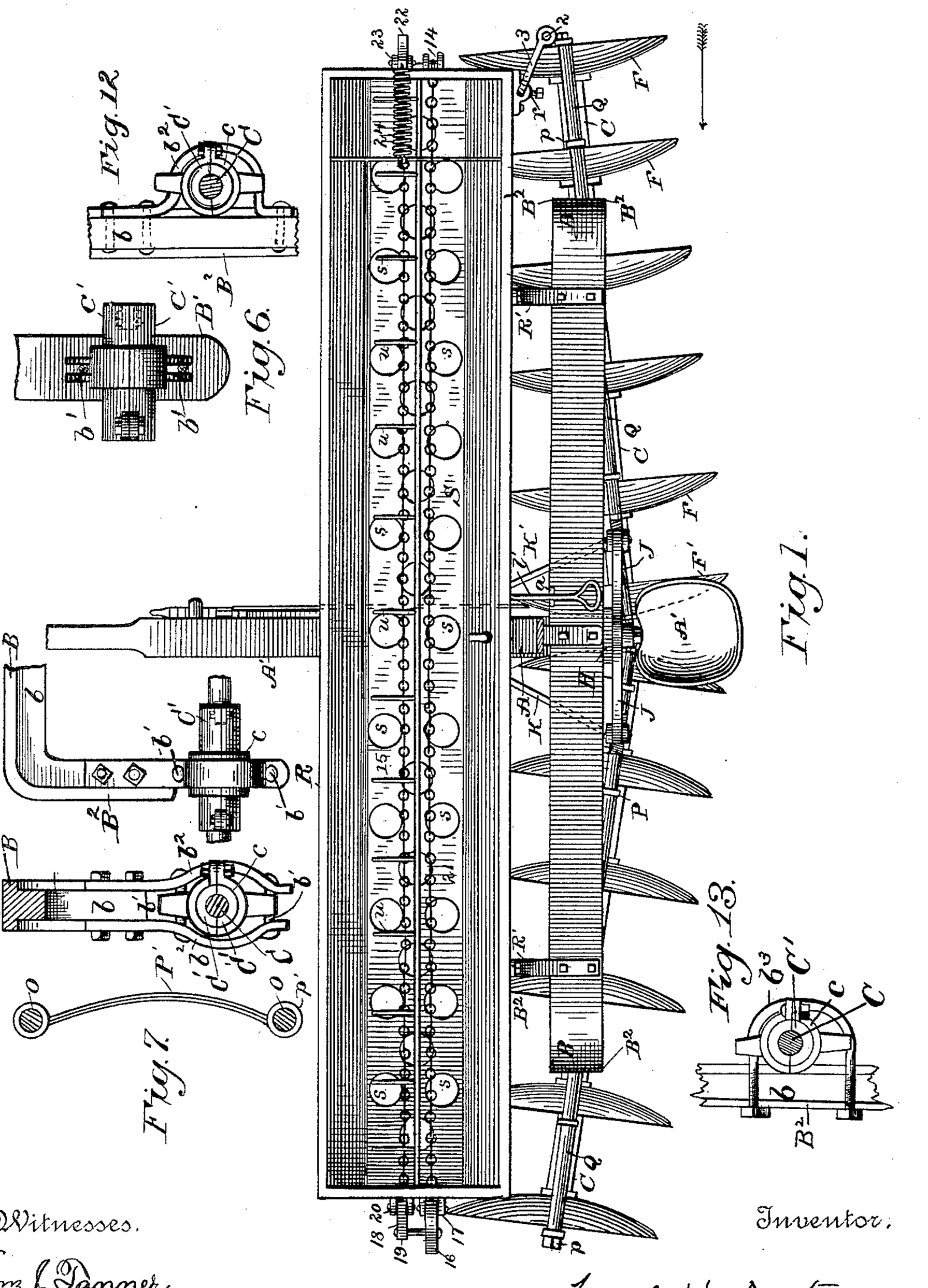
(No Model.) 4 Sheets—Sheet 1.

# F. H. NORTON.

## COMBINED DISK HARROW AND SEEDER.

No. 394,128. Patented Dec. 4, 1888.



(No Model.) 4 Sheets—Sheet 2.

# F. H. NORTON.

## COMBINED DISK HARROW AND SEEDER.

No. 394,128. Patented Dec. 4, 1888.

