

No. 658,803.

Patented Oct. 2, 1900.

H. N. RANDALL.
CORN PLANTER.

(Application filed Jan. 29, 1900.)

(No Model.)

7 Sheets—Sheet 1.

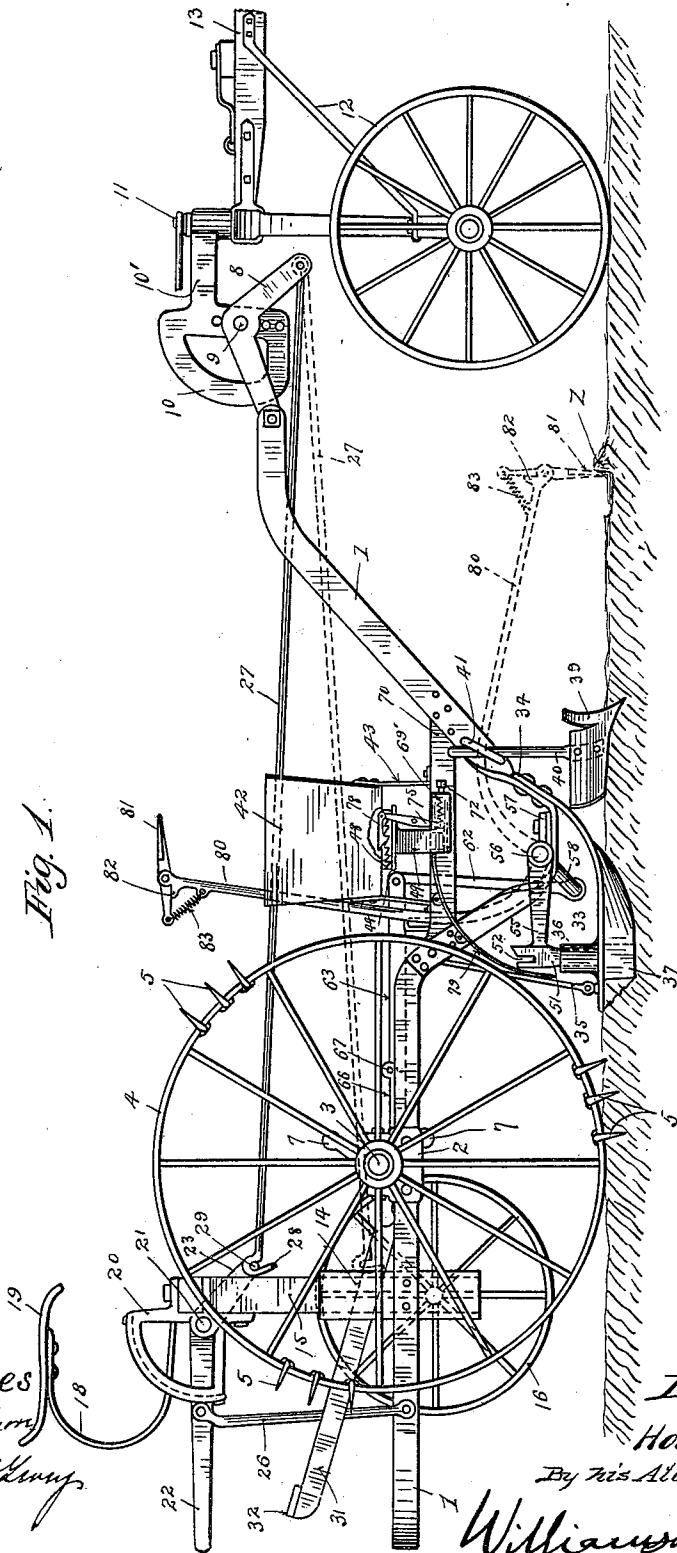


Fig. 1.

Witnesses
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By his Attorneys,

Williamson & Merchant

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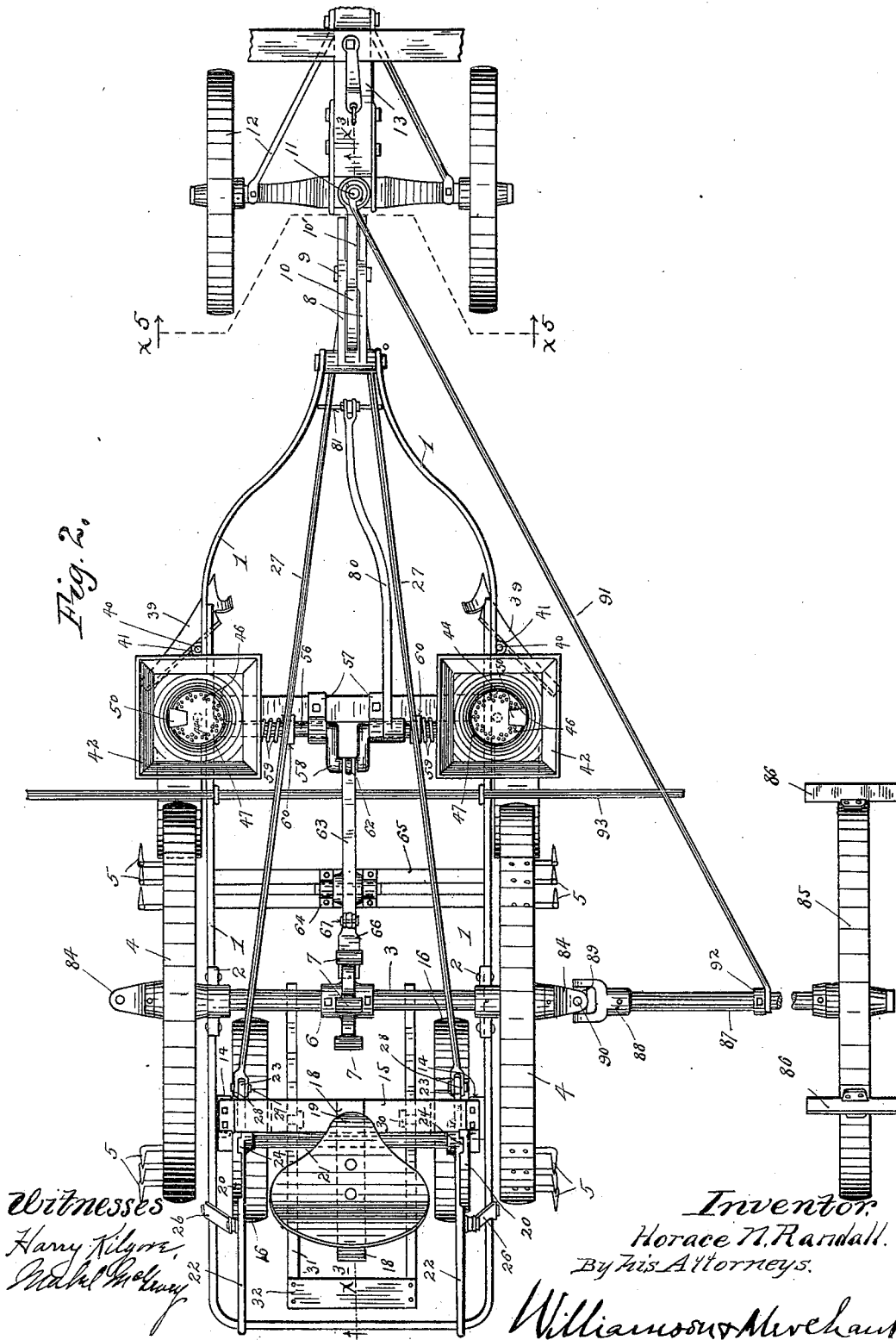
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7 Sheets—Sheet 2.

