

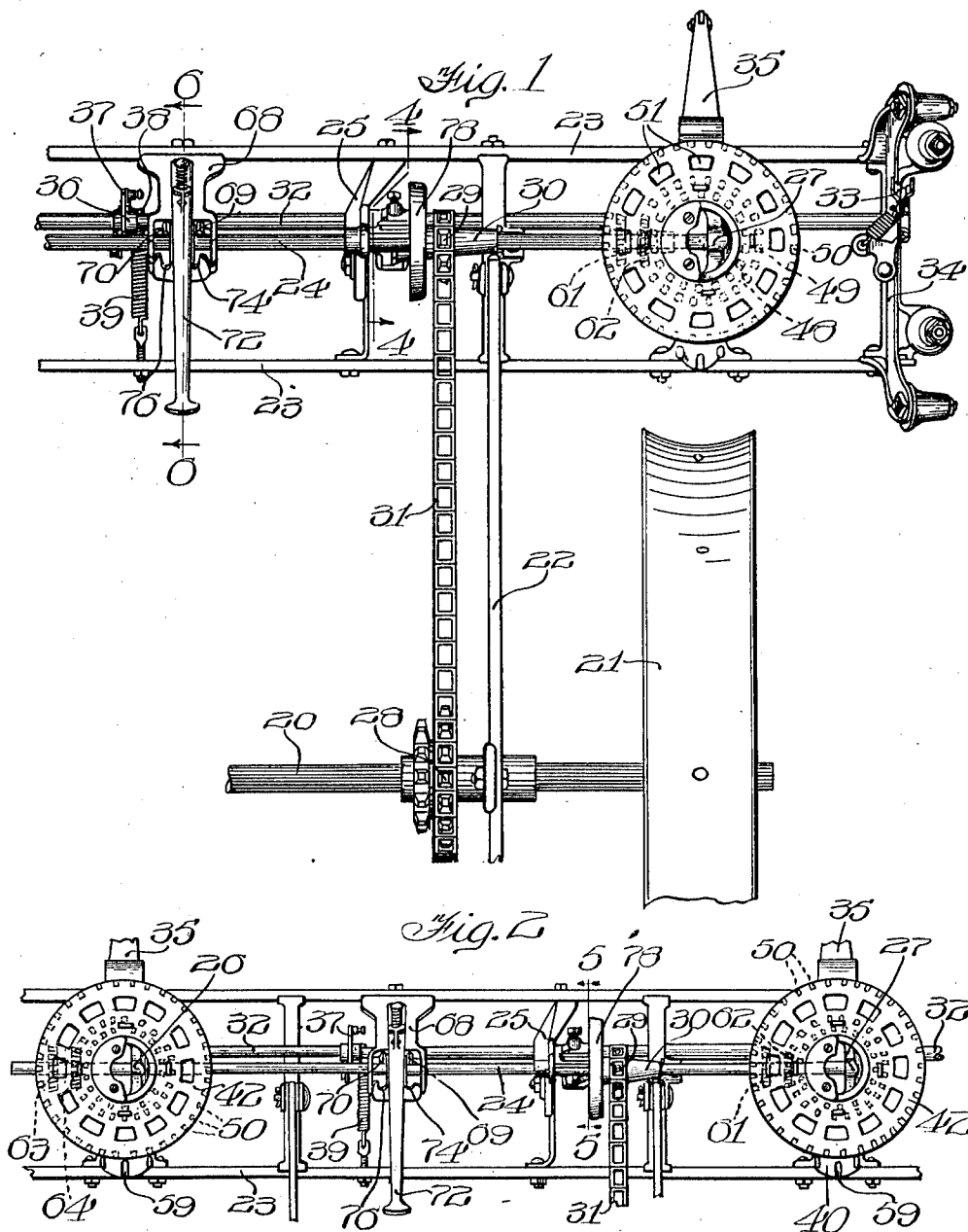
W. S. GRAHAM.
CORN PLANTER.

APPLICATION FILED NOV. 9, 1912.

