seats 41 provide a 180 degree braking or frictional contact with the tubular arms 43, and when one considers that, with the use of 22" diameter disk blades 42, set at a plowing angle of thirty degrees, in a gumbo soil condition, there will be a turning-moment of 30,000 inch pounds on each respective tubular arm 43 at the place where it is secured to the beam 40, then one will realize the importance of this brake seating 41 construction as disclosed.

In conjunction with the seats 41 I provide a special designed eyebolt 44 which serves to apply pressure to the tubular arm 43 in its contact with the seat 41. This eyebolt 44 will have an elongated tubular contact with the arm 43 and also a 360 degree frictional contact with said arm 43. The bolt portion 45, of the eyebolt 44, will extend through the web 46 of the beam 40, and as the nut 47, having threaded connection with bolt portion 45, is rotated, tension pressure will be applied to the tubular arm 43, which through eyebolt 44, will tend to draw said tubular arm hard-up against the brake-seats 41. The arrangement of the seats 41, eyebolt 44, and nut 47 is such to establish a complete 360 degree circular frictional contact to the tubular arm 43 to secure it in a predetermined fixed position, and also fixed against rotation at a predetermined setting.

This tubular arm 43 and seating construction 41 permits a highly flexible disk blade 42 adjustment. In fact any portion of an angle of degree can be made relative to a complete 360 degree circle. And any form of adjustment can be quickly made.

Referring to Figure 4, a typical tubular arm 43 construction, which is used throughout the disk harrow 12, is disclosed. A pipe or tube portion 48, is vertically disposed, and is formed a lubricator. On the upper end portion 49 a pipe cap 50 has threaded engagement with the tube 48. This cap can be removed in order to fill the tube 48 with oil or grease to some predetermined fluid-level 51. The shank portion 52 of the arm or tube 48 is made of a conventional pipe L 53. This L 53 will be spot welded to tube 48 at the place marked 54. The opposite end portion 55 of the L 53 has threads 56 for threaded engagement with a stub shaft bushing 57. This threaded engagement secures the bushing 57 from relative rotation of the stub shaft 58 when the stub shaft 58 is rotating under a rotary action induced by the turning of the disk blade 42. These said threads 56 or threaded engagement permits the bushing 57 to be easily replaced. Bushing 57 is cylindrical in formation with a large bearing surface 59 adapted to receive the end thrust of the disk blade 42. In this bearing surface 59 a gasket 60 is installed. Gasket 60 serves to make the lubricator tube 48 oil tight, in other words, it

serves to prevent the oil or grease from running out of the bearing 61.

Bearing 61 comprises a stub-shaft 58, bushing 57, and shank 53. The head 62 of the shaft 58 bears against the inner portion of the bushing 57 and this prevents the shaft 58 from longitudinal movement in one direction while nuts 63, which have threaded engagement 64 with shaft 58, prevent it from longitudinal movement in an opposite direction.

Disk blade 42 is mounted on shaft 58 and is secured against relative movement thereto by washer 65 and washer seal 66, when the nuts 63 are drawn up hard against washer 65.

Washer seal 66 is pressed onto the shaft 58 and rotates with it together with disk blade 42 and washer 65.

While I have shown a conventional concavo-convex shaped disk blade 42, it is possible, with this tubular arm 43 construction, to use a flat circular disk blade, to equally good advantage, instead of the said concavo-convex shaped disk blade 42. I have discovered that when a disk blade can be inclined vertically and horizontally, such as shown in my rear disk blade construction 67, a flat circular shaped disk blade will do as good, or better, a disking job as a conventional concavo-convex shaped disk blade 42.

The rear gang 67 of disk blades 42 have supporting arms 68 formed of tubes or pipes 69 and pipe fittings 70. Each supporting arm 68 is also formed a lubricator. The disk blade bearing 61 construction, is the same as that just described for use in the front gang of disk blades. The pipe 69 and pipe fitting 70 construction of the rear gang, of disk blades, supporting arms 68 permits the disk blades to be inclined vertically and horizontally.

The lubricator capacity of the arms 43 and 68 is sufficient to hold enough volume of oil or grease to supply efficient lubrication to the disk blade bearings 61 for a period of one year under the usual time of operation.