Fig. 2.



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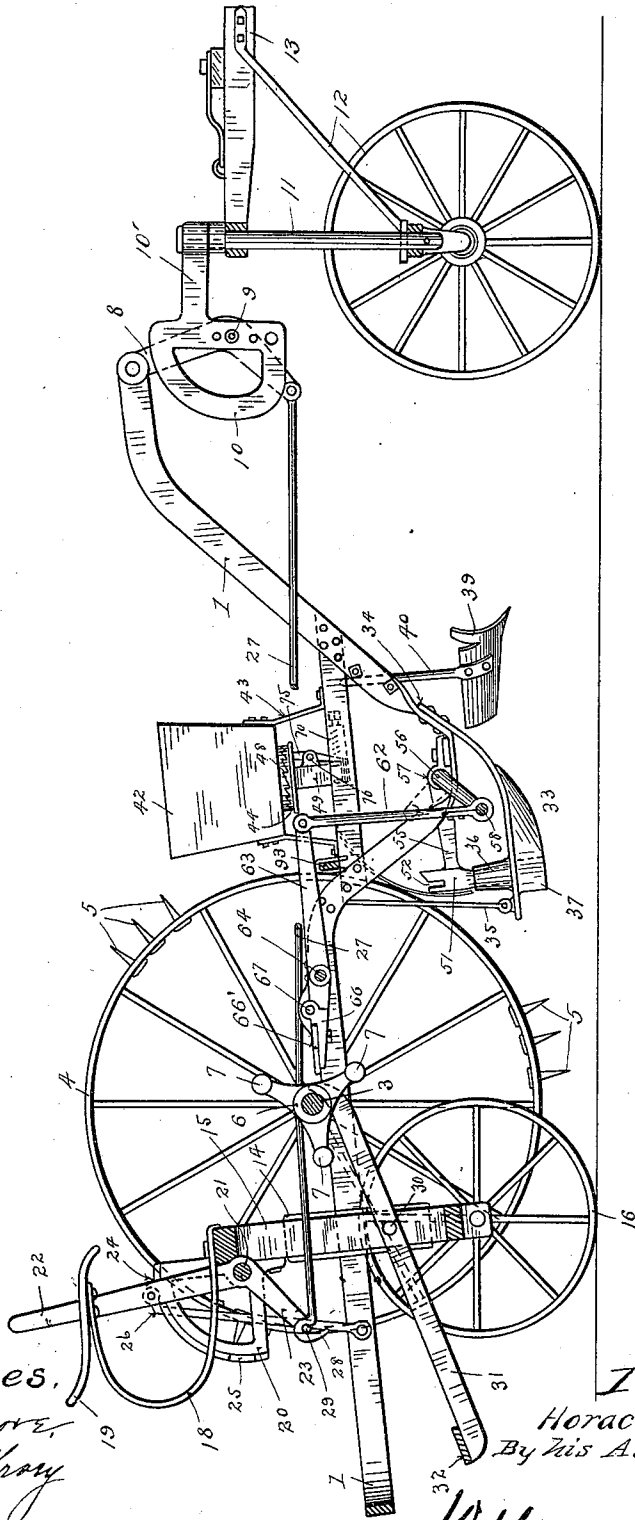
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Fig. 3.



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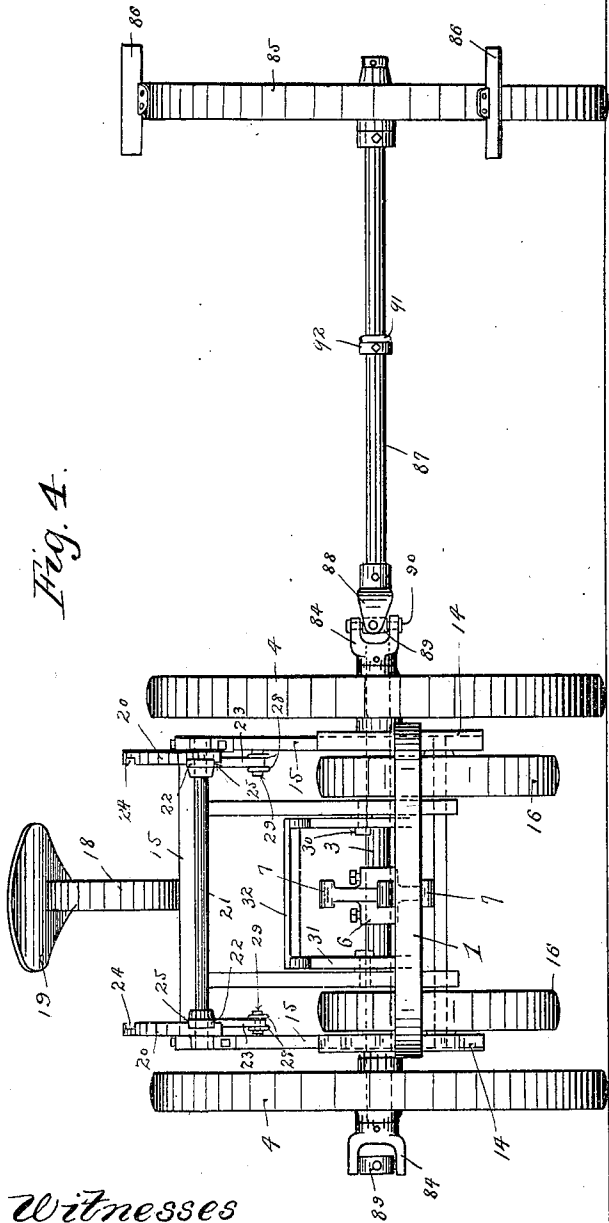


Fig. 4.