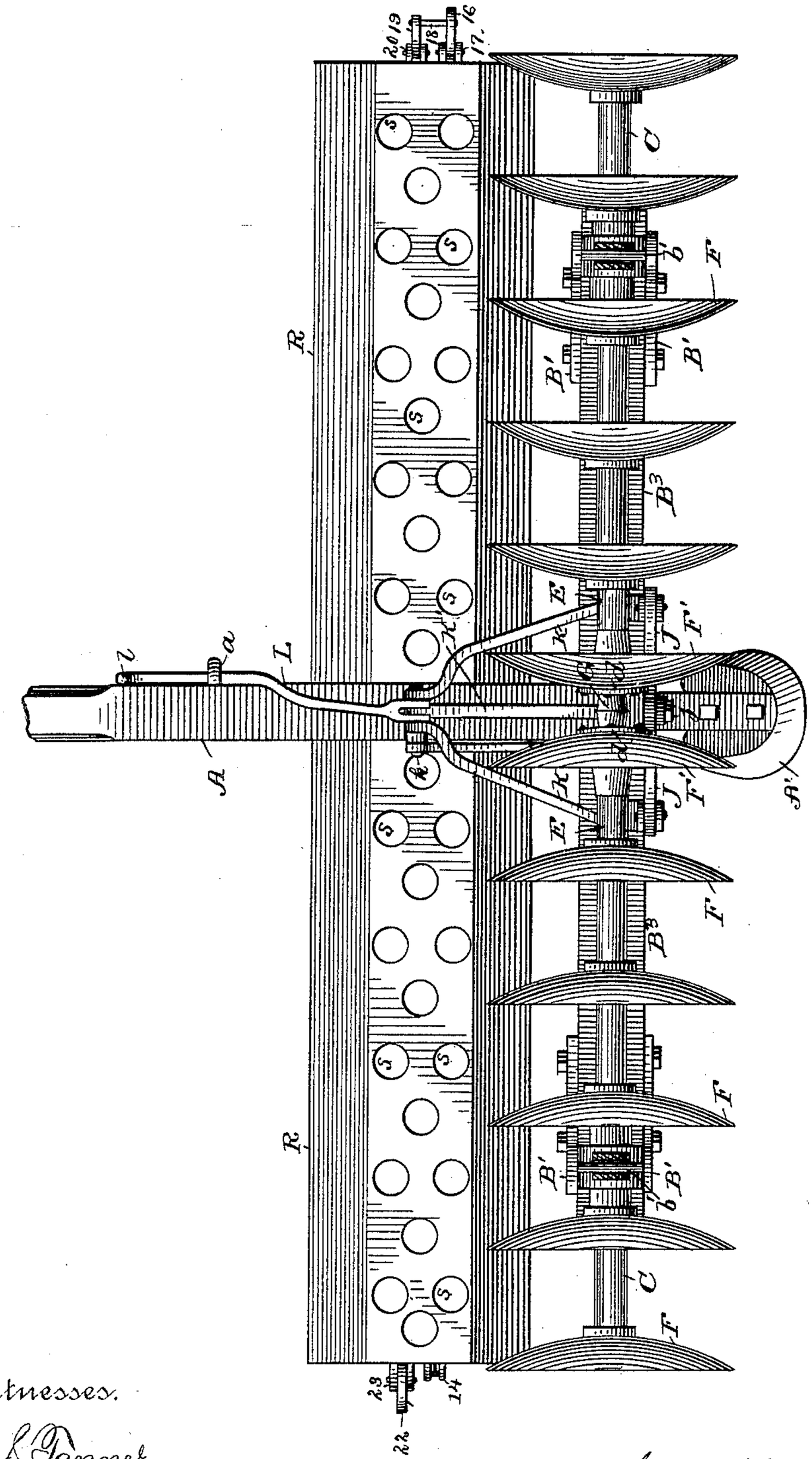



Fig. 2.

Witnesses.
Wm. J. Dannel.
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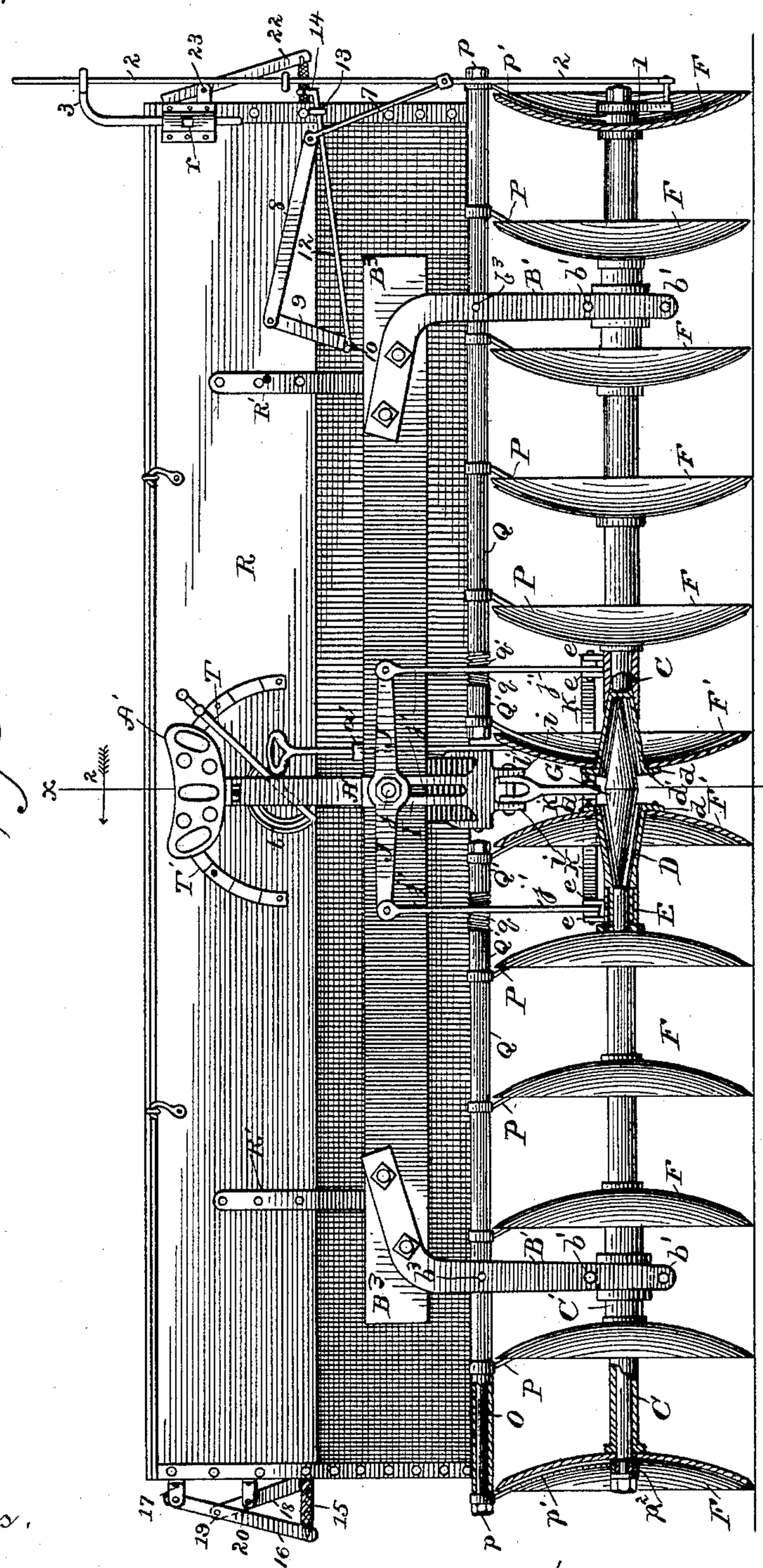
(No Model.) 4 Sheets—Sheet 3.

