No. 785,493. PATENTED MAR. 21, 1905.

H. S. HOWARD.

SULKY DISK HARROW.

APPLICATION FILED FEB. 5, 1904.

5 SHEETS—SHEET 1.

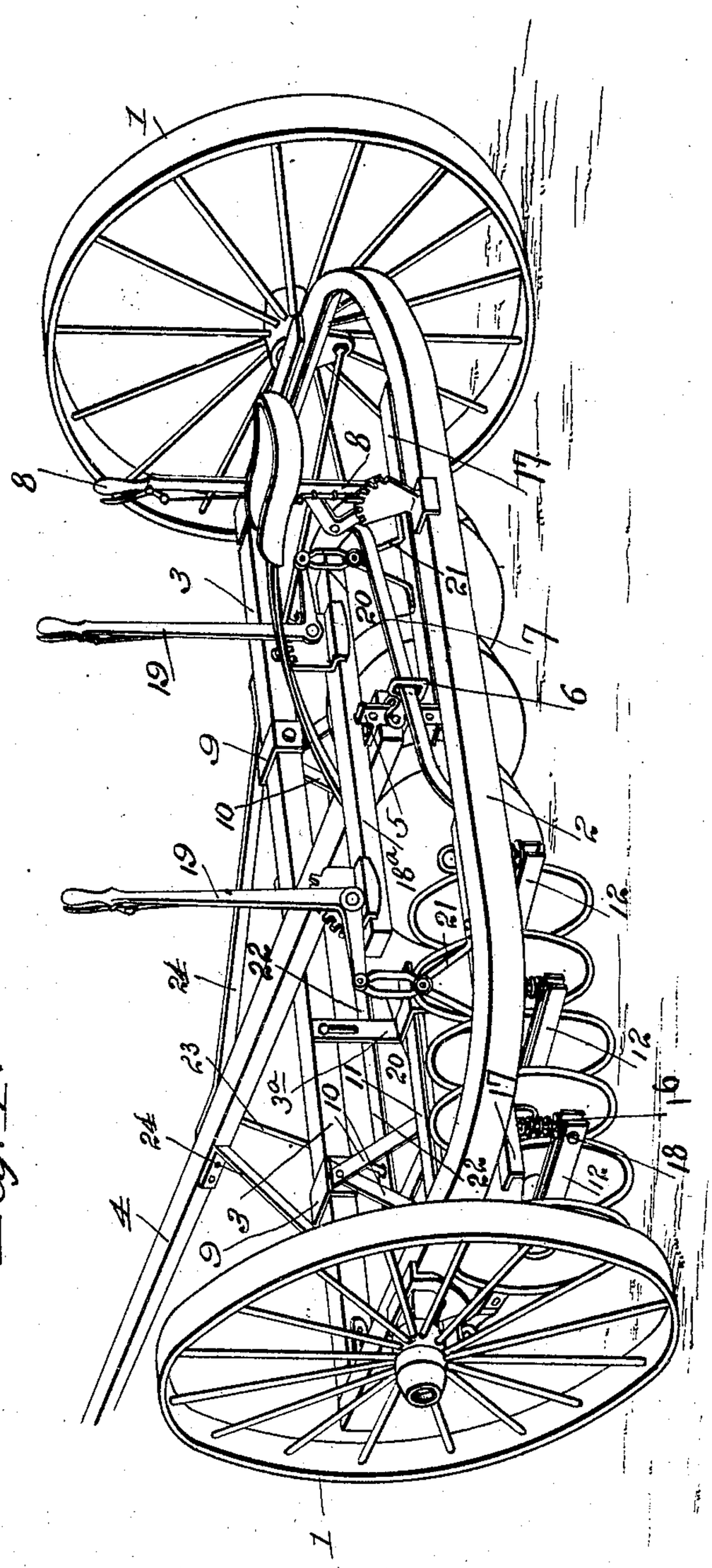

Fig. 1.

Witnesses
R. L. White.

Harlan S. Howard
Inventor
By his Attorneys Davis & Davis.

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5 SHEETS—SHEET 2.

Fig. 2.