Patented July 8, 1913.

3 SHEETS—SHEET 1.

1,066,601.



WITNESSES:

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CORN PLANTER.

Patented July 8, 1913.

3 SHEETS—SHEET 2.

Fig. 3.

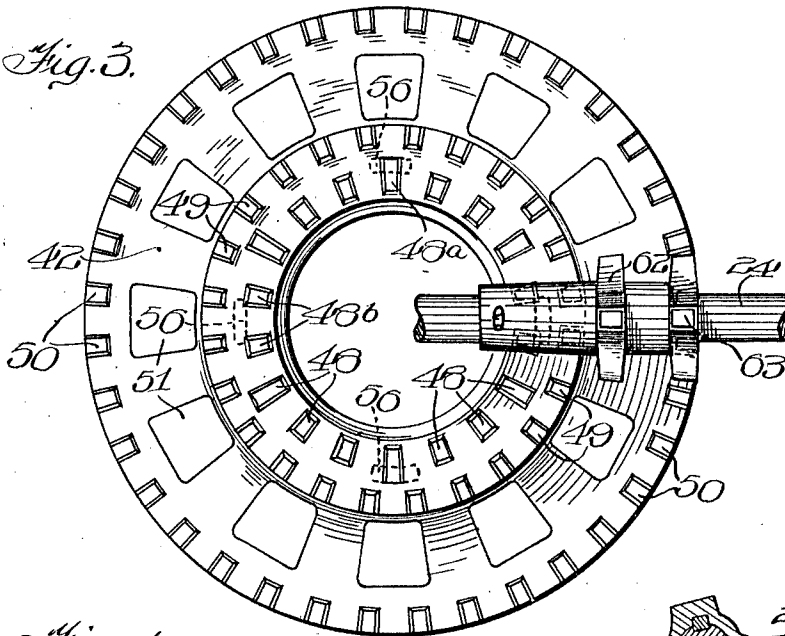


Fig. 4.

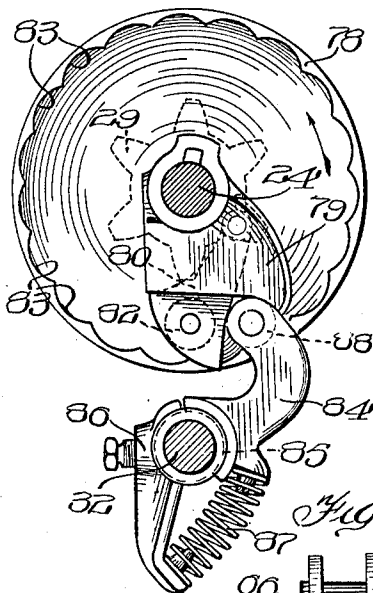


Fig. 5

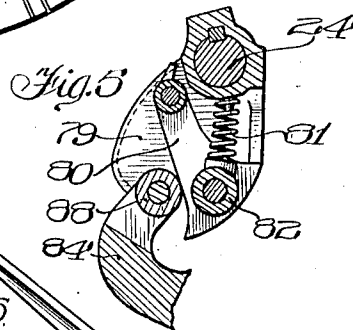


Fig. 6.

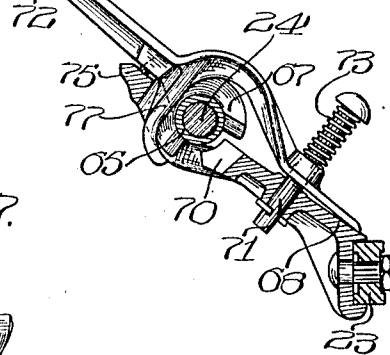
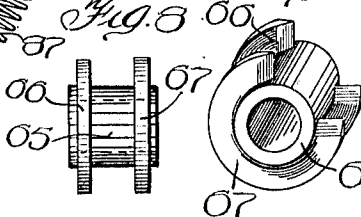


Fig. 7.