# F. H. NORTON.

## COMBINED DISK HARROW AND SEEDER.

No. 394,128. Patented Dec. 4, 1888.

Fig. 3.



Witnesses.

Wm. J. Tanner.

F. C. Tanner.

Inventor.

Fred H. Norton.

By his Attorneys

Dewey & Bliss.

(No Model.) 4 Sheets—Sheet 4.

# F. H. NORTON.

## COMBINED DISK HARROW AND SEEDER.

No. 394,128. Patented Dec. 4, 1888.

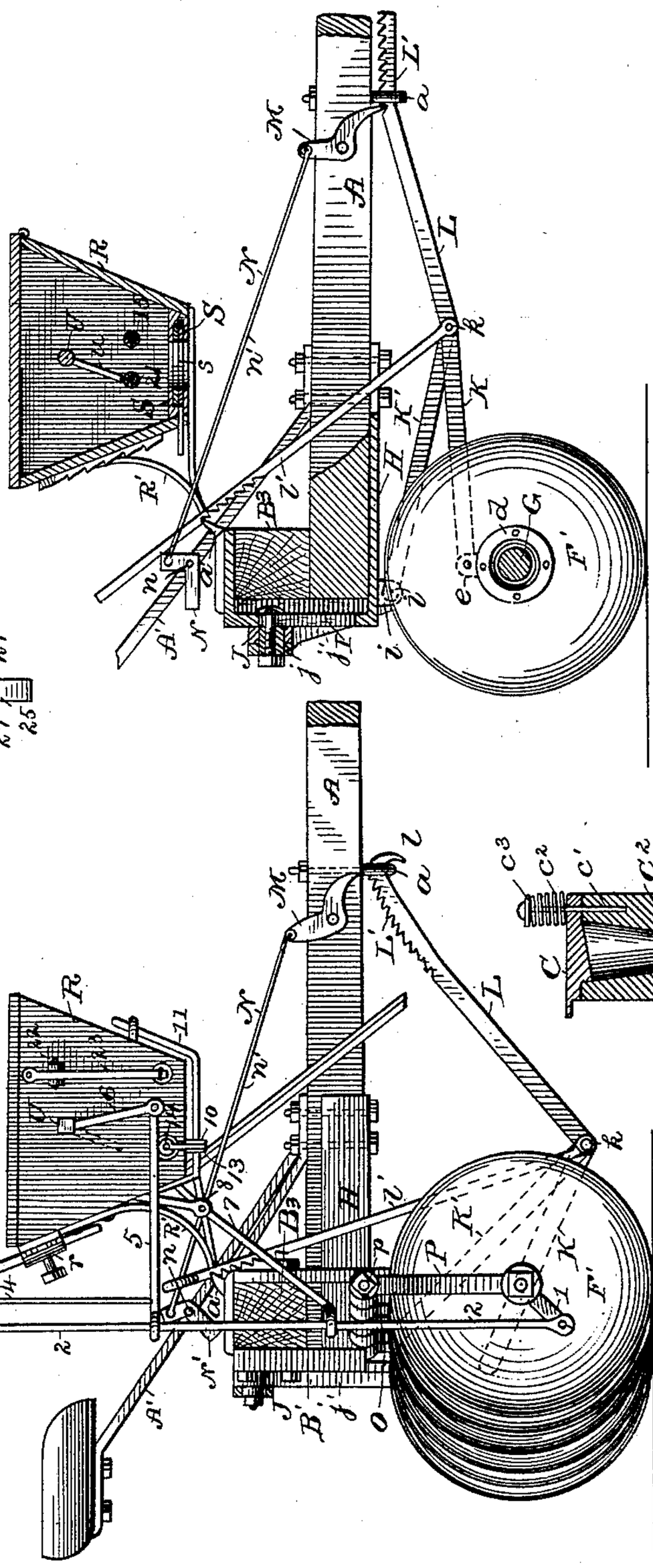


Fig. 5.

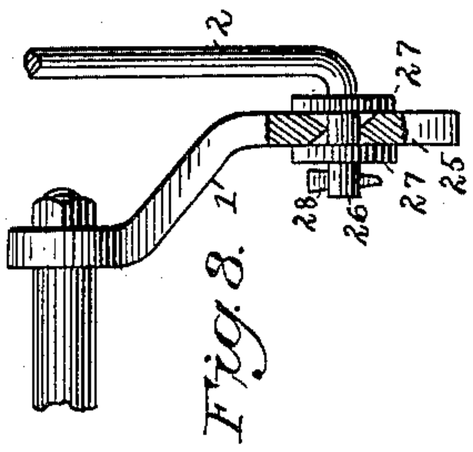


Fig. 8.



Fig. 4.



Fig. 9.

Witnesses,

Edwd. J. Tanner.

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Inventor,

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N. PETERS. Photo-Lithographer. Washington, D. C.

# UNITED STATES PATENT OFFICE.

FRED. H. NORTON, OF GOUVERNEUR, NEW YORK, ASSIGNOR TO THE ST. LAWRENCE MANUFACTURING COMPANY, OF SAME PLACE.

## COMBINED DISK HARROW AND SEEDER.

SPECIFICATION forming part of Letters Patent No. 394,128, dated December 4, 1888.

Application filed May 28, 1887. Serial No. 239,661. (No model.)