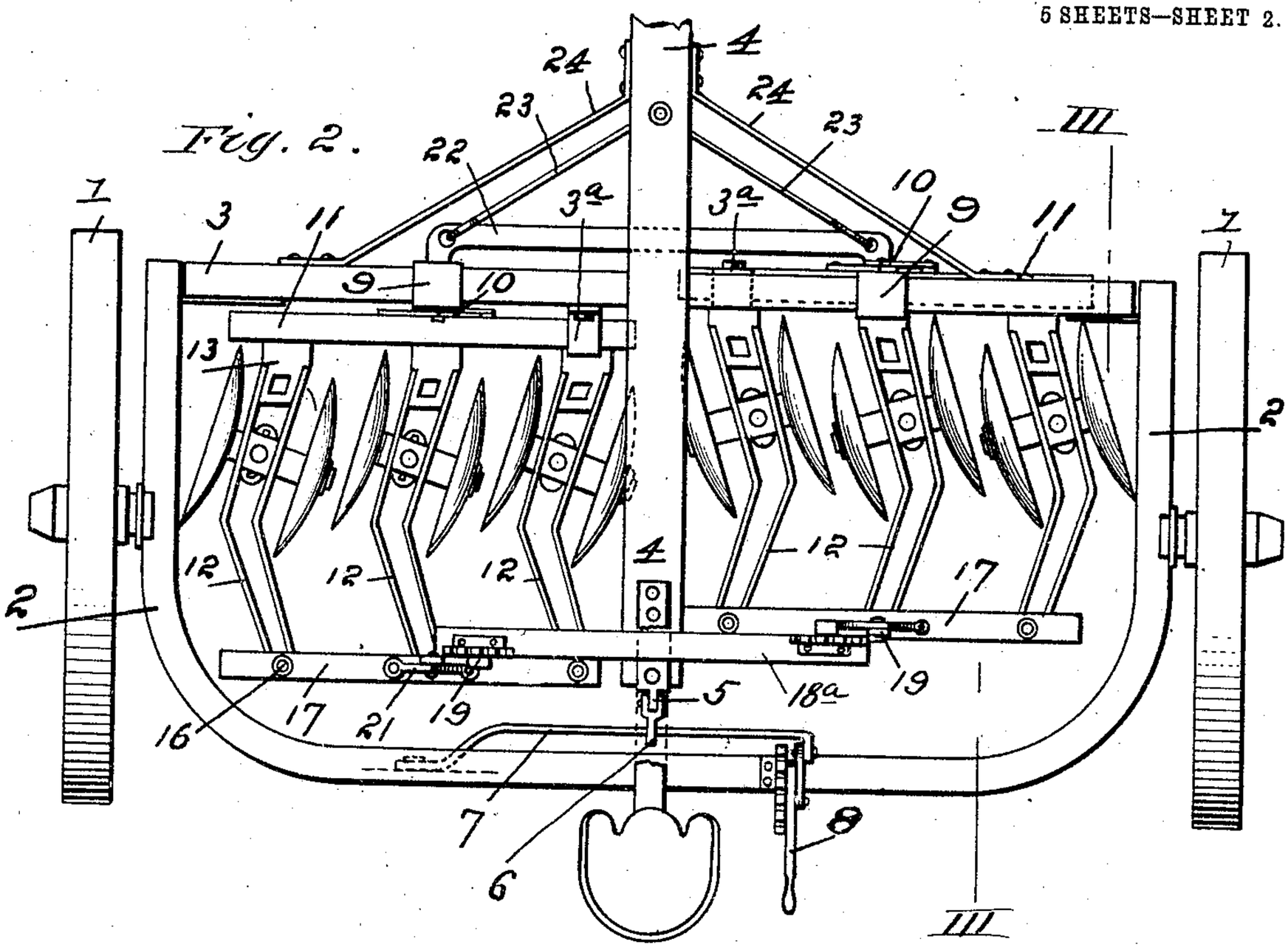
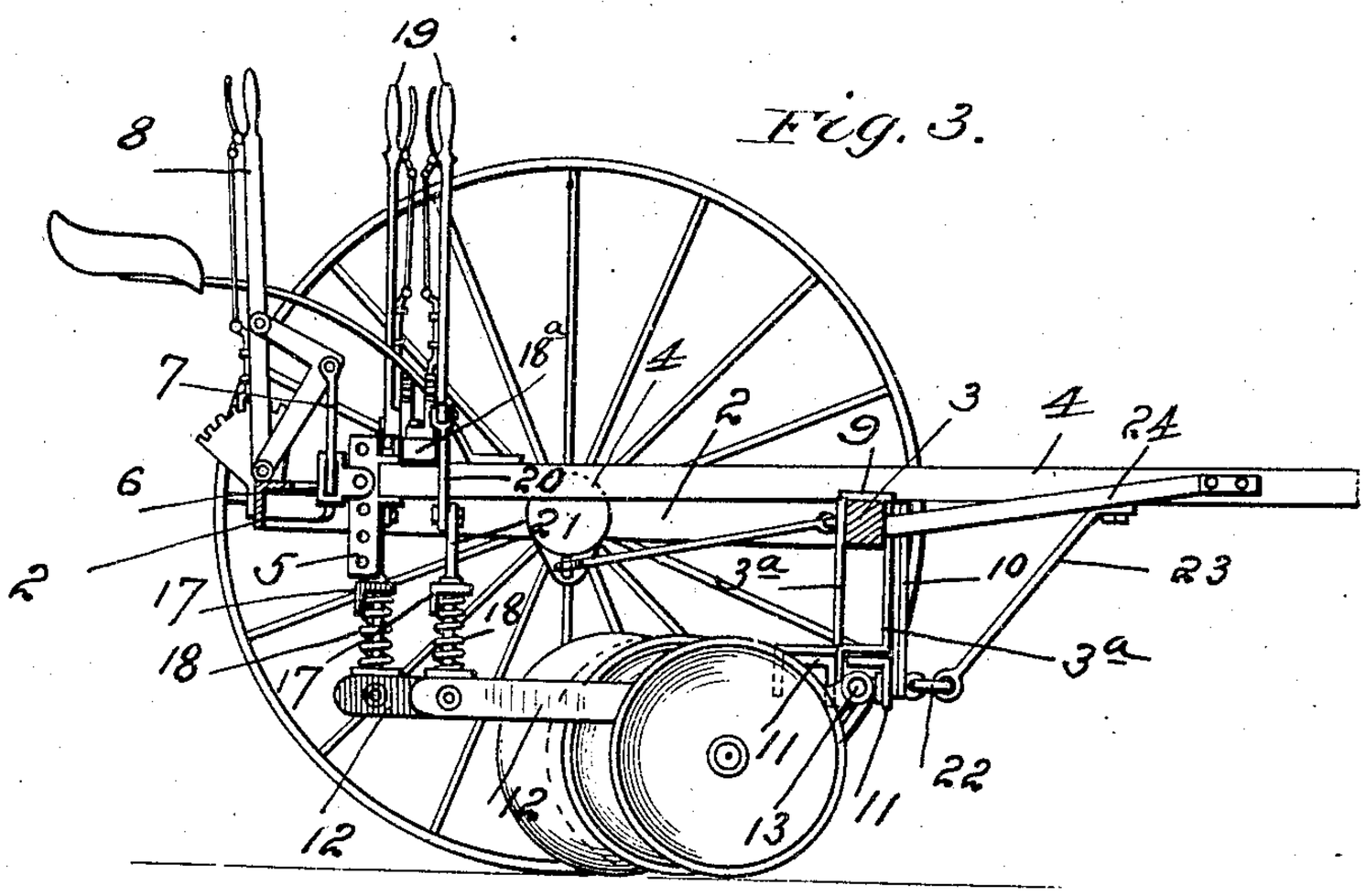


Fig. 3.



Witnesses
M. Barrett
R. L. White

Harlan S. Howard
Inventor
By his Attorneys Davis & Davis

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5 SHEETS—SHEET 3.

Fig. 4.

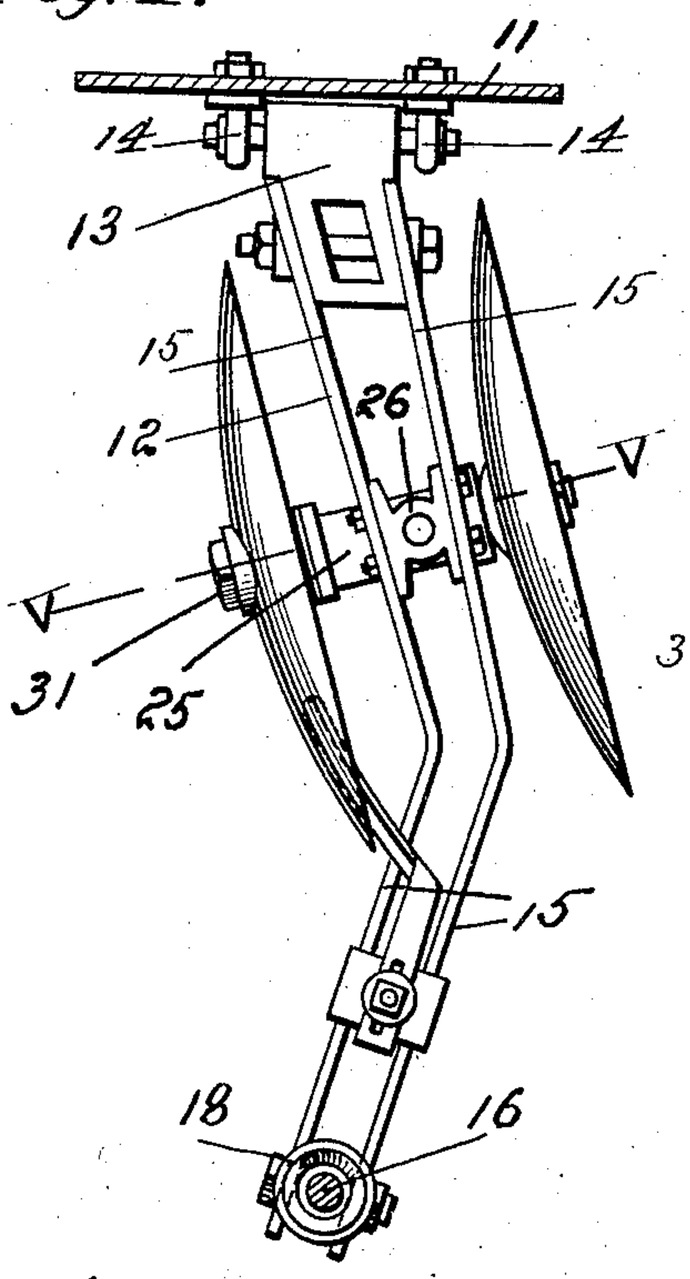


Fig. 5.