A cantilever hitch connection 29 is mounted on the top of beam 40 and it serves to connect the beam 40 with the lever arms 24. This hitch can be shifted along the top of beam 40 to provide an offset disk harrow or a non-offset disk harrow. Suitable bolt holes 72 are drilled in the beam for this purpose.

Also made part of the hitch 29 are two uprights 73 which contain several bolt holes 74 drilled therein. These holes 74 provide a pivot connection between the disk harrow 12 and link 32. Thus by locating the link 32 connection in the lower of the said holes 74 the front gang of disk blades will be operated on a higher vertical plane than the rear gang of disk blades, and when the link is connected with the upper of the holes 74, the rear gang will operate on a higher vertical plane than the front gang of disk blades. This said action is made possible by the lever 24 connection with the pins 28 in the hitch 29. It will be noted that the disk harrow 12 is pivotally connected with the levers 24 through means of pins 28, thus when the arc of travel of the link 32 is either lengthened or shortened, one gang of disk blades will either raise higher or lower than the opposite gang of disk blades. This creates another simple means of adjustment to the disk harrow 12.

Thus, any upward or downward movement of the levers 24, in their pin 28 pivot connection with the hitch 29, will transmit identical movement to the whole disk harrow 12, when the said levers 24 are being operated by the hydraulic lifting mechanism 13. Of course, when the levers 24 are not being operated by the hydraulic lifting mechanism 13, the levers 24 will be free to float on their fulcrum 25 and/or 26 and the disk harrow 12 will then assume a free-floating status.

This free-floating provision is especially adaptable for the disk harrow 39 when the tractor wheels 27 are moving on rolling ground.

Referring to Figure 9 it will be noted that I have provided a tandem disk harrow 39 comprising two parallel disk harrow units opposed to different hands. This tandem disk harrow 39 can be easily handled on turns due to its close up hitch to the tractor and also due to the individual disk blade adjustment construction as above set forth in detail. The object of this tandem disk harrow construction is to provide the wheat farmer with a disk implement that will do in one operation what formerly took two operations to do. The draft of the tandem disk harrow 39 can be regulated by adjusting each individual disk blade therein to suit the condition, of amount of draft, suitable for the tractor to pull. This tandem disk harrow 39 will be especially adaptable for working a concave cross section of earth (see Figure 10) because the vertical height of each disk blade 42 can be set to suit the concave cross section of the earth. This vertical adjustment of each individual disk blade 42 is made by simply moving the arms 43 and 68 up or down in eyebolt 44, thus providing a non-coaxial disk blade relationship and construction. Both units 75 and 76 are connected together by a cantilever frame 77 which is secured to the beams 40 of each respective unit.

The tandem disk harrow 39 will operate as a unit and it will be easy to maneuver because, its closeup construction is such that the overall distance, between the forward tip 78 and rearward tip 79 of the disk blades 42, does not exceed that of a conventional drag type disk harrow. In other words, I have two disk harrow units 75 and 76 in that said overall distance.

From the above description it will be seen that I have provided a free-floating, non-coaxial disk blade construction of a disk harrow, in which each disk blade has an individual adjustment provision permitting it to be adjusted above or below the height of the vertical adjustment of the adjacent disk blade, without changing the respective pitch or inclination of the disk blade.

A swiveled adjustment is provided to permit each disk blade to be adjusted, on a horizontal plane, to any angle of degree, or part of a degree, of a 360 degree circle. This adjustment can be made also independent of the adjacent disk blade.

Each independent disk blade is mounted, similar to an upright wheel, on an individual axle secured in an individual bearing support which is formed a lubricator. This axle runs, in oil or grease, in a dust-proof bearing construction.

All adjustment of each disk blade is directly made by moving its bearing support. The disk blade is secured against relative motion of its bearing support. Each bearing support is seated in a brake seat, formed a 180 degree semi-circle, in a beam. These seats are arranged to provide a predetermined and fixed setting of the bearing supports by providing frictional resistance to relative motion of the surfaces of the bearing supports and seats in contact with each other.

Also a simple hydraulic lifting mechanism is provided to operate the disk harrow and it com-

prises a telescopic lever wherein a reciprocating to-and-fro motion is created in the lever itself and is changed into a rotary motion by a telescopic lever movement in a self-contained element.