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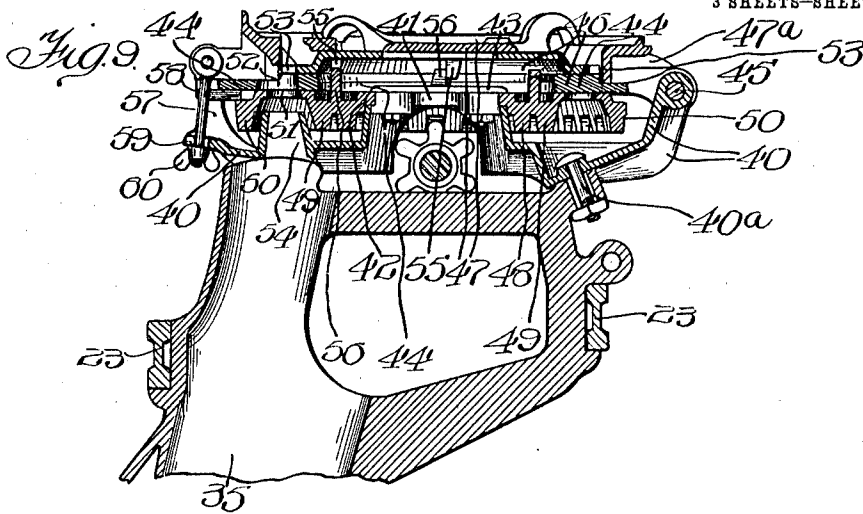
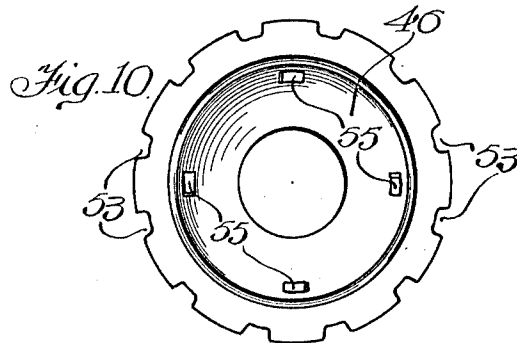
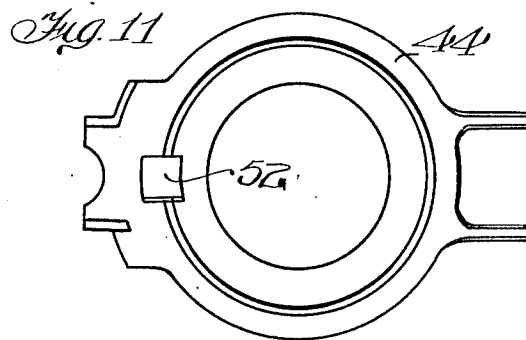
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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CORN-PLANTER.

1,066,601.

Specification of Letters Patent.

Patented July 8, 1913.

Application filed November 9, 1912. Serial No. 730,349.

To all whom it may concern:

Be it known that I, WILLIAM S. GRAHAM, a citizen of the United States, residing at Canton, in the county of Fulton and State of Illinois, have invented certain new and useful Improvements in Corn-Planters, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to corn planters and particularly to that type of machine in which a single kernel is dropped at a time into the runner, the seed-plate being driven from the carrying wheels through the medium of a clutch thrown into operation by the usual tappet wire.

It has for its object the provision of new and improved means for driving the seed-plate so that either two, three or four grains of corn may be dropped in each hill as desired, means being provided for changing at the proper time from one driving gear to another without stopping the machine.