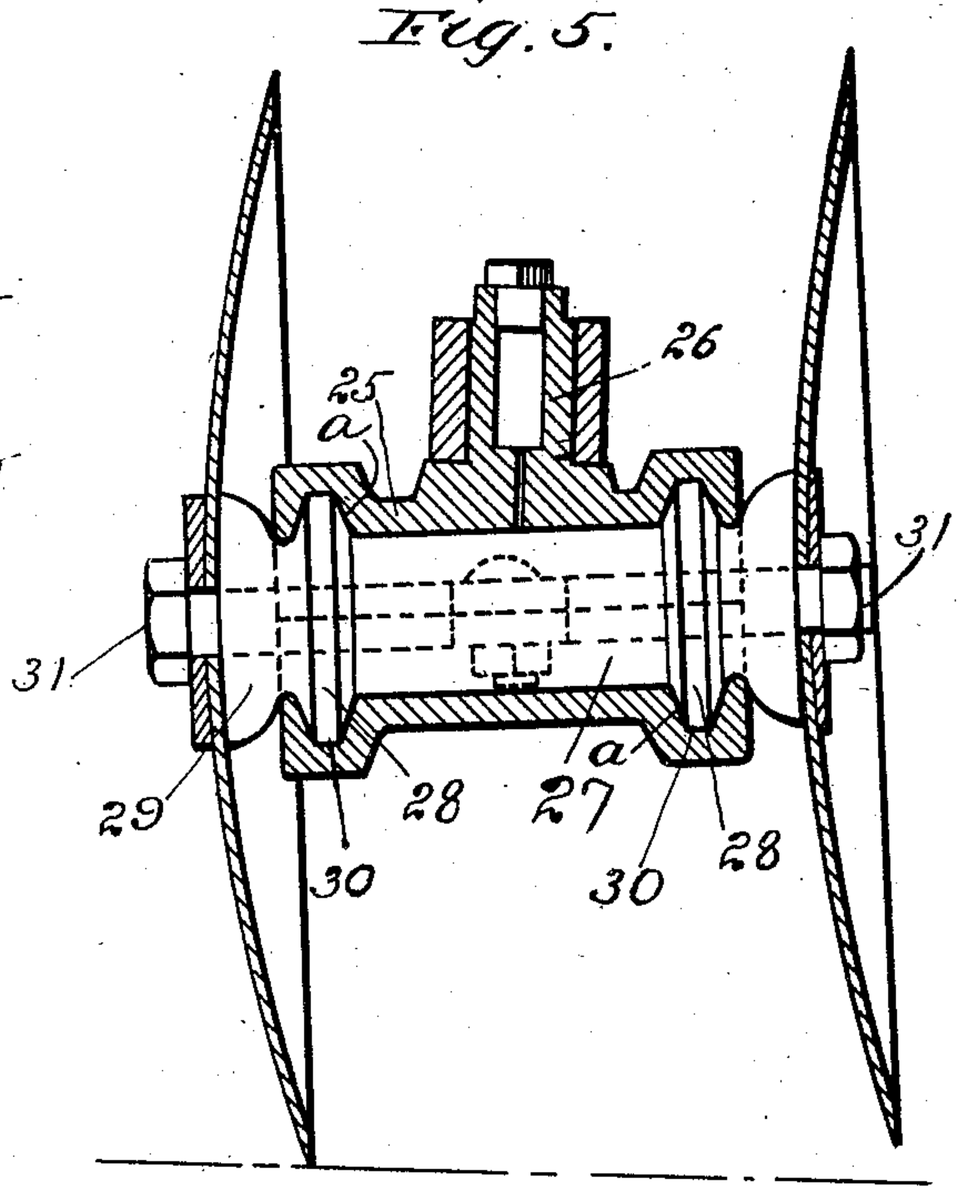


Fig. 6.

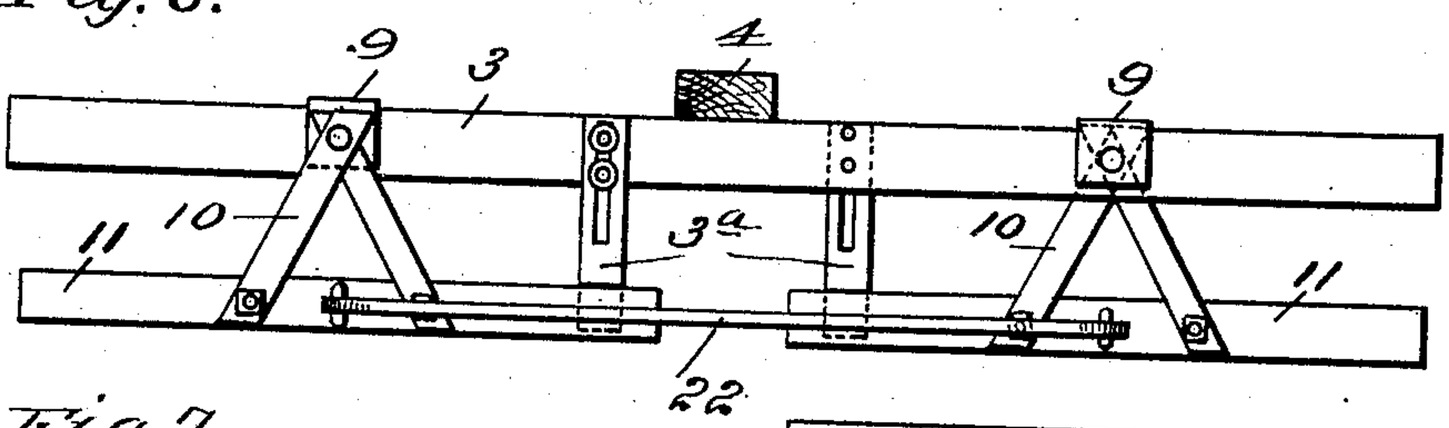
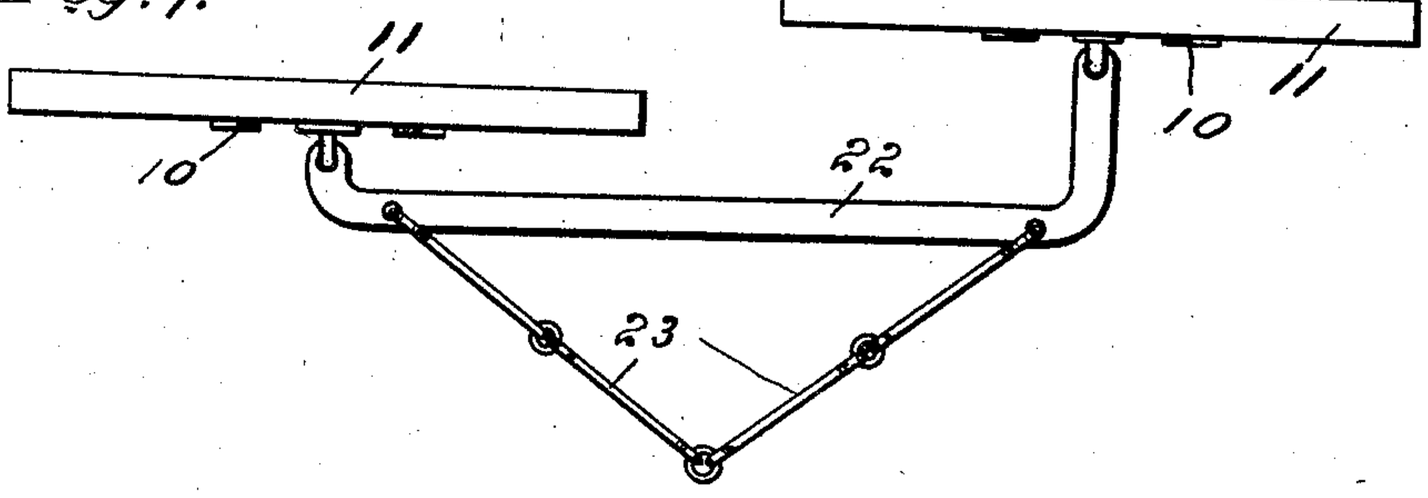


Fig. 7.