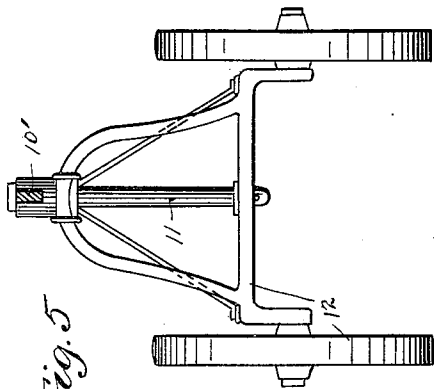


Fig. 5.

Witnesses
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7 Sheets—Sheet 5.

(No Model.)

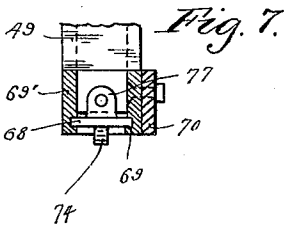


Fig. 6.

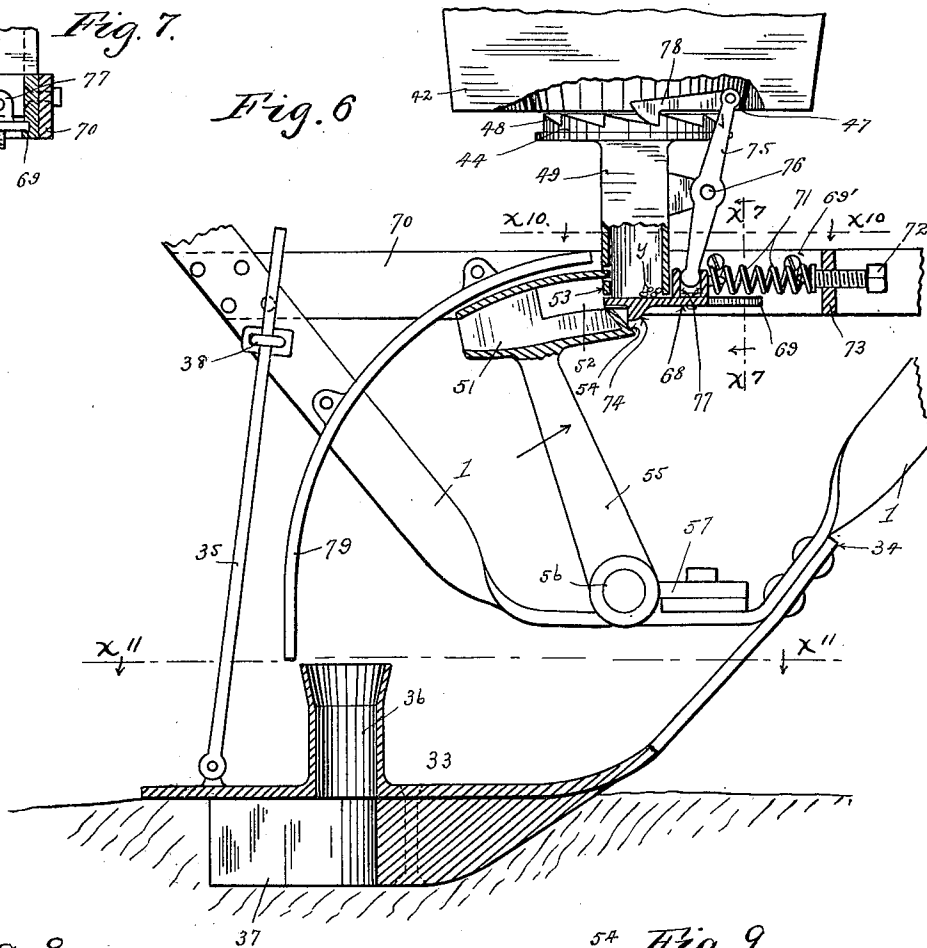


Fig. 8.

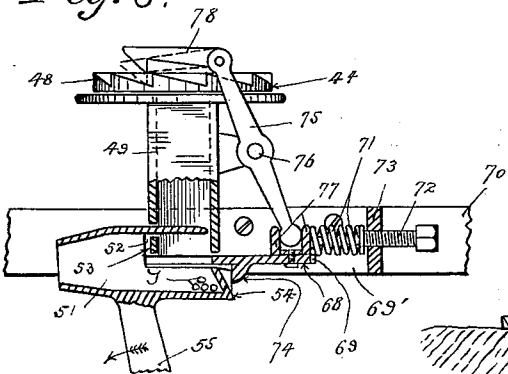


Fig. 9.

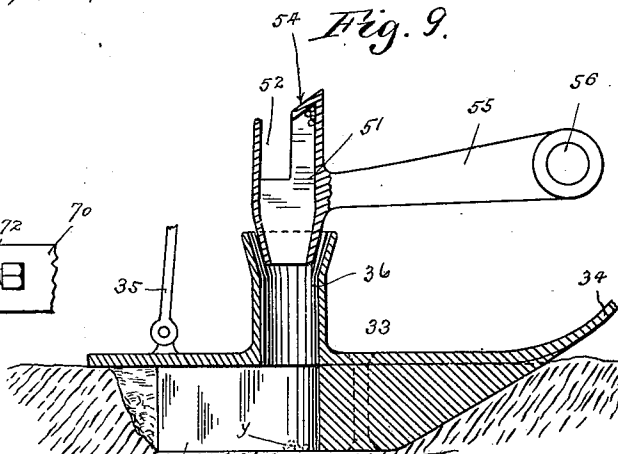
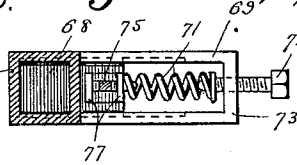


Fig. 10.

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Fig. 11.