Heretofore efforts have been made to provide a seed-plate with three gears on its under face, through any one of which gears the seed-plate might be driven for dropping either two, three or four grains in the hill. In some instances the three gears have been crowded inside of the periphery of the seed-plate,—that is to say, the diameter of the largest gear has been smaller than the diameter of the seed-plate,—so that the seed were adapted to fall beyond the periphery of the gears into the seed-tube below. This has been objectionable, however, for the reason that in such cases it is necessary to provide a seed-plate of such extreme size as to be impracticable. In other instances the three gears have been placed outside of the periphery of the seed-plate,—that is to say, the diameter of the smallest gear has been greater than the diameter of the seed-plate,—so that the seed were adapted to fall inside of the smallest gear into the seed-tube below. In this case difficulty has been encountered in various ways, such as being compelled to use a gear-plate of abnormal size, difficulty in getting the teeth in the different sets of a practical size and of the right multiples, and difficulty in providing shifting means for the pinions so that they could be moved from one set of teeth to another without getting the arrangement out of time.

I have provided a construction in which both the seed-plate and all of the gears are of a practical workable size, in which the teeth of the gears are all of proper proportions relative to the diameter of the gears, in which the proper multiples are readily arrived at for attaining the dropping of two, three or four grains, and in which provision is made insuring a proper timing of the parts.

The means by which I have accomplished my object are illustrated in the accompanying drawings and hereinafter specifically described. That which I believe to be new is set forth in the claims.

In the drawings,—Figure 1 is a top view, partly broken away, of the front frame of the planter embodying my improvements, showing the connection to the rear frame of the planter and showing the check-rower head on the front frame; Fig. 2 is a top view, also partly broken away, showing the connections between the seed-shaft and the seed-plates at both sides of the machine; Fig. 3 is a bottom plan view of the gear-plate by which the seed-plate is driven; Fig. 4 is substantially a cross-section taken on line 4—4 of Fig. 1; Fig. 5 is substantially a cross-section taken on line 5—5 of Fig. 2; Fig. 6 is substantially a cross-section taken on line 6—6 of Fig. 1; Fig. 7 is an enlarged detail, being a perspective view of the collar mounted upon the seed-shaft by means of which said seed-shaft is shifted; Fig. 8 is a view of said collar as seen from the left in Fig. 7; Fig. 9 is a central vertical section through the seed-plate and its operating devices; Fig. 10 is a bottom view of the seed-plate; and Fig. 11 is a top view of the bottom-plate.

Referring to the several figures of the drawings in which corresponding parts are indicated by the same reference characters,—20 indicates the main shaft of the machine having carrying wheels 21 keyed or otherwise non-rotatably mounted on said shaft at its ends. 22 indicates the main frame of the planter in which said shaft 20 is journaled in any suitable manner, the forward end of the shaft 22 having pivotally mounted upon it the runner frame 23 of any suitable construction. 24 indicates the seed-shaft of the machine suitably journaled in a bracket carried by the frame 23 and by bearings

26—27 carried by said runner frame adjacent to the seed-plates.

28 indicates a sprocket gear keyed or otherwise non-rotatably mounted upon the shaft 20 in line with a sprocket gear 29 keyed or otherwise non-rotatably mounted upon a sleeve 30 rotatably mounted upon the seed-shaft 24. 31 indicates a sprocket chain connecting said gears 28—29 whereby when the machine is being drawn forward the sleeve 30 is continuously rotated, as will be readily understood.

32 indicates a shaft journaled in the bracket 25 and otherwise suitably supported in the front frame 23. Said shaft 32 has mounted upon each end a tappet lever 33 by which said shaft is rocked in the ordinary well known manner by a tappet wire working in the check-rower head 34, as will be readily understood.

35 indicates a runner or furrow-opener, partly broken away in Fig. 9, where it is best shown, said furrow-opener being of any approved type.

36 indicates a bracket mounted upon the rock-shaft 32, having an upwardly extending arm 37, and a downwardly extending arm 38, to either arm of which a spring 39 is adapted to be connected at its front end, the rear end of said spring being connected to the front frame 23. The spring 39 serves to hold the rock-shaft 32 in position with the tappet lever in its foremost position, as shown in Fig. 1, when the spring is connected to the downwardly extending arm 38, or to hold the rock-shaft 32 in position with the tappet lever 33 in its rearmost position whenever it is desired to use the machine as a drill instead of as a check-rower.