Witnesses
H. M. Babbitt
R. L. White

Harlan S. Howard
Inventor
By his Attorneys Davis & Davis

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5 SHEETS—SHEET 4.

Fig. 8.

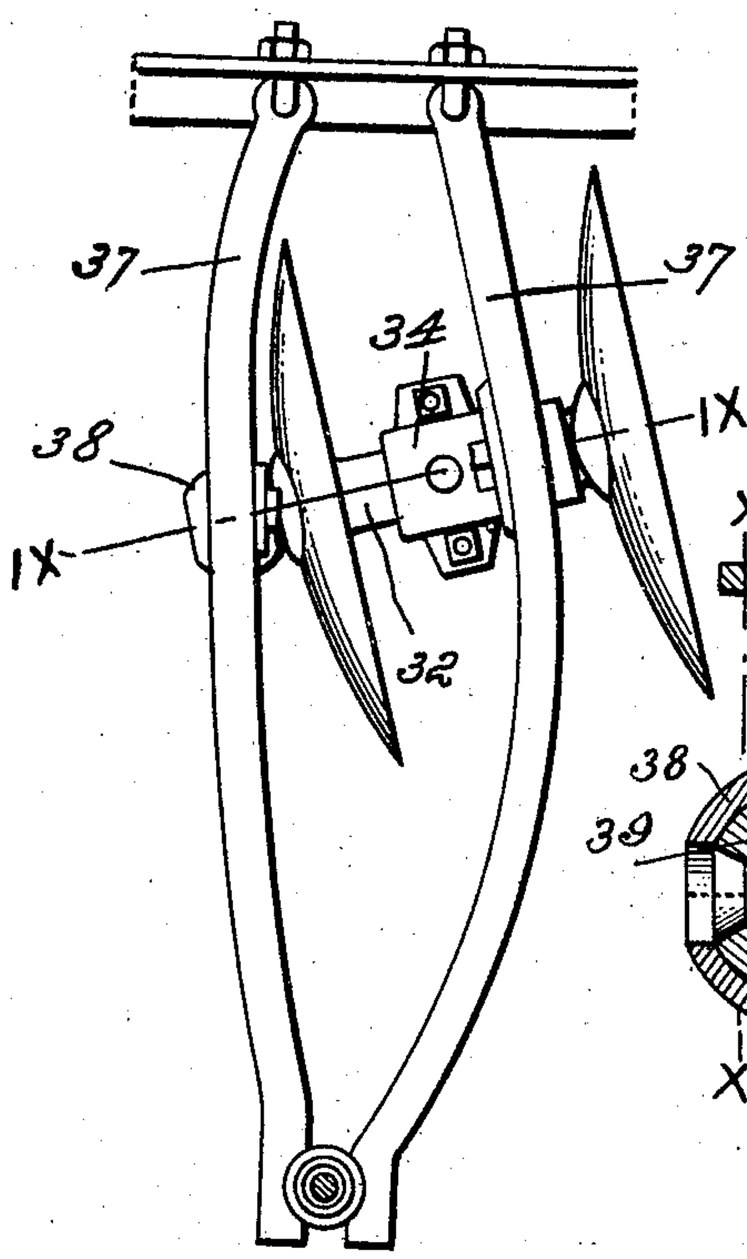


Fig. 9.

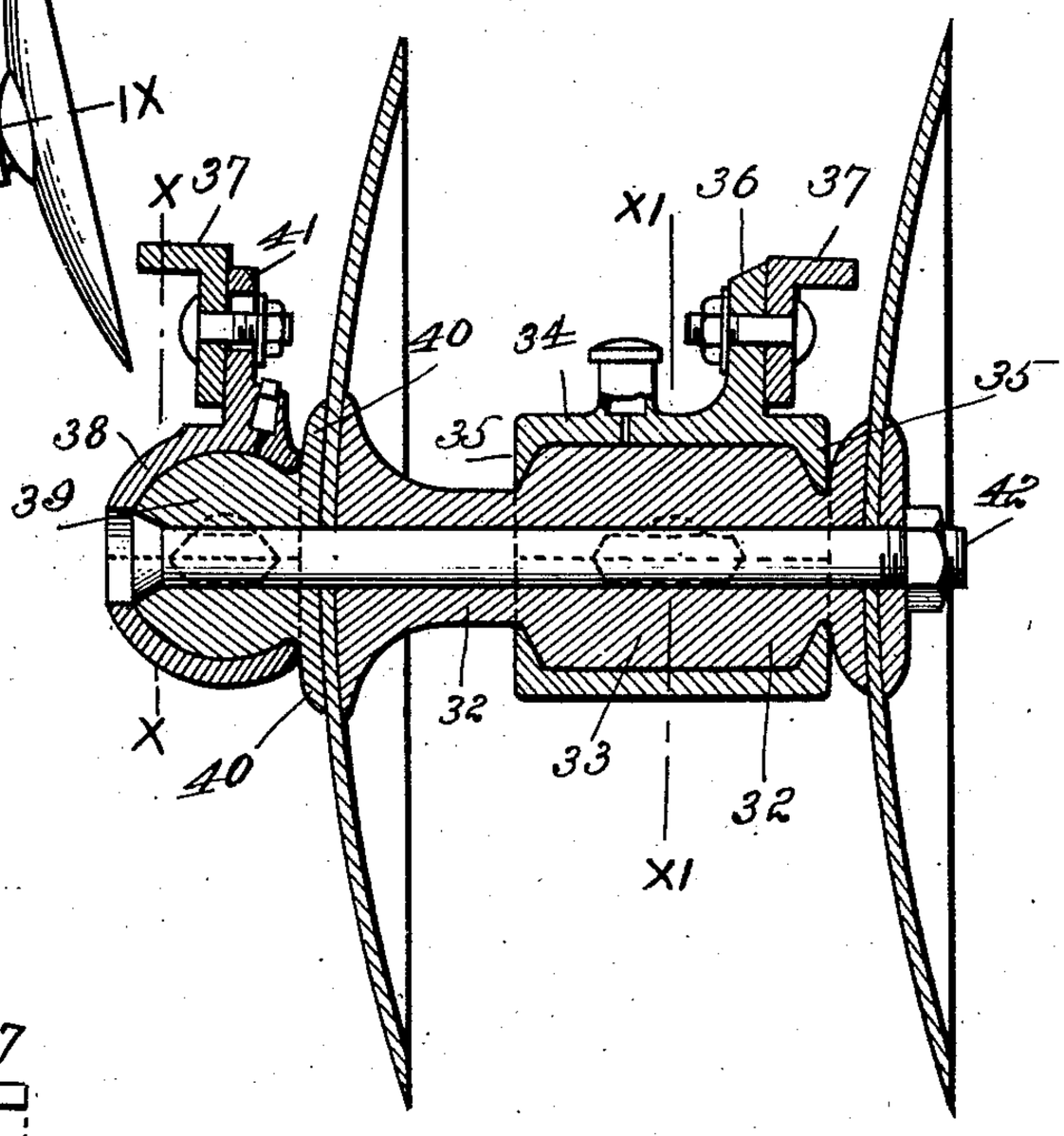


Fig. 10.