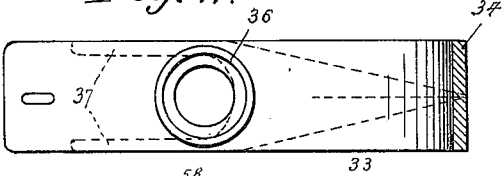


Fig. 12.

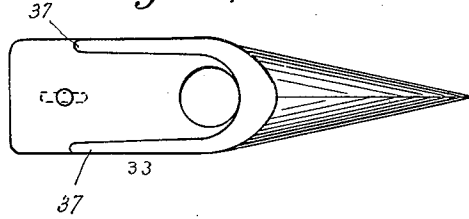


Fig. 13.

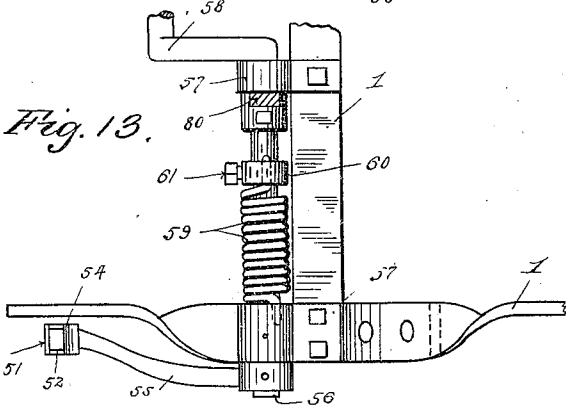


Fig. 15.

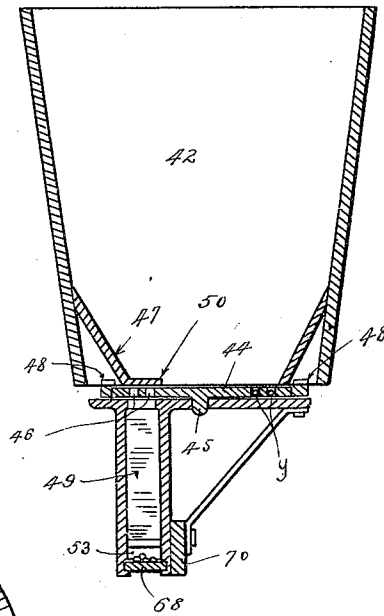


Fig. 14.

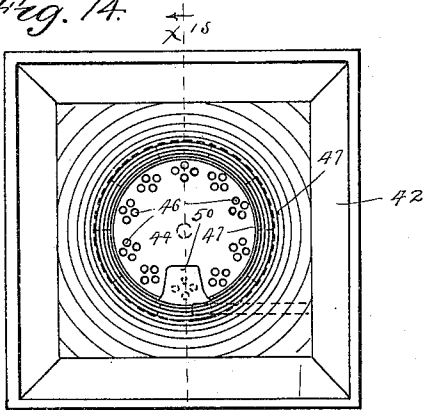
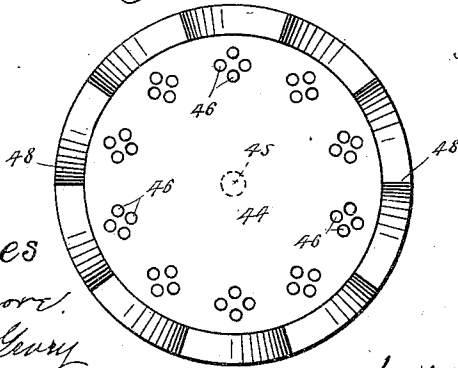


Fig. 16.



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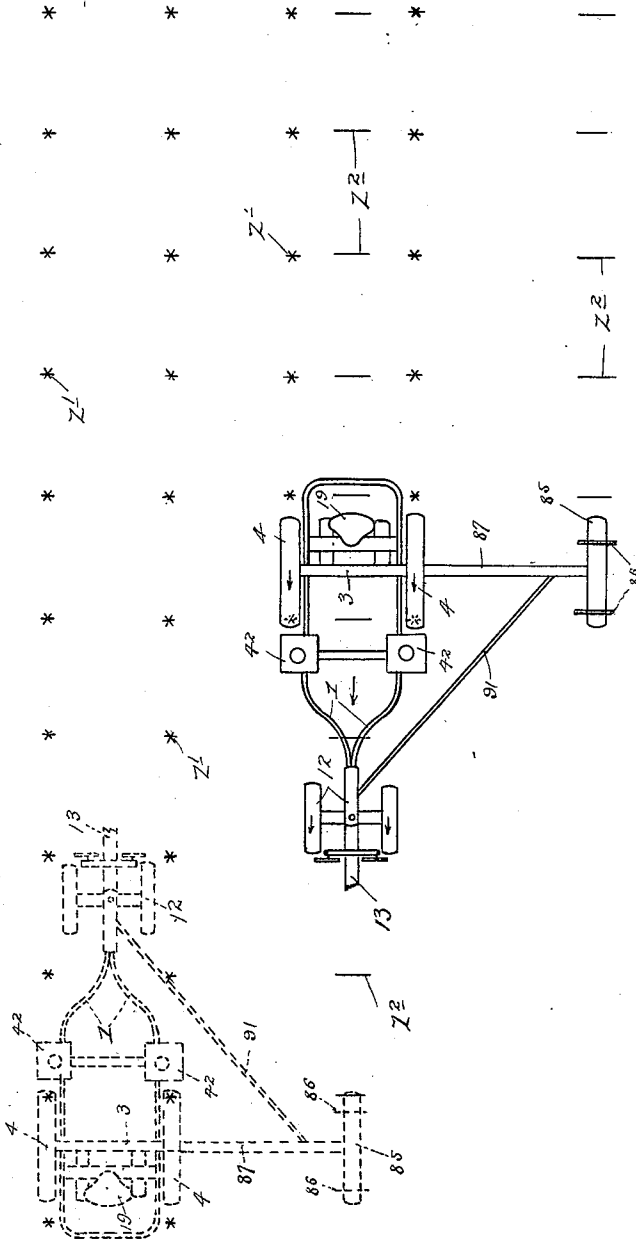
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7 Sheets—Sheet 7.

Fig. 17.



Witnesses,
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UNITED STATES PATENT OFFICE.

HORACE N. RANDALL, OF TRACY, MINNESOTA.

CORN-PLANTER.