What I claim is:

1. In a disk harrow constructed to be pulled by a tractor and having its depth of penetration regulated by a hydraulic lift mechanism made part of said tractor, and comprising a series of front and rear disk blades independently disposed in parallel relationship; a bar comprising a plurality of front and rear sets of semi-circular seats, each seat formed and adapted to the purpose to act as a frictional brake; a plurality of cylindrical disk blade bearing supports seated in said seats; one of said disk blades mounted on each support; means connected with the bar for engaging the said supports and for clamping the same against the said seats; a connection mounted on said bar for connecting the bar with the hydraulic lift mechanism of the tractor.

2. In a disk harrow constructed to be pulled by a tractor and its depth of penetration regulated by a hydraulic lift mechanism made part of said tractor, a supporting bar comprising an I-beam disposed with its web extending vertically, having a plurality of sets of semi-circular notches formed in the upper and lower flanges of said beam at intervals along the length of said beam, each set comprising notches in the upper and lower flanges in vertical alignment with each other, a plurality of cylindrical disk supports seated in said notches, and means extending through said web for engaging said supports and for clamping the same against the seats formed by said notches, a connection mounted on said supporting bar for connecting the bar with the hydraulic lift mechanism of the tractor.

3. In an offset disk harrow constructed to be pulled by a tractor and having its depth of penetration regulated by a hydraulic lift mechanism made part of said tractor, and comprising front and rear gangs of disc blades independently disposed in parallel rows, a supporting bar comprising an I-beam disposed with its web extending vertically, having a plurality of front and rear sets of semi-circular notches formed in the upper and lower flanges of said beam at intervals along the front and rear sides of said beam, each set comprising notches in the upper and lower flanges in vertical alignment with each other, each notch formed and adapted to the purpose to act as a frictional brake, a plurality of cylindrical disk supports seated in said notches, means extending through said web for engaging said supports and for clamping the same against the seats formed by the said notches, a disk blade mounted on each of the said cylindrical disk support and a connection mounted on said bar for connecting the bar to the lift mechanism of the tractor.

4. In combination a tractor having a hydraulic lifting mechanism comprising a lever having a fulcrum support secured to the tractor, a disk harrow comprising front and rear gangs of disk blades independently disposed in parallel rows; a bar comprising a plurality of forward and rearward semi-circular seats, each seat formed and adapted to the purpose to act as a frictional brake; a plurality of cylindrical disk blade supports seated in said seats; means connected with the bar for engaging said supports and for clamping same against the seats; one of said disk blades mounted on each support; a cantilever hitch shiftably mounted on said bar for connecting said bar to the lever of the hydraulic lifting mechanism whereby actuation of the hydraulic lifting mechanism will raise and lower said bar.

5. A combination as defined in claim 4 in which a hydraulic piston and cylinder adapted to the purpose to act as a telescopic lever is connected with the lever for raising or lowering the said bar.

6. A combination as defined in claim 4 in which a link is connected to the cantilever hitch and tractor to position the said bar and disk blades.

7. In a disk harrow construction, forward and rearward gangs of harrow disks, a support bar rigidly mounting said disks, means coupling said support to a tractor comprising a cantilever member rigid with said support, a pair of levers pivoted to said cantilever, means pivotally attaching the other ends of said levers to the lower portion of the tractor, hydraulic piston and cylinder members adapted to the purpose to act as a telescopic lever, means connecting one of said members to one of said levers, and means attaching the other of said members to the upper portion of the tractor in vertically spaced relation to said levers whereby actuation of said piston and cylinder members will raise and lower said support.

8. In a disk harrow construction, forward and rearward gangs of harrow disks, a support bar rigidly mounting said disks, means coupling said support to a tractor comprising a pair of levers pivoted to said support in laterally spaced relation to each other, means pivotally attaching the other ends of said levers to the under portion of the tractor, an upright rigidly carried by said support, a link having one of its ends pivoted to said upright in vertically spaced relation to said levers, means pivotally attaching the other end of said link to the upper portion of the tractor in vertically spaced relation to the points of attachment of said levers, hydraulic piston and cylinder members, means connecting one of said members to one of said levers, and means attaching the other of said members to the upper portion of the tractor in vertically spaced relation to said levers whereby actuation of said piston and cylinder members will raise and lower said support.

9. A tandem offset disk harrow constructed to be pulled by a tractor and comprising two offset disk harrows set to opposite hands and close coupled together, one behind the other, in parallel alignment and joined together by a cantilever hitch; each respective offset disk harrow, of the tandem, constructed as outlined and defined in claim 3.

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