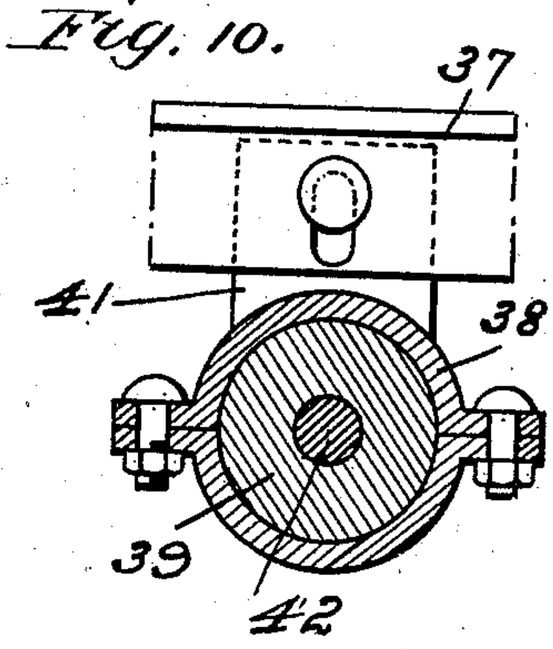
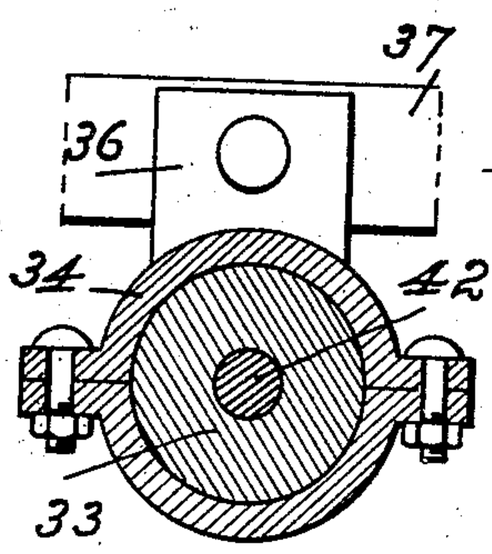


Fig. 11.



Witnesses
F. H. Babbitt
R. L. White

Harlan S. Howard
Inventor
By his Attorneys Davis & Davis

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H. S. HOWARD.

SULKY DISK HARROW.

APPLICATION FILED FEB. 5, 1904.

5 SHEETS—SHEET 5.

Fig. 12.

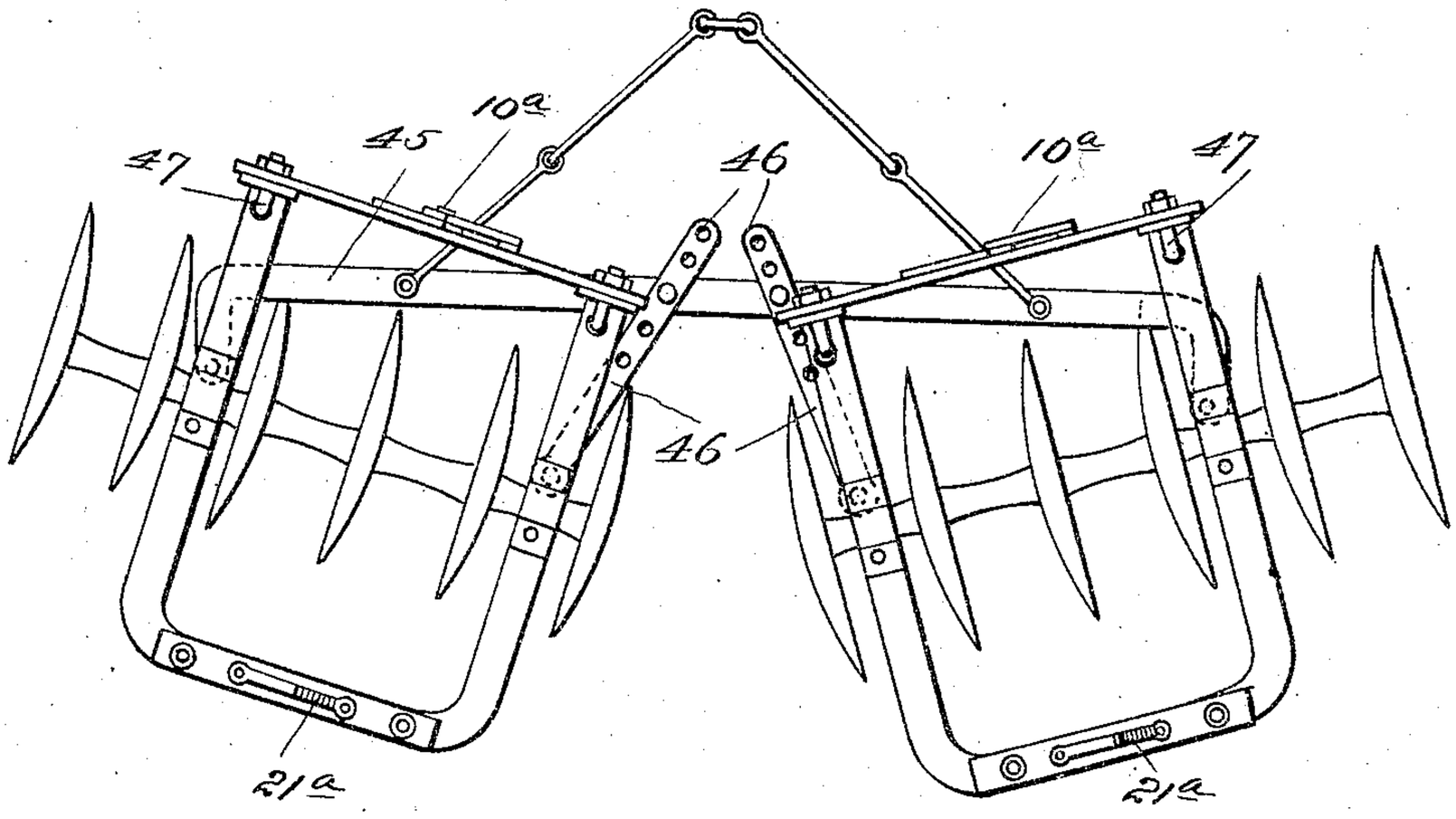


Fig. 13.