*To all whom it may concern:*

Be it known that I, FRED. H. NORTON, a citizen of the United States, residing at Gouverneur, in the county of St. Lawrence and State of New York, have invented certain new and useful Improvements in Combined Disk Harrows and Seeders, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a top or plan view, partly broken away, with the gangs out of line. Fig. 2 is a bottom view, with the gangs in line. Fig. 3 is a rear elevation of Fig. 2. Fig. 4 is an end view looking in the direction of the arrow, Fig. 1. Fig. 5 is a vertical section on line *x x*, Fig. 3, looking in the direction of the arrows 2, same figure, showing in full lines some of the gang-draft connections (which would not naturally be seen in this figure) to illustrate their operation. Figs. 6, 7, 8, 9, 10, 11, 12, 13 are details enlarged, part of them illustrating modifications.

A is the pole, and A′ the seat and standard.

In one class of disk harrows the inner ends of the gangs are so connected to each other that they necessarily rise and fall together by reason of their being attached to each other in such manner that they are incapable of vibrating vertically independently of each other. In another class the inner ends of the gangs abut against each other or against an interposed device of some sort which permits the inner end of either gang to vibrate vertically independently practically of the inner end of the adjacent gang. Two advantages are incident to this second class, to wit: a more ready conformation or adaptation of the position of one gang to the contour of the surface of the ground being operated upon, and the relieving of the bearings by which the gangs are connected to the draft-frame from the inward thrust produced by the disks when in operation. An illustration of this second class or type is found in Patent No. 351,625 to A. Corbin, Jr., in which it is proposed that the inner ends of the gangs be provided with rounded ends to abut against each other or against an interposed stationary plate. My harrow belongs to this second class, and one part of my invention relates to the combination, with the inner ends of the gangs, of a pin which is adapted to receive upon its ends the inward thrust of the gangs, and thus relieve the boxing of the axles from the friction and wear to which they would be otherwise subjected, and at the same time permit the inner ends of the gangs to vibrate in vertical planes, the ends of the pins serving as pivot-points about which the gangs can vibrate in every direction as may be required in the ordinary working of the harrow. Each end of this pin is free to vibrate vertically about its opposite end, which is seated in, but disconnected from, the adjacent gang-axle.

Other parts of the invention relate to features of construction and combination which will be fully explained and referred to in the claims.

B B² *b*, Figs. 1, 10, 11, and 12, is the gang-axle beam, bolted firmly to the tongue and forming therewith the main frame. The axle-beam is made of one piece of angle-iron bent downward at its ends and connected with the gangs, as will be fully explained.

C C are the gang-axles, preferably round, in cross-section, and connected near their outer ends to the downward-projecting ends of the gang-axle beam.

C′ C′ is a two-part tubular boxing surrounding one of the spacing-thimbles. It has a circumferential rib, *c*, with upward and downward lugs arranged in pairs.

*b*² *b*² are bars bolted at their upper ends to the inward, projecting web *b*, and are bent into shape to surround loosely the rib of the tubular boxing. *b′ b′* are bolts supported in the bars *b b* above and below the tubular boxing, and at such distances apart as will permit an up-and-down movement of the main frame relatively to the gang-axles. The lugs straddle these bolts and are of such length as to permit this up-and-down movement without escaping from the bolts. As a modification I propose to extend downward the ends B² of the beam far enough to receive a yoke, *b*², which has its ends bolted to the web *b* in such position as to receive and support the tubular boxing, substantially as shown in Fig. 12; or I may connect the gangs with the gang-axle B by means of stirrups *b*³, surrounding

the tubular boxing, the ends of the stirrup passing through the inward-projecting web and bolted thereto, as in Fig. 13.

In other figures I have shown metal down-hangers B′ B′, arranged in pairs at each end of the ordinary cross bar or plank, $B^3$, and upon opposite sides thereof. In connection with these down-hangers I propose to use bolts *b′ b′* upon opposite sides of the tubular boxing and at about the same distances apart vertically as are the corresponding bolts and the legs of the stirrups in the other figures; but, as above stated, I prefer the T-iron continuous metal gang-axle beam, which is adapted for use generally in this class of harrows for connecting the gangs with the tongue or draft-frame.

I do not claim to be the first to use a bent iron bar in the construction of a disk harrow-frame; but, so far as I am aware, the use of T-iron for this purpose is new, and it possesses many advantages over a flat bar, whether the same be used with its flat face uppermost or with its edge uppermost. For instance, with a T-iron beam having its ends bent downward with the flat surface uppermost and its central rib projecting downward from the horizontal part and inward from the vertical end portions I provide a desirable broad flat bearing for the feet of the brackets of a seed-box, to be hereinafter described, and can utilize advantageously the central web *b* as a support for either the bars $b^2$ or the stirrup shown in Fig. 12, each of which can be bolted to that web with one of its edges abutting against the inner face of the flat upper and outer web, whereby the bolts are largely relieved from strain and a much greater strength and durability attained than would be possible with any of the constructions heretofore known.

At the inner end each gang-axle carries a flaring shell, D *d*, preferably of chilled iron, or other suitable hard metal, and in ordinary manufacture I propose to cast these shells directly upon their respective axles.

E *e e* is a sleeve-bearing surrounding the axle between the smaller end of the shell and the adjacent disk.

The disks F F are of any usual sort placed upon the axles with interposed spacing-thimbles, and clamped together by a nut on the outer end of the axle. The inner disk, F′, has a central opening of such size as to fit over the larger end of the shell, to which it may be fastened by rivets passing through the disk and the flange *d* at the inner end of the shell.

G is a thrust-pin arranged within the shells and engaging at its ends with the inner ends of the axles, or, when preferred, the shells may be so formed as to cover or inclose the inner ends of the axles, as is indicated at the right-hand end of the thrust-pin in Fig. 3, to provide a hardened surface. I prefer to make the thrust-pin of chilled iron or hardened steel, with both its ends cone-shaped and of less diameter than the inner diameters of the shells to permit the vibrations of the gangs. It will be seen that although this pivotal thrust-pin receives the inward thrust of the gangs, yet by reason of the inner diameter of the inner ends of the shells being much greater than the diameter of the adjacent portions of the pin the inner ends of the gangs can rise and fall relatively to their outer ends and their bearings in the frame, so as to conform to the surface of the ground over which they are drawn.