40 All of the parts heretofore described are of well known construction and operation and it is believed to be unnecessary to further describe them herein.

Coming now to the seed-hoppers and the mechanism for driving the seed-plates from the seed-shaft 24, 40 indicates a base-plate secured upon the upper end of the furrow-opener 35 in any approved manner, one of the bolts by which the plate 40 is secured in position in the present construction being shown in Fig. 9 and designated 40^a. The bearings 26—27 for the seed-shaft 24 are, in the construction shown, formed integral with the base-plates 40. Said base-plate 40 is provided about its central point with a boss or ring 41 circular in shape forming the bearing for the gear-plate 42 which is held in position thereon by a plate 43 which is secured to the ring 41 and overlaps the inner edges of the gear-plate 42.

44 indicates a plate, usually termed the bottom-plate, which is pivotally mounted upon the base-plate 40 by means of a pin 45.

46 indicates a seed-plate resting upon the bottom-plate 44 and held thereby in position

against the cut-off plate 47 upon which a hopper of any ordinary construction is secured in any suitable way, as will be readily understood. The said cut-off plate 47 is pivotally mounted by means of arms 47^a upon the pin 45, one of said arms 47^a being shown in Fig. 9.

As shown in Figs. 3 and 9, the gear-plate 42 is provided with three sets of gear teeth 48, 49 and 50, spaced thereabout at equal intervals from each other. In the construction shown, there are eighteen of the teeth 48, twenty-four of the teeth 49, and thirty-six of the teeth 50.

51 indicates openings through the gear-plate 42, one of said openings being, as shown in Fig. 9, directly in alinement with the opening 52 through the base-plate 44 and directly in line with one of the seed-cells 53 of the seed-plate 46. As shown in Fig. 3, the gear-plate 42 is provided with twelve of such openings 51 spaced about said plate 42 between the teeth 49 and the teeth 50. As shown in Fig. 10, the seed-plate also is provided with twelve seed-cells 53 spaced equally about its periphery. Thus one of the openings 51 in the gear-plate 42 is found directly beneath each of the seed-cells 53 as said two plates rotate together, as hereinafter described. As shown in Fig. 9, the base-plate 40 is provided with an opening 54 therethrough directly in line with the opening 52 through the base-plate 44.

The seed-plate 46 is caused to rotate with the gear-plate 42 by reason of lugs 55 extending from the lower face of said seed-plate, which lugs are engaged by lugs 56 extending from the upper face of the gear-plate 42.

As best shown in Fig. 9, the bottom-plate 44 rests at its rear edge upon lugs 57 rising from the rear face of the base-plate 40. The cut-off plate 47 is provided with a pivoted pin 58 at its rear edge the lower end of which is adapted to be turned down into engagement with a slot 59 in the rear edge of the base-plate 40, a thumb nut 60 screw-threaded on the lower end of the pivoted pin 58 being adapted to be tightened thereon to hold the bottom-plate 47 rigidly in position.

As best shown in Fig. 2, the seed-shaft 24 is provided at one end with two pinions 61—62 and at its other end with two pinions 63—64 keyed in position thereon and rotatable therewith. As shown in said Fig. 2, the pinion 62 is in engagement with the teeth 49 of one of the gear-plates 42 and the pinion 64 is in engagement with the teeth 49 of the other gear-plate 42. The pinions 61—62—63—64 have six teeth each, wherefore at each complete rotation of the seed-shaft 24 with the pinions 62 and 64 in engagement with the gear-plates 42, as shown in Figs. 1 and 2, said gear-plates 42 are given one-fourth of a complete rotation.