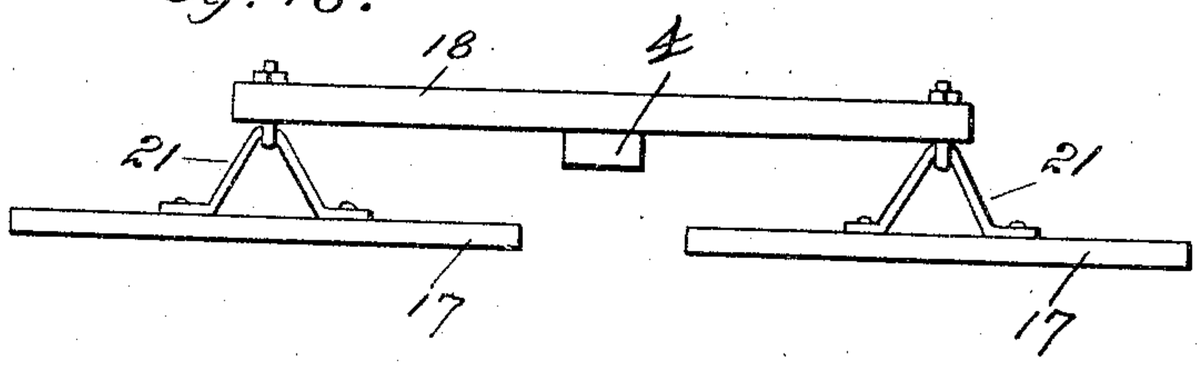
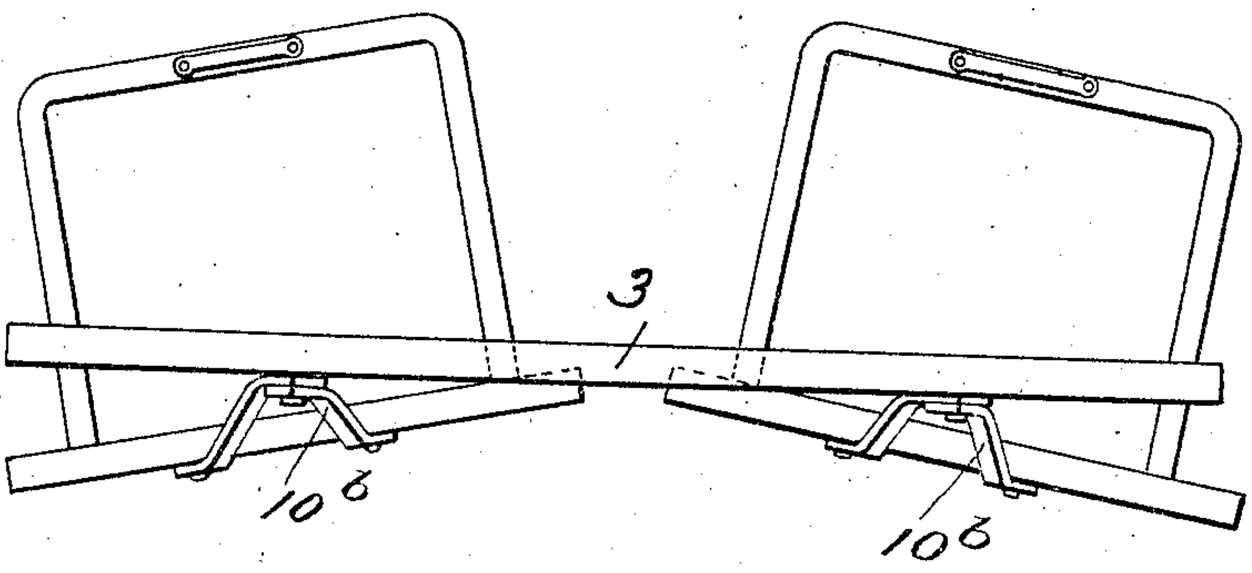


Fig. 14.



Witnesses
M. Babcock
R. L. White

Harlan S. Howard
Inventor
By his Attorneys Davis & Davis

No. 785,493. Patented March 21, 1905.

UNITED STATES PATENT OFFICE.

HARLAN SMITH HOWARD, OF MADISON, WISCONSIN.

SULKY DISK HARROW.

SPECIFICATION forming part of Letters Patent No. 785,493, dated March 21, 1905.

Application filed February 5, 1904. Serial No. 192,079.

To all whom it may concern:

Be it known that I, HARLAN SMITH HOWARD, a citizen of the United States, residing at Madison, county of Dane, State of Wisconsin, have invented certain new and useful Improvements in Sulky Disk Harrows, of which the following is a specification, reference being had therein to the accompanying drawings, in which—

Figure 1 is a perspective view; Fig. 2, a plan view; Fig. 3, a longitudinal vertical sectional view on the line III III of Fig. 2; Fig. 3ª, a detail view; Fig. 4, a detail plan view of one pair of disks and a disk-carrying arm; Fig. 5, a longitudinal vertical sectional view on the line V V of Fig. 4; Fig. 6, a detail front elevation showing the means for pivotally connecting the disk-carrying sections to the rocker-bar of the supporting-frame; Fig. 7, a detail plan view showing the draw-iron connected to the front bars of the disk-carrying frames; Fig. 8, a detail plan view of a slightly different form of means for mounting the disks in pairs; Fig. 9, a vertical sectional view on the line IX IX of Fig. 8; Fig. 10, a detail vertical sectional view on the line X X of Fig. 9; Fig. 11, a similar view on the line XI XI of Fig. 9; Fig. 12, a detail plan view showing the draw-iron connected directly to the disk-axle boxes; Fig. 13, a detail rear elevation showing a slightly different manner of connecting the presser-bars of the disk-carrying frames to the main supporting-frame, and Fig. 14 a detail plan view showing a slightly different form of connection between the front bar of the disk-sections and the front bar of the main frame.

The object of this invention is to simplify and improve the construction of sulky disk harrows and to provide means whereby such a harrow may be manipulated to adapt it to different kinds of soil and whereby the operator will have complete control of the machine, as will appear hereinafter more fully.

Referring to the various parts by numerals, 1 designates the transporting-wheels, which support between them the main frame 2. The front bar 3 of this main frame is pivoted at its ends in the side bars, so as to be capable of a rocking motion. Rigidly secured to this front bar midway its ends is the tongue 4. The rear end of this tongue extends near to the rear bar of the main frame, and secured thereto is a vertical bar 5, which is provided with a series of holes. Connected to this bar by means of a bolt passing through one of said holes is a bearing-iron 6, which is formed with an aperture in the rear of the tongue 4. Extending through the aperture of this bearing-iron is a bar 7, one end of which is pivotally secured to the rear bar of the main frame, as shown in Fig. 2. The other end of this bar is connected to a lever 8, which is pivoted on the main frame and by which said bar may be manipulated to raise or lower the rear end of the tongue, thereby rocking the front bar of the main frame on its pivots and raising or lowering the disk-carrying frames, as will be hereinafter set forth. The operation of this part of the machine is substantially as described in my Patent No. 742,988 and dated November 3, 1903.

Secured to the front bar of the main frame on each side of the tongue are cap-irons 9, and pivotally connected to these cap-irons are depending diverging supporting-bars 10, whose lower ends are connected to the front bars 11 of the disk-carrying frames. The supporting-bars connected to the left-hand cap-iron are on the rear side of the rocker-bar, and those connected to the right-hand cap-iron are secured to the forward side thereof, so that the front bars of the disk-carrying frames are not in alinement, the right-hand one being slightly forward of the left-hand one in order that the inner disks of each disk-carrying frame may be placed near the center line of the machine. Connected to each front bar of each disk-carrying frame are three rearwardly-extending disk-carrying arms 12. These arms at their forward ends are bolted to heads 13, which are pivotally connected to the front bars by means of eyebolts 14. Each disk-carrying arm consists of two side pieces 15, which are separated a short distance and extend rearward oblique to the line of travel. About midway their ends these arms are bent and extend rearward oblique to the line of travel, but at an angle reverse to that of the forward portion, so that the rear end of each of said disk-carrying arms is di-

rectly in the rear of its forward end, as shown very clearly in Figs. 2 and 4. The disk-carrying arms on the left-hand disk-carrying frame are extended or inclined toward the left-hand side of the frame and are then bent and their rear ends inclined toward the right hand. The arms of the right-hand section are inclined in the opposite direction, as shown clearly in Fig. 2 of the drawings. The disk-carrying axles are mounted in journal-boxes which are perpendicular to a longitudinal central line drawn through the forward portion of the disk-carrying arms, so that said disks are at an angle to the line of draft, the outermost disk of each pair being slightly in advance of the inner disk of each pair. Pivotally connected to the rear end of each disk-carrying arm is an upward-extending rod 16. The upper ends of the rods connected to the arms of each disk-carrying frame extend loosely through apertures in a presser-bar 17 and are provided with retaining nuts and plates above the said bar. Interposed between said presser-bar and the disk-carrying arms are springs 18, one of said springs surrounding each of the rods 16 and normally and yieldingly maintaining the rear ends of the disk-carrying arms depressed. Mounted on the rear end of the tongue is a transverse bar 18[a], on each end of which is mounted a lever 19. Connected to each of these levers is a depending link 20, whose lower end is pivotally connected to a hanger 21, which is rigidly secured at its lower end to the center of the adjacent presser-bar. It will be readily seen that by manipulating either of the levers 19 the connected rear end of one of the disk-carrying frames may be raised or lowered, as desired. It will also be seen that either disk-carrying section may be manipulated independently of the other.