H I *i i* is a bearing-block, preferably of cast-iron. The horizontal part H may have upward-projecting lips to embrace the sides of the tongue and support it against splitting. The vertical part I is slotted to receive a pivot-bolt to be described.

J is an equalizer mounted centrally upon a pivot-bolt, *j*, which passes through the slot and carries at its rear end a thimble and nut, the length of the thimble being a little greater than the thickness of the equalizer, so that the pivot-bolt can be screwed up tightly against the slotted upright I and permit the equalizer to vibrate freely about it to permit not only the vibration of the inner ends of the gangs independently of one another in vertical planes to conform to the surface of the ground, but also to permit the gangs to occupy different horizontal and parallel planes, whereby the harrow is adapted to pulverize the ground to uniform depth under a great variety of circumstances.

In the Corbin harrow above referred to, when the gangs are assuming such various positions at work, the inner ends of the gangs must either rub against each other or against the interposed plate, whereas in my harrow the gangs vibrate about the ends of the interposed pin, which serve as pivot-points for that purpose, either end of the pin being free to rise and fall about its opposite end as a center. In order to provide for such movements without having the pin assume an undesirable angle to either of the disk-gangs, and to prevent placing the inner disks too far apart, I employ a long pin and then combine with the inner ends of the axles shells which overlap the pin and carry disks at their inner ends. Again, another function of these shells is this: They guard against loss or accidental displacement of the pin in case, from any cause, the inner ends of the gang-axles should be separated from each other farther than they usually are when in operation, it being impracticable, or at least undesirable, to attach either end of the pin to its adjacent gang, and it will be readily understood that by reason of the pin being perfectly loose within the shells its presence facilitates the vibration of the inner ends of the gangs independently of each other in all directions, either end of the thrust-pin being free to vibrate vertically about its opposite end whenever the movement of the inner end of either gang necessitates such movement.

The conical form of the shells greatly facilitates the escape of dirt, should any fall from the disks upon the pin and enter the mouths of the shells. Therefore there is little or no liability of dirt getting to the inner ends of the shells and grinding off the outer ends of the pins. In order to insure sufficient strength and rigidity of the pin, I increase its diameter at the center, or by loosening the nut it, together with the equalizer, may rise and fall together within the limits of the slot.

*j' j'* are links pivoted at their upper ends to the equalizer and at their lower ends to the lugs *e e* of the tubular bearing, whereby the weight of the main frame and the driver may be made to resist any upward movement of the inner ends of the gangs, it being apparent that if the pivot-bolt be locked in a lower position in the slot than that shown in Fig. 3 the inner ends of the gangs will be depressed relatively to their outer ends, and consequently the center disks of the harrow will tend to cut deeper into the soil than will the outer ones.

I am aware that it is common to connect a horizontal bar to the inner ends of the gangs, so as to maintain them in a substantially common horizontal plane to insure that they shall at their inner ends cut to the required depth, and hence I do not claim such bar; but I believe myself to be the first to use a pivoted bar the ends of which can vibrate up and down in combination with the inner ends of the gangs, for the purpose of regulating their depth of cut.

To assist in moving forward and regulating the depth of cut of the disks, I employ a vibrating thrust-bar connected at its rear end to the main frame, with devices to support and adjust its front end. To permit the inner ends of the gangs to vibrate vertically or independently, I connect them with the thrust-bar by draw-bars, and to facilitate the adjustment of the thrust-bar I employ a link within reach of the driver.

Referring particularly to Figs. 2, 4, and 5, K K represent the draw-bars, connected at their rear ends to the bearings E E of the gang-axles by pivots, which pass through the draw-bars and the lugs *e e*. These draw-bars are pivoted at their front ends to the front downward-projecting end of the thrust-bar K', which latter has its rear end connected to the main frame.

By an examination of Figs. 4 and 5 it will be readily understood that when these parts are in the position shown in Fig. 4 the inner ends of the gangs are in rear of their outer ends; but when the corresponding parts—that is, the thrust-bar and draw-bars—are in the position shown in Fig. 5 the gangs are in substantially a straight line and at right angles to the line of draft. It will also be seen that when the gangs are being shifted from one of these positions to the other the line of draft is varied by reason of the up-and-down movement of the front end of the thrust-bar, and that such change in the line of draft affects the depth of cut of the disks at opposite ends of the gangs in a way and to an extent which would not be accomplished by a mere change in the angle of the gangs to the tongue from the fact that as the gangs are being shifted from the position shown in Fig. 4 to that in Fig. 5 the front ends of the draw-bars are elevated relatively to the gang-axles. Such elevation of the draw-bars tends to lessen the depth to which the innermost disks will cut as compared with the disks at the outer ends of the gangs. By preference I make each draw-bar of a separate bar of metal and unite their front ends to the thrust-bar and to a part or link, L, by a pivot, *k*.

The forward end of the part L is ratcheted, as at L', its extreme end being formed into a hook, *l*, which takes hold of an eye, loop, or staple, *a*, on the under side of the tongue. This loop or eye is of such size and shape that the ratcheted part is free to slide through it within certain limits, the hook *l* supporting the draw-bar against backward pull.

*l'* is a locking-link pivoted at its lower end upon the pivot *k* and notched at its upper end to engage with a catch or lock-plate, *a'*, projecting from the seat-standard or other suitable support. The upper end of this link is formed into a handle within convenient reach of the driver, and it will be readily understood that by pulling upward on this locking-link the driver can move the inner ends of the disk-gangs forward relatively to their outer ends, and vice versa.