SPECIFICATION forming part of Letters Patent No. 658,803, dated October 2, 1900.

Application filed January 29, 1900 Serial No. 3,076. (No model.)

To all whom it may concern:

Be it known that I, HORACE N. RANDALL, a citizen of the United States, residing at Tracy, in the county of Lyon and State of Minnesota, have invented certain new and useful Improvements in Corn-Planters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to planters and is in the nature of an improvement on the machine set forth and claimed in my prior patent, No. 619,345, dated February 14, 1899, entitled "Corn-planters," which prior machine and also my present improvement are especially designed and particularly adapted for planting corn.

The several objects of my present invention are attained by the novel devices and combinations of devices hereinafter described, and defined in the claims.

In common with my prior patent I employ in my present planter mechanism which is operated without the usual wire or line extended across the field and which is capable of correction or resetting at any time, so as to prevent the hills from being planted to any material extent transversely out of line with each other.

The preferred form of my present invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views—

Figure 1 is a right side elevation showing my improved check-row planter with the parts thereof in position for coöperation in the planting action. Fig. 2 is a plan view of the complete planter. Fig. 3 is a longitudinal vertical section approximately on the line $x^3 x^3$ of Fig. 2, some parts being shown in full and the traction-wheels and planting devices being raised out of operating positions. Fig. 4 is a rear elevation of the planter. Fig. 5 is a transverse vertical section taken on the line $x^5 x^5$ of Fig. 2 looking forward. Fig. 6 is an enlarged view, partly in side elevation and partly in longitudinal section, showing a portion of the seed-magazine, the furrow-forming shoe, and the so-called "shuttle device" for delivering the seeds or kernels of corn from the former to the latter. Fig. 7 is

a transverse vertical section on the line $x^7 x^7$ of Fig. 6. Fig. 8 is a view corresponding to Fig. 6 in some respects showing the shuttle in a different position. Fig. 9 is a detail view, in vertical longitudinal section, showing the furrow-forming machine and the coöperating shuttle in position to deliver thereto. Fig. 10 is a horizontal section on the line $x^{10} x^{10}$ of Fig. 6. Fig. 11 is a horizontal section taken on the line $x^{11} x^{11}$ of Fig. 6. Fig. 12 is a bottom plan view of one of the furrow-forming machines. Fig. 13 is a detail in plan showing a portion of the shuttle-actuating crank-shaft and several immediately-connected parts. Fig. 14 is a plan view of one of the seed boxes or hoppers. Fig. 15 is a transverse vertical section on the line $x^{15} x^{15}$ of Fig. 14. Fig. 16 is a plan view in detail and on an enlarged scale showing the disk-like rotary feed-bottom of one of the hoppers; and Fig. 17 is a view in diagram illustrating the action of the machine in forming the checked rows.

The numeral 1 indicates the main frame of the machine, which is formed of heavy strap-iron and is provided at its sides with bearings 2, in which the driving-axle 3 is loosely mounted. This driving-axle 3 is provided with traction-wheels 4, rigidly secured to the same and preferably provided with the several groups of teeth 5 for increasing the traction of the wheels, as hereinafter noted. At its intermediate portion the axle 3 is provided with a hub 6, having a plurality (as shown, three) of trip-arms or projections 7, which serve a purpose to be hereinafter noted. The sides of the main frame 1 are drawn together at their forward ends and are pivoted to the upper arm of a bell-crank lever 8, which in turn is pivoted at its elbow by a bolt or pin 9 to a segmental bracket 10. The segmental bracket 10 is shown as provided with a projection 10', which is pivoted on the upper end of the long and heavy king-bolt 11 of the forward truck 12 of the planter. This truck 12 is a small two-wheeled truck, and the pole 13 forms a part of the frame thereof. The truck 12 is thus mounted, with freedom for pivotal movements, in a horizontal plane or on the axis of the king-bolt 11, and the said truck serves to support the forward portion of the main frame 1.

Rigidly secured to the sides of the main frame 1, rearward of the driving-axle 3, is a pair of cooperating and approximately-vertical guides 14, in which the frame 15 of a supplemental or lifting truck is loosely mounted for vertical or approximately-vertical movements. At its lower portion the supplemental frame 15 is provided with a pair of loose wheels 16, which work within or between the traction-wheels 4, and while they are much smaller in diameter they preferably have about the same face or width. The spring-support 18 of the rider's seat 19 is rigidly secured to the upper central portion of the supplemental or lifting frame 15, and to each side of the upper portion of said frame 15 is rigidly secured one of a pair of lock-segments 20. A transverse rock-shaft 21 is loosely mounted in the hub portions of the lock-segments 20, and on this rock-shaft adjacent to each segment 20 is rigidly secured a lifting-lever 22, provided with a lower end extension 23. In this preferred construction the lock-segments 20 are provided with flanges, each having a pair of notches 24 25, and the levers 22 are permitted slight lateral springing movements sufficient to normally hold them in one or the other of the lock-notches 24 25, with which they happen to be aligned, but nevertheless to permit them to be readily disengaged therefrom by the operator. Each lever 22 is connected by a link 26 with the corresponding side of the main frame 1. Also the arm or extension 23 of each lever 22 is connected to the free arm of the bell-crank lever 8 by a long tension-rod 27. To make this connection a separable one, the tension-rods 27 are provided with hooked ends 28, which engage over pins or studs 29 on the lever extensions 23, this being done for a purpose to be hereinafter stated.

Pivoted to the supplemental or lifting frame 15, as shown at 30, is a lifting-lever or platform-frame 31, the forwardly-projected arms or prongs of which engage under the driving-axle 3 and the rear end of which is provided with a transverse board or foot-rest 32, upon which the operator may stand when lifting the traction-wheels and main frame, as hereinafter more fully described.

As this is a double-row planter, the seed-boxes, furrow-forming shoes, and seed-delivery devices are arranged in duplicate side by side and simultaneously operated from a common source or trip, which in the present construction is the trip hub or knocker 6 7.