As will be readily understood, then, for each complete rotation of the seed-shaft 24 with the pinions 62—64 in operative position, three seed-cells of the seed-plate 46 are carried over the openings 52—54 of the plates 44—40, three kernels of corn being accordingly dropped by such operation. When the seed-shaft 24 has been shifted laterally of the machine by the means hereinafter described so that the pinions 61—63 engage the teeth 50 of the gear-plate 42, for each complete rotation of the seed-shaft 24 the gear-plate 42 is given a sixth of a rotation, thus carrying two of the cells 53 of the seed-plate 46 past the openings 52—54 and dropping two kernels into the seed-tube. When the seed-shaft 24 has been shifted farther to the right in Fig. 2, bringing the pinions 62—64 into engagement with the teeth 48 of the gear-plate 42, for each complete rotation of the seed-shaft 24 the gear-plate 42 will be given a third of a rotation thus carrying four cells 53 of the seed-plate 46 past openings 52—54 and causing four kernels to be dropped into the seed-tube.

As illustrated in Fig. 3, the parts are in the position they assume when the gear-plate 42 is at rest with the clutch by which the seed-shaft 24 is driven thrown out of operation. As is seen from an inspection of Fig. 3, the teeth 48—49 close to the pinion 62 are directly in line longitudinally of the shaft 24 so that the gear 62 may at this phase be readily slid into engagement with either the teeth 49 or with the teeth 48. It will be understood, however, that if the seed-shaft 24 were shifted longitudinally of itself bringing the pinion 62 into mesh with the teeth 49 and if said seed-shaft 24 were given then a complete rotation rotating the gear-plate 42 one-fourth of a complete rotation, thereupon the tooth 48^a would be directly in line longitudinally of the shaft 24 with one of the teeth of the pinion 62. In that case it would be impossible then to shift the seed-shaft 24 farther to the left in Fig. 3, but when the seed-shaft 24 had been given one more complete rotation giving the gear-plate another quarter rotation, then the teeth marked 48^b would be in position over the central longitudinal line of the seed-shaft 24, whereupon the pinion 62 would again be in position to be shifted to the left in Fig. 3. That is to say, the pinion 62 can be shifted from the teeth 49 to the teeth 48 only upon each alternate rotation of the seed-shaft 24.

Coming now to the means for shifting the seed-shaft 24 longitudinally of itself in the front frame 23 of the planter for the purpose of shifting the pinions by which the gear-plate is driven as above described, 65 indicates a short sleeve keyed or otherwise fixed upon the shaft 24, said sleeve being provided with two collars 66—67 spaced

apart thereon. As best shown in Fig. 7, the collars 66 and 67 are cut away at one side of the sleeve 65, the ends of said mutilated collars 66—67 being beveled.

68 indicates a bracket mounted on the front cross-bar of the front frame 23 and extending upwardly and rearwardly therefrom. As shown in Fig. 2, the bracket 68 is provided at its upper end with an opening in which the sleeve 65 on the seed-shaft 24 is located and in which it is capable of movement laterally of the machine. 69—70 indicate lugs extending upward from the lower face of the opening in the upper end of said bracket 68. These lugs 69—70 extend into such close proximity to the seed-shaft 24 that the sleeve 65 is incapable of being moved laterally except when the seed-shaft is in the position shown in Fig. 6 with the lugs 69—70 opposite the point where the collars 66—67 are cut away. The sleeve 65 is so adjusted upon the shaft 24 that the collars 66—67 are in the position shown in Fig. 6 when the clutch hereinafter described is in the position shown in Fig. 4,—that is to say, when the said shaft 24 is not operatively connected through the clutch to the drive-shaft 20 of the machine. As best shown in Fig. 2, the upper edges of the lugs 69—70 are beveled to correspond to the beveling of the ends of the mutilated collars 66—67.

71 indicates a pin passing through a suitable opening in the bracket 68, mounted upon the upper end of which is a lever 72 yieldingly pressed downward against the bracket 68 by a spring 73 also mounted upon the upper end of said pin 71. The upper end of the bracket 68 is provided with three notches 74—75—76, with any one of which the lever 72 is adapted to engage, the lever 72 being free to be shifted from one to another of the notches 74—75—76 when it is raised against the action of the spring 73. As shown in Fig. 6, an arm 77 carried by the lever 72 works between the collars 66—67 whereby a movement of the lever 72 from one to another of said notches serves to shift the seed-shaft 24 longitudinally of itself. As will be readily understood, when the lever 72 is in engagement with the notch 76 the pinions 61 and 63 will be engagement with the teeth 50 of the gear-plates 42. When the lever 72 is in engagement with the notch 75 the pinions 62 and 64 are in engagement with the teeth 49 of the gear-plates 42, and when the lever 72 is in engagement with the notch 74 the pinions 62—64 are in engagement with the teeth 48 of said gear-plates 42.