When it is desired to move the inner ends of the gangs backward relative to their outer ends, it can be done by releasing the locking-link from its catch or lock-plate *a'*, when the draft of the team will pull the outer ends of the gangs forward relatively to their inner ends; or the same end can be attained by pushing downward upon the locking-link. When the inner ends of the gangs are pulled forward the upper forward end of the part L of the draw-bar will be thrust through the hook *l* and be caught and held by a pawl, M, which is pivoted at *m* to the tongue.

N is a tripping-lever pivoted at *n* to some convenient part of the main frame or to the seat-standards *a'* and connected by link *n'* to the pawl M for the purpose of unlocking the pawl from the ratchet when it is desired to have the inner ends of the gangs moved backward.

By an examination of Figs. 4 and 5 it will be readily seen that the part L of the draw-bar when engaged with either the pawl M or the loop or staple *a* will support the forward end of the thrust-bar K' against downward movement, irrespective of the locking-link *l'*; or the link *l'* will perform the same function even though the part L of the draw-bar be omitted. Hence, although I prefer to use both of these devices, L and *l'*, yet I do not wish

to be limited thereby. By an examination of the same figures it will be seen that the inner ends of the gangs can be adjusted to various positions and moved forward when in operation by means of the jointed draw-bar and the link $l'$, even though the thrust-bar K′ be omitted; hence I do not wish to be limited to the use of the thrust-bar independently of the jointed draw-bar or the locking-link.

P P are scrapers curved to fit with sufficient accuracy the concave faces of the disks. Each scraper has a hole in its upper end to receive a rod, O, upon which they are spaced by means of thimbles Q Q′. The outer end of each series of scrapers is supported by an eyebolt which surrounds one of the thimbles, the shank of the bolt passing through one or a pair of the hangers B′, as at $b^3$, Fig. 3. Near the rear end each scraper-bar is thrust through a hole in one of the links $j'$. The thimbles Q′ Q′ are shorter than the thimbles Q.

$q$ $q$ are coiled springs surrounding the scraper-bar between the thimbles Q′ Q′ and the links $j'$, whereby there is a slight longitudinal movement of the scraper-bar and its attached scrapers, whenever required. Thus it will be seen that the thimbles not only serve to connect the scrapers with the scraper-bar, but to space the scrapers, and that while the springs $q$ $q$ permit the adjacent thimbles to move endwise relatively to the links $j'$, yet the scrapers, the thimbles, and the scraper-bars move endwise substantially together without disturbing their working relation to each other and to the disks, the relative positions of the parts being such that the scrapers are automatically maintained in about the same position as regards the disks unless moved in one direction or another by reason of some irregularity in the disks themselves or of material which adheres to the disks.

$p$ $p$ are nuts on the end of the scraper-rods. These nuts are so clamped to the scraper rods or bars, the scrapers, and the spacing-thimbles to each other and to the springs $q$ $q$, that the scraper-bars and scrapers move together longitudinally of the gangs whenever required.

As shown in Fig. 7, which is a cross-section of one of the scrapers, they (the scrapers) are so formed as to present a rather sharp cutting-edge to the disk to meet the advancing earth when it adheres to the disk, the upper ends of the scrapers being supported against forward thrust by the rods O, while their lower ends rest against the thimbles, except in the case of the outer scraper, P′, of each gang, which may have attached to its lower end a collar, $p'$, which is mounted loosely between the nut of the gang-axle and the outer disk. I propose to make these scrapers of thin steel or other elastic material, which, with the endwise movement of the scraper-bar, which is made possible by the springs $q$ $q$, will insure a satisfactory operation.

R is a seed-box.

R′ R′ are brackets mounted on the harrow-frame and carrying the seed-box.

S S′ are thin metal strips or plates provided each with three rows of similarly-spaced square or round holes, $s$ $s$, which register with corresponding holes in the bottom of the seed-box, as is customary in similar machines. These strips are arranged in a groove in the bottom of the seed-box, the upper one being stationary, the lower one being adjustable endwise by means of a cam-lever, T, pivoted to the rear wall of the box and engaging with an arm, $t$, connected with the lower plate and projecting through a slot in the box.

T′ is a notched segment with which the lever T engages.

It is well known that when distributing guano or other fertilizers difficulty arises by reason of the material arching over above the delivery-openings, and to obviate such objection I employ a rocking-shaft, U, mounted at its ends in the ends of the feed-box and carrying a series of downward-projecting agitators, $u$. I propose to use two parallel lines or strands of chains or some equivalent form of distributer to assist in the discharge of seed or fertilizer, or both, through the openings in the bottom of the seed-box; and to impart the desired motions to the agitator and the distributing-chains I propose to connect them with one of the gang-axles by devices which I will now proceed to describe, referring particularly to Figs. 1, 2, 4, 8, and 9.

1 is a crank-plate or arm attached to the outer end of one of the gang-axles, preferably by means of the same nut which clamps the axle, disks, and thimbles together.

2 is a crank-rod connected at its lower end to the crank-plate and sliding freely through a loop on the upper end of an arm, 3, which is adjustable in a plate or clamp on the seed-box at $r$.

4 is a link flexibly connected at its upper end to arm 3.

5 is a link suspended at one end upon the link 4 and provided at its outer end with an eye surrounding the rod 2.

The link 4 is adjustable relatively to the link 5 or the arm 3, or both, so that when the arm 3 is adjusted up and down a corresponding adjustment of link 4 may be made, so that the link 5 may be maintained in a substantially horizontal position. The forward end of link 5 is connected to a crank-arm or lever, 6, of the rocking-shaft U.

7 is another link attached to the crank-rod at its lower end and preferably adjustable thereon. The upper end of link 7 is connected to the outer end of arm 8 of a crank-axle, 9 10 11, of which the parts 9 11 are nearly perpendicular, and are connected at their lower ends by a horizontal part, 10, the entire crank-axle lever being pivoted upon spurs or their equivalents $r'$ $r'$, projecting from the seed-box.