The furrow-forming shoes are indicated as entireties by the numeral 33, and they are secured, one in line with each traction-wheel 4, to the downwardly-bent intermediate portions of the main frame 1. They are thus secured at their forward ends by rivets or bolts, passed through a portion of the frame 1 and through an extended flange 34 of the said shoes, while at their rear portions they are connected by rods or links 35 with the

said main frame 1. The forward under portions of the shoes 33 are approximately wedge-shaped, as best indicated in Fig. 12, so that they are adapted to form the furrow into which the corn is planted. At their intermediate portions the shoes 33 are provided with vertical tubes or neck portions 36, through which the seeds are delivered, and just below this delivery-tube 36 the shoe is cut away to its bottom and is provided with rearwardly-projecting side flanges 37, which prevent the displaced dirt from falling back into the furrow before the seed or corn has been properly planted. The rods 35 are shown as adjustably secured to the frame 1 at their upper ends by means of staples 38, and in this manner vertical adjustments of the shoes 33 are provided for.

Rigidly secured to the sides of the frame 1, one in front of each furrow-forming shoe 33, is a grader or scraper blade 39, the stem 40 of which is adjustably secured to the said main frame 1 by a staple or U-bolt 41 or other suitable device. The so-called "graders" or "scrapers" 39 will be so adjusted that when the furrow-forming shoes are lowered so as to properly form the furrow they will scrape over the upper surface of the ground, level the same, and remove stones, cornstalks, &c., and thus prepare the ground for the furrow and for the traction-wheels. It is important that the ground over which the traction-wheels travel should be as nearly as possible smooth and level. If the ground is rough or undulating, or if the wheels are permitted to travel over rocks or obstacles, they will be given too much movement for the distance traveled, and hence the marking devices will work more rapidly out of time. The planers or scrapers prepare the ground for the traction-wheels, as well as for the furrow-forming shoes.

A corresponding pair of seed-containing magazines or boxes 42 are secured to the opposite sides of the machine-frame 1, as shown, by means of legs or brackets 43. These magazines or boxes are provided with disk-like bottoms 44, that are mounted for rotary movement on short vertical trunnions 45 and are provided at their marginal portions but within the magazines with groups of small perforations 46. Each perforation 46 is intended to be of such size as to contain at any one time one kernel of corn, and four of these perforations, as shown, are provided for each group, although this number may be varied according to the number of kernels it is deemed desirable to plant in each hill. Just outward of the hopper-like lower end section 47 of the magazine 42 the rotary bottom or disk 44 is provided with ratchet-teeth 48. There are as many ratchet-teeth 48 as there are groups of perforations 46.

Below each magazine 42 is a supplemental magazine or delivery-spout 49, the open upper end of which stands in the line of movement with the groups of perforations or seat-

passages 46 of the disk 44. One group of the perforations 46 always stands immediately over the open upper end of the spout 49 when the said disk is not under movement from one position to another. Each magazine or hopper 42 is provided with a fixed striker or scraper 50 in the form of a small plate which stands over the open upper end of the spout or auxiliary magazine 49 and closely engages the upper surface of the disk 44. Under the rotary movement of the disk 44 this striker or scraper 50 serves to clear off from the perforations 46 which are being moved to a discharging position all the surplus kernels of corn and prevents any corn from passing through the perforations which have been thrown above the spout 49, except those kernels—to wit, four in the illustration given—which have previously entered the said perforations.

A pair of vibrating shuttles or seed-delivery heads similar to those employed in my prior machine are mounted to move in vertical planes longitudinally of the machine for cooperation one with each of the seed-magazines and corresponding shoes. As shown, these shuttles or heads are in the form of hollow and approximately-cubical receptacles 51, the forward ends of which are entirely open and the rear ends of which are slotted transversely, as shown at 52, so as to pass or permit the entrance of the cooperating fixed cross-slats 53 of the spouts 49. These shuttles or heads 51 are provided below the slots 52 with forwardly-inclined rear walls or flanges 54, which serve an important function, to be hereinafter noted, and each shuttle or head is carried at the free end of an arm 55, that is fixed on a transversely-extended rock-shaft 56, mounted in suitable bearings 57 on the depending central portion of the corresponding side of the frame 1. This rock-shaft 56 is provided with a crank portion 58, and it is under tension to throw the arms 55 and their shuttles or heads 51 downward, as shown, from a pair of coiled springs 59, wound on the said crank-shaft with one end of each spring secured in one of the bearings 57 and the other end thereof secured in a collar 60, that is adjustably secured on the said crank-shaft by a set-screw 61. The crank portion 58 of the crank-shaft 56 is pivoted to the lower end of a pitman 62, the upper end of which is pivoted to the forward end of a trip-lever 63, which in turn is pivoted in bearings 64, supported by transverse bars 65, secured at their ends to the sides of the main frame 1, as best shown in Fig. 2. At its rear end the trip-lever 63 is provided with a spring-pressed pivoted finger 66, which is adapted to move upward on its pivot 67, but cannot move downward without moving also the said lever 63. This pivoted finger 66 stands in position to be struck by the trip projections 7 of the hub 6, heretofore noted as being carried by the driving-axle 3. With this pivoted finger the said

trip projections 7 will operate the trip-lever 63 and the shuttles and other parts actuated thereby under advance movements of the machine; but under backing movements of the machine or backward rotations of the traction-wheels when raised the said finger 66 will simply be moved upward on its pivot 67 without any other effect on the trip-lever and parts operated thereby. The spring-finger 66 has an extensible section 66', the adjustment of which varies the throw of the shuttles. It is of course evident that the farther the extensible section 66' is extended the longer will be its engagement with the radial arm 7, and hence the farther the shuttles will be thrown upward.

Immediately below the open lower end of each spout or supplemental magazine 49 is a receding table or plunger 68, which is mounted to move in suitable guides or slots 69 of a bracket extension 69' of the corresponding spout 49. The brackets 69' are secured to brace-bars 70 of the main frame 1, and thus the spouts or supplemental magazines 49 are supported from said brace-bars 70. Springs 71 yieldingly hold the tables 68 in extreme rearward position, as shown in Fig. 6, and set-screws 72, working through portions 73 of said brackets 69' serve to adjust the tensions of said springs. The tables or plungers 68 normally serve as bottoms to the spouts 49, and they are provided with depending lugs 74, with which the end walls 54 of the shuttles 51 are adapted to engage to force the said receding tables or plungers 68 against their springs 71 and into the position indicated in Fig. 8. A short lever 75 is pivoted at 76 to a projection from each spout 49. At its lower end each lever 75 works between a pair of lugs 77 on the corresponding table or plunger 68, and at its upper end it is provided with a pawl 78, which cooperates with the ratchet-teeth 48 of the corresponding rotary disk or bottom 44 of the magazine 42.