Each disk-carrying frame is pivotally hung at its longitudinal center by means of the supporting-irons 10 and the hangers 21, so that the said frames may swing and adjust themselves to the soil. To limit the upward swing of the disk-carrying frames at their inner sides, bumper-irons 3[a] are bolted to the rocker-bar 3. These irons are bent horizontally near their lower ends to extend over the inner ends of the front bars of the frames, their extreme lower ends extending down in the rear of said front bars, as clearly shown in Figs. 2 and 3 of the drawings, and are slotted at their upper ends in order that they may be vertically adjusted. It will thus be seen that these bumper-irons will prevent the inner ends of the frames being lifted sufficiently to raise the disks out of the ground and that the disks at said inner ends of the frame will be forced to cut as deep as the outer disks of the frames.

The pressure of the soil on the disks while the machine is pulverizing tends powerfully to thrust the disks toward the center of the machine. This pressure also strongly tends to raise the inner disk of each pair out of the soil, thus bringing on said disks a twisting pressure or strain which tends to draw or bend the rear end of the disk-carrying arms toward the center of the machine. It will therefore be seen that by forming the disk-carrying arms as described, so that their rear portions extend in the direction of the thrust of the disks, they will be in the best form to take up this thrust without yielding and without danger of distortion. It will also be noted that by bringing the rear end of each disk-carrying arm directly in the rear of its forward end and there securing it to the presser-bar the tendency to shift laterally is counteracted.

By constructing the main frame and mounting therein the disk-carrying frames as described the larger portion of the weight of the machine is brought on the rear ends of the disk-carrying arms, and as the disks are mounted in said arms near the forward ends thereof a powerful leverage is obtained to force said disks into the soil. This is of importance, particularly as said disks may be adjusted to the proper depth by manipulating the levers 19, which are connected to the rear ends of said disk-carrying arms.

Connected to the forward sides of the front bars 11 at the centers thereof is a draw-iron 22, and this draw-iron is connected to the tongue by means of links 23, said links being connected to said iron near its outer ends and to the tongue at a point forward of the draw-iron. Connected to the tongue are two rearward and outward extending brace-bars 24, whose rear ends are connected to the forward side of the rocker-bar, near the ends thereof, said bars being connected in such manner as to permit the rocker-bar to have the necessary movement, as heretofore described.

When it is desired to tilt the disk-frames by throwing their rear ends down and slightly raising their forward ends, the lever 8 is operated to swing down the rear end of the tongue, thereby rocking the bar 3 and throwing upward and forward the lower ends of the supporting-irons 10.

As heretofore set forth, the pressure on the outer disk of each pair when said disks are arranged as shown in Fig. 2 tends to lift the inner disk of said pair. This lifting of the inner disk on harrows heretofore manufactured in which the disks were mounted in pairs was very objectionable and practically destroyed said harrows after a year or two of use. To overcome this objection, I have provided a peculiar and efficient means of mounting the disks in pairs. In Figs. 4 and 5 a journal-box 25 is provided with a vertical post 26, which fits between the two side pieces 15 of a disk-carrying arm, said post being rigidly bolted thereto. The journal-box is slightly upwardly inclined with respect to the post 26 and toward its outer end, so that the outer

disk is slightly higher than the inner disk of each pair, the latter disk normally working slightly deeper in the soil than the outer disk. Each disk-axle consists of a sleeve 27, which is provided near each of its ends with a radial flange-like enlargement 28 and at its ends with the enlargements 29, against which the disks are rigidly bolted, the outer face of one of said enlargements being concave and the outer face of the other being convex to fit the corresponding faces of the disks. The journal-box 25 is formed with a channel 30 at each of its ends to receive the radial flanges 28 of the sleeve, so that said sleeve will be held against lateral movement through the journal-box, and dust and grit will be prevented from entering said box. To clamp the disks to the sleeve 27, a bolt 31 is passed through said sleeve and through the disks and rigidly secured in place, suitable washers being provided to bear against the outer faces of the disks.

It will be readily seen that a journal-box constructed as described is adapted to prevent the pressure on the outer disk of each pair from lifting the inner disk. It will be noted that when all the looseness in the journal-box is taken up the disks will merely have approached the same level. It will also be noted that the pressure on the journal-box will be brought at the points marked *a* in Fig. 5.

In the form of disk-mounting shown in Figs. 8 and 9 a slightly different form of journal-box is employed, whereby the outer disk of each pair is supported slightly higher than the inner disk. In this form of box the disk-carrying axle consists of a sleeve 32, which is formed near one of its ends with the enlargement 33. This enlargement is mounted in the journal-box 34, which is provided with the inward-extending end flanges 35 and with the vertical lug 36, said lug being bolted to one of the disk-carrying bars 37. The axial line of the journal-box is inclined upward toward the outer end of the box, so that the sleeve when secured therein is correspondingly inclined. Secured to the other disk-carrying bar 37 is a depending journal-box 38, which is substantially spherical in form and is adapted to inclose the spherical bearing-block 39, which is provided on its inner end with a convex flange 40, against which the convex side of one of the disks is adapted to fit. The box 38 is formed with the vertical slotted lug 41, by which said box is vertically adjustable on the bar 37. The disks are secured to the sleeve 32 and to the spherical bearing 39 by means of the bolt 42. It will be noted that in this construction the pressure on the forward outer disk, which tends to lift the inner rearward disk, will merely act to bring the two disks toward the same level. It will also be noted that when the journal-box and sleeve become so worn as to permit the inner disk to be lifted above the level of the outer disk the inner end of the axle may be lowered by means of the slotted lug 41.

In the arrangement of the machine shown in Fig. 12 the disks of each section are rigidly secured to a long spool which is suitably journaled in the disk-carrying frame. To the outer journal-box of the spool of each section is pivotally connected one end of a draw-iron 45. To the inner journal-box of the spool of each section is pivotally secured a forward-extending bar 46, which is provided with a series of apertures near its forward end, said bars being adjustably bolted to the draw-iron. By means of these bars the disk-carrying frames may be adjusted to secure the proper inclination of the gangs of disks with respect to each other and to the line of draft. Each disk-carrying frame in this construction is provided with the supporting-irons 10^a and the hangers 21^a, by which said frames may be hung in the main supporting-frame of the machine. Each disk-carrying frame is formed of a single bar bent to proper shape, its forward ends being rigidly bolted to the front bars 11^a of the frame by means of the eyebolts 47.