12 is a rod pivoted to the part 10 and sliding through an eye or loop, 13, depending

from the seed-box, and having an upturned outer end, 14.

15 is a line of chain connected to the upturned end 14, passing thence through the seed-box just above the metal plate S and out at the opposite end of the box, where it is connected to the lower end of a lever, 16, which is pivoted at its upper end, 17, to the seed-box or lug projecting therefrom.

18 is a lever pivoted at 19 to the lever 16 and fulcrumed at 20 to a lug or post projecting from the seed-box.

21 is a second chain connected to the lower end of lever 18 and passing thence parallel to chain 15 through the seed-box and out to and connected with the lower end of a lever, 22, which is fulcrumed at 23.

24 is a coiled spring, preferably arranged within the seed-box and connected to the upper end of lever 23. Thus this spring operates, through lever 22, to move the chain 21 toward that end of the box to which the lever is pivoted, the other chain, 15, being moved in the same direction by the upturned outer end, 14, of the rod 12 alternately, the connections between the opposite ends of these chains being of such character that the spring operates to move the chains in opposite directions into the position from which they have been moved by the positive action of the other and alternately-acting devices.

From an examination of the drawings it will be readily seen that as the gangs rotate and the crank-rod 2 moves up and down, both chains will be moved alternately endwise relatively to the seed-box and in such close proximity to the holes *s s* as to effect a thorough distribution of the seed or the fertilizer, as the case may be.

I am aware that chains have been used as distributers in seeding-machines; but the employment of two parallel lines of chain arranged in close proximity to each other and to the discharge-openings in the hopper is useful, particularly in the distribution of fertilizers, because their alternating movements effectually prevent choking or clogging of the material, and thus facilitate its delivery.

It will be readily understood that by adjusting the height of the arm 3 the distance traveled by the chains at each revolution of the gang-axles may be varied, and that by reason of the crank-rod vibrating about the arm 3 its operation is that of a lever with an adjustable fulcrum. It will further be seen that the character of the rock-shaft and chain-operating devices is such that the movements of these parts is not materially affected by any variation of the positions of the gangs relative to the feed-box which will occur under the ordinary operations for which the machine will be employed. Of course such variations are much less than would occur if the gangs were mounted, as they frequently are in machines of this character—to wit, with the hangers near the inner ends of the gangs and the adjusting-rods, links, or draw-bars attached to the outer ends of the axles.

To provide against undue cramping or wear of the crank-rod where it is connected with the crank-plate, I prefer to use the construction shown enlarged in Fig. 8, in which the crank-plate is provided with an offset, so that the part 25 stands out at some distance from the face of the disk, and is provided with a hole to receive the bent lower end, 26, of the crank-rod. The edges of the hole are beveled or rounded, so as to fit closely and prevent lost motion while permitting the vibrations of the gangs without cramping.

27 27 are washers, one on either side of the plate, and 28 is a pin or split key passing through the end 26 to prevent accidental displacement of these parts.

In Fig. 9 I have shown enlarged a convenient form of oil-cup, which may be applied to either of the bearings C′ or E, and in which $C^2$ is the cup adapted to receive the oil, and, when preferred, cotton-waste. *c* is the cap. *c′* is a pin projecting upward from the cup; $c^2$, a coiled spring; $c^3$, a washer which is pressed down upon the coiled spring and held by riveting the upper end of the pin or by a nut. The cap can be lifted slightly and then swung around on the pin as a pivot, the oil poured in, and the cap swung back with its sunken portion inside the cup, in which position the spring will hold it.

I claim—

1. In a disk harrow, the combination of two gangs of disks flexibly connected to the main frame, and a thrust-pin arranged between the inner ends of the axles adapted to receive the thrust produced by the engagement of the disks with the soil, substantially as set forth.

2. In a disk harrow, the combination of two gangs of disks flexibly connected with the frame, of a thrust-pin arranged between the ends of the axle engaging therewith, and a shell attached to the axles and surrounding the thrust-pin, substantially as set forth.

3. In a disk harrow, the combination, with the disk-gangs, of hollow shells mounted upon their inner ends and disks mounted upon the inner ends of the shells and between the inner ends of the axles, substantially as set forth.

4. In a disk harrow, the combination, with the disk-gangs flexibly connected to the frame, of a thrust-pin arranged between the axles and having tapering ends, and the flaring shell attached to the gangs and surrounding the pins, substantially as set forth.

5. In a disk harrow, a gang-axle beam formed of a single piece of metal, which is T-shaped in cross-section, and has its horizontal part arranged with its flat face uppermost and its downward bent ends with the central rib projecting inward, in combination with axle-bearings secured to the inward-projecting ribs, substantially as set forth.

6. In a disk harrow, the combination, with

the main frame, of the flexibly-connected disk-gangs and the equalizing-bar attached to the main frame and adapted to vibrate in a vertical plane, substantially as set forth.

7. In a disk harrow, the combination, with the main frame, of the flexibly-connected disk-gangs and the vertically-adjustable equalizing-bar adapted to vibrate in a vertical plane, substantially as set forth.

8. In a disk harrow, the combination of the main frame, the gangs flexibly connected to the main frame, the slotted vertical part I, and the adjustable equalizing-bar, substantially as set forth.

9. In a disk harrow, the combination, with the gangs, of scraper-rods arranged above the gangs, a series of spacing-thimbles mounted on the rods, a series of scrapers between the disks of the gangs and provided with holes at their upper ends and mounted upon the rods between adjacent ends of the thimbles, substantially as set forth.

10. In a disk harrow, the combination, with the gangs, of scraper-rods arranged above the gangs, a series of spacing-thimbles mounted on the rods, and a series of scrapers mounted at their upper ends on the rods between the thimbles, the lower ends of the scrapers engaging with the axles of the gangs, substantially as set forth.