79 indicates segmental guards which are secured to the sides of the main frame 1 and its brace-bars 70 and extend on arcs just outward of the lines of movement of the corresponding shuttles or heads 51.

Rigidly secured to the intermediate portion of the crank-shaft 56 is an arm 80, provided at its free end with a pivoted blade 81, which is normally held against a stop-lug 82 on said arm by a spring 83. The arm 80 and its blade 81 constitute what may be appropriately termed the "hill-indicator." The so-called "hill-indicator" works centrally between the traction-wheels of the truck, and hence makes the hill-indicating marks on a line, on each side of which the horses travel and in line with the row of marks made by the marking-wheel on the last previous trip of the machine. This enables the driver to drive the horses on the proper line, while watching the indication as to correct planting, as shown by the marks made by the so-called "hill-indicator."

The marking wheel or device employed in connection with this machine involves novel features, and it is preferably constructed and applied as illustrated in the drawings. To provide for its application, either the ends of the axle 3 or the hubs of the traction-wheels are provided with pronged heads 84, which constitute each one member of a knuckle-joint connection. The marking-wheel 85 is preferably of about the same diameter as the traction-wheels 4, and it is provided with transversely-extended marking-blades 86, secured to the periphery thereof. This marking-wheel is rigid on the outer end of a shaft 87, which is provided at its inner end with a pronged head 88, which constitutes one member of the knuckle-joint connection. A block 89 is pivoted between the prongs of the head 88, and a pin 90 is passed through the said block 89 transversely to its other pivot. This pin or bolt 90 serves to detachably pivot the block 89 to either of the pronged heads 84 of the traction-wheel, according to which side of the machine the marking-wheel is to be used. A guy-rod 91, pivoted at its forward end, preferably to the upper end of the king-bolt 11 on the forward truck 12 is pivoted at its rear end on the intermediate portion of the axle 87, being held outward by a collar 92 on said shaft. This rod 91 prevents the marking-wheel 85 from dropping backward of a vertical plane intersecting the axis of the driving-axle 3, but permits the said wheel 85 to rise and fall to adapt itself to the irregularities of the ground. However, in order to cause the marking-wheel 85 to rise from the ground with the traction-wheels when the machine is rendered inoperative, as shown in Fig. 3, a transverse bar 93, fixed on the main frame 1, is projected at both ends, so as to underlie the rod 91. This lifting-bar 93 normally has such clearance from the rod 91 that it will not interfere with or prevent such vertical movements of the marking-wheel as are necessary in running over ordinarily-irregular ground. The knuckle-joint connections between the shaft or axle 3 and the shaft 87 causes the marking-wheel to rotate with the traction-wheels, but permits the vertical vibrating movements of the same.

Operation. The operation of the machine above described will be substantially as follows: Attention is first called to Fig. 1, which shows the machine at work and illustrates the parts in positions which they will occupy when the finger 66 of the trip-lever 63 is free from the hub projections 7 of the main axle 3. When one of the projections 7 under the advance movement of the machine strikes the finger 66 of the lever 63, it will force the shuttles or heads 51 first into the position indicated in Fig. 6 and then into the extreme position indicated in Fig. 8. In moving from the position indicated in Fig. 6 into the position indicated in Fig. 8 the rear walls or flanges 54 of the shuttles 51 will engage the lugs 74 of the receiving tables or plungers 68 and will

cause them to recede into positions indicated in said Fig. 8. Under this movement the tables 68 will drop their four kernels of corn (more or less) into the cooperating shuttles or heads 51, as indicated in Fig. 8. These kernels of corn are indicated in the drawings by the letter *y*. The said movement of the tables 68, acting through the levers 75, causes the pawls 78 to engage other teeth of the rotary bottoms of the disks 44 of the seed-receptacles 42. The same movements of the crank-shaft 56 which throws the shuttles upward, as above described, throws the arm 80 and its pivoted blade 81 downward into the operative position indicated by dotted lines in Fig. 1, and while this blade 81 is thus thrown downward it will scrape up a small amount of dirt, and thus form a small transversely-extended ridge or pile of dirt *z*. The distance between the lowered blade 81 and the neck or tubes 36 of the shoes 33 is equal to the distance between the hills of corn which are planted. The same movement of the crank-shaft 56 which throws the shuttles downward with the corn and thus plants the hills carries the arm 80 and blade 81 upward, and hence the ridge or pile of dirt *z* will be located in line with the hill next to be planted. This subject will be returned to later on when Fig. 17 is given final consideration. As the operative projection 7 of the striker or hub 6 passes below and releases the pivoted finger or section 66 of the trip-lever 63 the springs 59 on the crank-shafts 56 are permitted to become active to throw the arms 55 and their shuttles 51 back into their normal or lowered positions (best illustrated in Fig. 9) with a very quick movement, and the kernels of corn will be violently thrown or shot, as it were, through the necks or tubes 36 of the shoes 33 and into the ground. Under these rapid movements of the shuttles the forwardly-inclined rear walls 54 thereof prevent the kernels from being thrown outward by centrifugal force. When the shuttles are thrown downward, the springs 71 quickly return the tables or plungers 68 to their normal positions, and, acting through the levers 75, they cause the pawls 78 to move the rotary bottoms or disks 44 one step in advance, and thus deposit new charges of seed or corn within the spouts 49 and onto the said tables 68. The traction-wheels 2 follow closely after the furrow-forming shoes 33 and close the furrows onto the planted corn. The traction spurs or teeth 5 of the wheels 2 are so disposed that they enter the ground while the corresponding trip projection 7 of the hub 6 is in engagement with the trip-lever 63 66, and thus slipping of the traction-wheels while performing their hardest work is made impossible.

It will sometimes happen that the machine will get out of time with respect to the transverse rows previously planted—that is, the operator may find the machine to be planting the hills a little too soon or a little too

late to bring them in transverse line with the previously-planted rows of hills. The machine is in my present invention properly reset so as to plant the rows earlier or later, as may be necessary to bring the rows in proper transverse line, in a manner very similar to that set forth in my prior patented machine—that is, the traction-wheels are raised from the ground and are then turned either forward or backward to give the proper adjustments or resetting of the machine. The raising of the traction-wheels is, however, accomplished in my present invention with greater ease than in my prior patent. The operator simply steps upon the footboard of the lifting frame or lever, and thus his weight is rendered effective to assist in lifting the traction-wheels, main frame, and parts carried thereby. The operator must, however, first release the levers from the lower notches of the latch-segments, and then while standing on the lifting-frame, as just noted, and raising the levers the supplemental truck is thrown downward with its wheels in contact with the ground, the traction-wheels are raised, and through the long rods the bell-crank lever is moved and the forward portion of the frame is raised. This position of the parts is illustrated in Fig. 3. To secure the parts in the positions indicated in Fig. 3, the levers are engaged with the upper notches of the latch-segment.