Instead of connecting the hangers 21 of the presser-bars of the disk-carrying frames to the links 20 and levers 19, as shown in Figs. 1 and 2, these hangers may be pivoted directly on the cross-bar 18^a, as shown in Fig. 13. In this form of the machine the disk-carrying frame may be manipulated by means of the lever 8.

If it be desired, the supporting-irons 10 may be so bent as to permit the disk-carrying frames to be set at an angle with respect to the line of draft, as shown in Fig. 14. In this view the supporting-irons are designated by 10^b.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a disk harrow the combination of a main frame, transporting-wheels, a rocker-bar at the forward end of the main frame, depending supporting-irons pivoted to said rocker-bar on horizontal pivots, front bars carried by said supporting-irons, a plurality of disk-carrying arms secured at their forward ends to said front bars, a rear bar corresponding to each of the front bars, means for connecting the rear ends of the disk-carrying arms to the rear bars, means for pivotally supporting the rear bars, and means for vertically moving the rocker-bar and main frame with respect to each other whereby the disk-carrying arms will be vertically adjusted, and means for independently vertically adjusting the rear bars and the rear ends of the disk-carrying arms connected thereto.

2. In a disk harrow the combination, of a supporting-frame and transporting-wheels, a plurality of disk-carrying frames mounted in the main frame, a series of disk-carrying arms

in each of said disk-carrying frames, the rear portions of said arms extending inward in the direction of the thrust of the disks, the forward portions thereof extending forward and inward, the front and rear ends of the disk-carrying arms being longitudinally in line with each other, and a pair of disks carried by each arm near the forward end thereof, the axle of said disks being perpendicular to the forward portion the arm and the disks being at an angle to the line of draft.

3. A journal-support for a pair of cultivator-disks comprising, a sleeve formed with an enlargement near one of its ends, a journal-box to receive said enlargement, means for supporting said journal-box whereby the axial line thereof will incline upwardly, a disk connected to each end of said sleeve, a spherical journal-block secured to the outer side of one disk, a journal-box for said block, means for adjustably supporting said spherical journal-box, and a bolt passing through the sleeve and the spherical journal-block and securing the two disks rigidly in position.

4. In a disk harrow the combination, of a supporting - frame, transporting - wheels, a rocker - bar at the forward end of the said frame, depending supporting-irons pivoted on said rocker-bar one on each side of the longitudinal center of the main frame, a pair of disk-carrying frames, the front bar of each disk-carrying frame being rigidly secured to the adjacent supporting-iron, bumper-irons secured to the rocker-bar and extending rearward over the front bars of the disk-carrying frames the lower ends of said bumper-irons extending downward in the rear of said front bars, means for horizontally pivoting the rear ends of the disk-carrying frames and disks carried by said frames.

5. In a disk harrow the combination, of a main frame, transporting-wheels, a rocker-bar forming the front bar of the main frame, depending supporting - irons connected to the rocker-bar on each side of the longitudinal center of the main frame, a pair of disk-carrying frames, one on each side of the longitudinal center of said main frame, the front bars of said disk - carrying frames being rigidly connected to the supporting-irons, a draw-iron connected at its ends to the forward sides of the front bars of the disk-carrying frames, midway the ends thereof, said bar being parallel with the rocker-bar, a tongue connected rigidly to the top of the rocker-bar, and links connecting the ends of the draw-iron to the tongue forward of the rocker-bar.

6. A disk harrow comprising, a supporting-frame, transporting-wheels, a disk-carrying frame mounted in the main frame, rearward-extending disk - supporting arms pivoted at their forward ends in the disk-carrying frame, journal-boxes carried by each pair of disk-supporting arms, one of said boxes of each pair being forward of and slightly higher than the other, a pair of disks supported by said journal-boxes, so that the axial line of disks will be at an angle to the line of draft and one of said disks will be forward of and slightly higher than the other, whereby the thrust of the disks will tend to bring them to the same working level.

7. A disk harrow comprising, a main frame, a disk-carrying frame mounted therein, a series of pairs of disk-supporting arms mounted in the disk-carrying frame, journal-boxes carried by each pair of disk-supporting arms, one of said boxes being forward of the other, the forward one being a long cylindrical box and the other a spherical box, journals corresponding in shape to said boxes, means for securing disks thereto, and means for vertically adjusting the spherical box.

8. A disk harrow comprising, a supporting-frame, a series of disks supported therein and arranged in pairs, two journal-boxes for each pair of disks, one of said boxes being forward of and slightly higher than the other, the forward box being long and cylindrical and the other being spherical, a supporting - sleeve mounted in the long cylindrical box, a spherical journal mounted in the other box, means for securing two disks to the ends of the sleeve and to the spherical journal whereby the axial line of the disks will be at an angle to the line of draft and the forward disk will be slightly higher than the rear one, and the thrust of said disks will tend to bring them to the same working level.

9. In a disk harrow the combination of a main frame, transporting-wheels, a rocker-bar at the forward end of the main frame, depending supporting-irons secured to said rocker-bar, front bars carried by said supporting-irons, a plurality of disk-carrying arms supported at their forward ends on the front bars, the rear portions of said arms extending inward in the direction of the thrust of the disks, the forward portions extending forward and inward, a pair of disks carried by each arm near the forward end thereof, the axle of said disks being perpendicular to the forward portion of the arms and the disks being at an angle to the line of draft, a rear bar corresponding to each of the front bars, means connecting said rear bar to the rear ends of the disk-carrying arms and means for vertically adjusting said rear bars.

10. In a disk harrow the combination of a main frame, transporting-wheels, a rocker-bar at the forward end of the main frame, depending supporting-irons secured to said rocker-bar, front bars carried by said supporting-irons, a plurality of disk-carrying arms supported at their forward ends on the front bars, the rear portions of said arms extending inward in the direction of the thrust of the disks, the forward portions extending forward and inward, a pair of disks carried by each arm near the forward end thereof, the axle of said

disks being perpendicular to the forward portion of the arms and the disks being at an angle to the line of draft, a rear bar corresponding to each of the front bars, means connecting said rear bar to the rear ends of the disk-carrying arms, means for vertically adjusting said rear bars, and means for vertically moving the rocker-bar and main frame with respect to each other.

11. In a disk harrow the combination of a supporting-frame and transporting-wheels, a plurality of disk-carrying arms mounted in the main frame, the rear portion of said arms extending inward in the direction of the thrust of the disks the forward portion thereof extending forward and inward, the front and rear ends of the disk-carrying arms being longitudinally in line with each other, a pair of disks carried by each arm near the forward end thereof, the axle of said disks being perpendicular to said forward portion of the bar and inclining upward and forward, whereby the disks will be arranged at an angle to the line of draft and the forward disk of each pair will be higher than the rear disk.

12. In a disk harrow the combination of a supporting-frame and transporting-wheels, a plurality of disk-carrying arms mounted in the main frame, the rear portion of said arms extending rearward and inward in the direction of the thrust of the disks, the forward portion thereof extending forward and inward, the front and rear ends of the disk-carrying arms being longitudinally in line with each other, a pair of disks carried by each arm near the forward end thereof, the axle of said disks being perpendicular to said forward portion of the arm and inclining upward and forward, whereby the disks will be arranged at an angle to the line of draft, and the forward disk of each pair will be higher than the rear disk, and means for vertically adjusting the rear ends of the disk-carrying arms.

In testimony whereof I hereunto affix my signature, in presence of two witnesses, this 29th day of January, 1904.

HARLAN SMITH HOWARD.

Witnesses:

JOHN G. KANOUSE,

J. M. WILLIAMS.