11. In a disk harrow, the combination, with the gangs, of scraper-rods arranged above the gangs, a series of scrapers supported at their upper ends upon the rods and at their lower ends upon the gangs between the disks, and scrapers arranged outside the outer disks of the gangs, said outside scrapers being mounted at their upper ends upon the rods and provided at their lower ends with collars mounted loosely upon the gang-axles, substantially as set forth.

12. In a disk harrow, the combination, with the gangs and the vertical links at the inner ends of the gangs, of the scraper-rods above the gangs, the thimbles upon opposite sides of the vertical links, springs interposed between the thimbles and the vertical links, and scrapers supported at their upper ends upon the scraper-rods, substantially as set forth.

13. In a disk harrow, the combination, with the gangs, of the gang-axle beam having the downward-projecting arms, the scraper-rods connected at their outer ends to the downward-projecting arms of the axle-beam, and the scrapers mounted at their upper ends upon the scraper-rods, substantially as set forth.

14. In a disk-harrow, the combination, with the gangs, of the scraper-rods arranged above the gangs and connecting devices loosely surrounding the scraper-rods, whereby the rods and scrapers mounted on the rods can move lengthwise of the gangs and relatively to the frame of the harrow, substantially as set forth.

15. In a disk harrow, the combination, with the gangs, of scraper-rods above the gangs, a series of scrapers connected with the rods, supports connecting the outer ends of the rods and the scrapers loosely with the main frame, supports for the inner ends of the rods and the scrapers, thimbles surrounding the scraper-rods, and springs interposed between the thimbles and the supports at the inner ends of the scraper-rods, whereby the scrapers and their rods are automatically maintained in working relation to the disks, but are free to move in their supports, substantially as set forth.

16. In a harrow, the combination of the frame, the vibrating thrust-bar connected at its ends to the main frame, and the vibrating gangs connected at their inner ends to the thrust-bar, substantially as set forth.

17. In a disk harrow, the combination, with the main frame and the vibrating gangs, of draw-bars connected at their rear ends to one of the gang-axles, and a thrust-bar connected at its rear end to the main frame and at its front end to the draw-bars, substantially as set forth.

18. In a harrow, the combination of the main frame, the vibrating thrust-bar connected at its rear end to the main frame, the vibrating gangs, and the draw-bars connecting the gangs with the thrust-bar, substantially as set forth.

19. In a harrow, the combination of the main frame, the vibrating thrust-bar connected at its rear end to the main frame, the vibrating gangs and two draw-bars, each connecting one of the gangs with the thrust-bar, substantially as set forth.

20. In a harrow, the combination of the draft-frame, the vibrating thrust-bar connected at its rear end to the main frame, the vibrating gangs connected at their inner ends to the thrust-bar, and the link arranged within reach of the driver and connected at its lower end to the thrust-bar, substantially as set forth.

21. In a harrow, the combination of the main frame, the vibrating thrust-bar connected at its rear end to the main frame, the vibrating gangs connected to the thrust-bar, the link and locking devices connecting the link with the main frame for adjusting the thrust-bar and gangs, substantially as set forth.

22. In a disk harrow, the combination of the main frame, the vibrating thrust-bar connected at its rear end to the main frame, and the part L, connecting the thrust-bar with the tongue, substantially as set forth.

23. In a harrow, the combination of the main frame, the vibrating thrust-bar connected at its rear end to the main frame, the vibrating disk-gangs, and the part L, and devices adjustably connecting its front end to the tongue, substantially as set forth.

24. In a harrow, the combination of the main frame, the vibrating thrust-bar connected at its rear end to the draft-frame, the vibrating

gangs connected at their inner ends to the thrust-bar, the part L, and the link *l*, substantially as set forth.

25. In a combined disk harrow and seeder, the combination of the disk-gang, the seed-box or fertilizer-box, a distributer in the box, a crank on the axle, a lever attached at its lower end to the crank, and a lever and connections interposed between the lever and the distributer, substantially as set forth.

26. In a combined disk harrow and seeder, the combination of a disk-gang, a seed-box or fertilizer-box, a distributer in the box, a crank on the disk-gang, a vertical rod attached at its lower end to the crank, an adjustable bearing connecting the upper end of the rod with the box, and the lever and connections between the rod and the distributer, substantially as set forth.

27. In a combined disk harrow and seeder, a combination of the disk-gang, a seeder-box, a chain distributer in the seed-box, a crank on the gang-axle, a vertical rod attached at its lower end to the crank, a lever and connection between the vertical rod and one end of the chain to move the chain in one direction, and a spring at the other end of the chain to move it in the opposite direction, substantially as set forth.

28. In a combined disk harrow and seeder, the combination of a disk-gang, a seed-box, a distributer in the box, a vertical rod attached at its lower end to the crank, a lever pivoted to the seed-box and having one arm connected to the vertical rod, a crank-axle connected to the other arm of the lever, and a connection between the crank-axle and the distributer, substantially as set forth.

29. The combination, with a seed-box having a perforated bottom, of two lines of chain arranged parallel to each other, a spring connected with one end of one chain for moving it in one direction, a link connected to the adjacent end of the other chain for moving it in the same direction, and means connecting the opposite ends of the chains, whereby the chains are moved simultaneously but alternately in opposite directions, substantially as set forth.

30. The combination, with a seed-box having a perforated bottom, of two lines of chain arranged parallel to each other, a spring connected with one end of one chain for moving it in one direction, a link connected to the adjacent end of the other chain, and the levers pivoted to the seed-box and connecting the opposite ends of the chains, substantially as set forth.

31. The combination, with the disk-gang and the box, of a fertilizer-distributer having a rocking shaft, the crank on the gang-axle, the lever, and means connecting the lever with the rocking shaft, substantially as set forth.

32. The combination, with the gang and the box, of a seed-distributer having a rocking shaft, the crank on the gang-axle, the lever, means for connecting the lever with the seed-distributer, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FRED. H. NORTON.

Witnesses:
A. F. CORBIN,
F. A. PETERSON.