When the machine is rendered inoperative and moved from one place to another, the traction-wheels, main frame, and parts carried thereby are raised, as shown in Fig. 3, and the load is carried by the forward truck and the supplemental lifting-truck. When the machine is operated, the rods are advisably disconnected from the pins of the lever extensions and are dropped into the positions indicated by dotted lines in Fig. 1. This relieves the said rods from strains when the forward truck runs over irregular ground and causes the rear portion of the machine to be drawn by direct strains on the main frame. The rods being disconnected, as above indicated, permit the furrow-forming shoes to travel evenly over undulating ground. This also insures planting to an even depth regardless of the undulations of the ground.

Attention is here again directed to the diagram view, Fig. 17, in which the stars (marked z') indicate the planted hills of corn and the straight lines (marked z^2) indicate the marks made in the field by the marking-blades of the marking-wheel. The machine in traveling from its dotted-line position to one end of the field will plant a double row of hills z' and will leave one line of transverse marks z^2 . The machine is then turned around and the marking-wheel is shifted to the other side of the machine, or, rather, is left projecting in the same direction, while the machine is turned around. The machine is then

driven in a reverse direction, as indicated by the full lines, Fig. 17. In making the return trip the horses are driven one on each side and the traction-wheels are run one on each side of the first row of marks z^2 . The marking-wheel is carried at such a distance from the adjacent traction-wheel that when the machine is thus guided by the marks z^2 the transverse rows of hills z' will be equally spaced. It will be noted that the marks z^2 are made in transverse line with the hills which are being planted by the machine, and it will also be remembered that the blade of the transverse row-checking device leaves the ridges or hills z just the distance between one hill in advance of the hills which are being planted. Hence it of course follows that if the said piles or ridges z are formed on the marks z^2 formed by the marking-wheel on the last previous trip of the machine across the field the rows which are then being planted will come directly in transverse line with the rows previously planted. The driver or operator by noting any variation from this proper marking action may readily determine whether the machine is planting too soon or too late and may readily reset the machine by moving the traction-wheels in the manner previously described. It will be understood that the purpose of pivoting the blade to the lever is to prevent the same from being broken in case it should strike a stone or unyielding object.

It will be noted that the forward truck of the machine when the machine is drawn is free for pivotal movement in a horizontal plane on the pivot, and is also free for movement in a vertical plane longitudinally of the machine on the pivot. In other words, the said truck is free, practically, for universal movement within certain limits. This permits the forward truck to move unevenly to adapt itself to the irregular ground and also permits the pole to be variously adjusted at its forward end without affecting the action of the machine or of the planting devices.

It will of course be understood that the machine above described is capable of many modifications in its details of construction and that the machine might be designed simply to plant one row at a time or might be designed to plant more than two rows at one trip.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a planter, the combination with a seed magazine or receptacle, of a vibrating feed shuttle or head cooperating therewith to deliver the seeds, of a vibrating hill-indicator movable with a properly-timed action with respect to said shuttle, to make marks on the ground between the truck-wheels indicating where the machine has planted, substantially as described.

2. In a planter, the combination with a seed-magazine and a vibrating shuttle for delivering the seeds from said magazine to the

ground, of a transverse row-marker carried by the machine, and a hill-indicator comprising an arm connected for movements with said shuttle and provided at its end with a blade or marking device engageable with the ground, when said shuttle is raised, substantially as described.

3. In a planter, the combination with the main frame, traction wheel or wheels and planting devices, of the supplemental truck movable on the main frame, the lifting frame or lever pivoted to said supplemental truck and operative on said main frame when stood upon, and a cooperating hand-lever pivoted on said supplemental truck-frame and provided with connections for assisting in the lifting of the main frame and traction-wheels, substantially as described.

4. In a planter, the combination with a seed magazine or receptacle having a rotary bottom with ratchet-teeth and seed-passages, of a receiving shelf or table receiving the seeds from said magazine and provided with a ratchet device operated directly by the movements of said receding shelf to rotate said rotary magazine-bottom by action on the ratchet-teeth thereof, and a vibrating shuttle or seed-delivery head acting upon said receding table and serving to deliver the seeds to the ground, substantially as described.

5. In a planter, the combination with a seed-magazine, of a vibrating shuttle or head receiving the seeds from said magazine and delivering them to the ground, said shuttle having the forwardly-inclined rear wall or flange for preventing the seeds from being thrown outward by centrifugal force, substantially as described.

6. In a planter, the combination with a traction wheel or wheels and a hub or knocker with striking projections, of a seed-magazine, a vibrating shuttle or seed-delivery head-re-

ceiving end from said magazine and delivering it to the ground, and connections for vibrating said shuttle involving the pivoted lever 63 with pivoted finger or projection 66 subject to the trip projections of said knocker, under one direction of movement only, being adapted to yield under backward movements of said truck-wheels substantially as described.

7. In a planter, the combination with a furrow-forming shoe and planting device, of truck or traction wheels, and graders or planers positioned to cut the upper surface of the ground in line with, and in advance of said traction-wheels, said graders having horizontally-extended lower edges that extend obliquely across the paths of said wheels, substantially as and for the purposes set forth.

8. In a planter, the combination with a rear truck and planting devices carried thereby and operated from the traction-wheels thereof, of a forward truck connected to the forward frame portion of said truck by a compound pivot or joint which permits said forward truck to swing horizontally and oscillate vertically, substantially as described.

9. In a planter, the combination with the forward truck, of a rear main truck connected to said forward truck by a bell-crank lever, planting mechanism carried by main truck, a lifting-truck mounted on the main truck, a lifting-lever on said lifting-truck connected to the main truck, and a detachable connection between said bell-crank and said lifting-lever, substantially as and for the purposes set forth.

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

HORACE N. RANDALL.

Witnesses:

F. S. BROWN,
W. O. MUSSER.