As will be understood from an inspection of the drawings in connection with the above description, the lever 72 is capable of being shifted only when the clutch is out of operative engagement with the shaft 24 and

when the collars 66—67 are in the position shown in Fig. 6. That is to say,—after the clutch has been thrown into operative engagement with the shaft 24 as hereinafter described, the seed-shaft 24 cannot be shifted through the medium of the lever 72 until the seed-shaft has completed one full rotation and the clutch has been again disengaged from the shaft 24. As will be further understood from the above description, if the lever 72 is carelessly thrown from one notch to another and left standing at an intermediate point without complete engagement with any one of the notches, the beveled end of one of the collars 66—67 will engage the beveled end of one of the lugs 69—70 and throw the sleeve 65 and the seed-shaft 24 in one direction or the other into operative position permitting the lever 72 to assume complete engagement with one of said notches.

Coming now to the clutch mechanism by which the gear 29 and the sleeve 30 are adapted to be brought into engagement with the shaft 24, 78 indicates a drum revoluble upon the shaft 24 and fixed upon the sleeve 30.

79 indicates a bracket feathered or otherwise non-rotatably mounted upon the seed-shaft 24.

80 indicates a dog pivotally mounted upon the bracket 79 eccentrically of the drum 78. 81 indicates a coiled spring tending to hold said dog 80 in its outermost position.

82 indicates a stud or roller mounted upon the free end of the dog 80 adapted to engage any one of the grooves 83 on the inner periphery of the drum 78. As will be understood, when the roller 82 is in contact with one of the grooves 83 of the drum 78 the rotation of said drum in the direction indicated by the arrow in Fig. 4 will serve to drive the seed-shaft 24 in the same direction, such rotation of the seed-shaft 24 subsisting until the roller 82 is withdrawn from the groove 83.

The means by which the roller 82 is thrown out of engagement with one of the grooves 83 and at the proper interval permitted to assume engagement again with another of said grooves 83 comprises an arm 84 revolubly mounted upon the shaft 32 by means of a hub 85.

86 indicates a bracket fixed upon the shaft 32, a spring 87 being interposed between said bracket and the arm 84 tending to hold said arm 84 turned to the limit of its motion in counter-clockwise direction relative to the shaft 32, as shown in Fig. 4. As indicated in Fig. 5, the arm 84 is forked at its outer end, between the arms of which fork there is revolubly mounted a roller 88.

With the clutch mechanism in the position shown in Fig. 4 with the roller 88 resting between the end of the bracket 79 and the dog 80 and thus holding the roller 82

out of engagement with the grooves 83 of the drum 78, the operation of the device is as follows: When a knot on the usual tappet wire engages the tappet lever 33 moving said lever backward and rotating the shaft 32 in clockwise direction in Fig. 4, the arm 84 and the roller 88 are rotated out of engagement with the bracket 79 and dog 80, thus permitting the spring 81 to move the roller 82 into engagement with one of the grooves 83 of the drum 78 whereby the drum 78, which is being rotated through the medium of the sprocket chain 31, rotates the shaft 24, rotating the seed-plate as above described. When the knot of the tappet wire has passed out of engagement with the lever 33, the spring 39 rotates the shaft 32 in a counter-clockwise direction in Fig. 4 as above described, bringing the roller 88 to substantially the position shown in Fig. 4. When the bracket 79 has almost completed one complete revolution about the shaft 24, the forward edge of said bracket 79 in the direction of its rotation is brought into contact with the roller 88, moving the arm 84 in a counter-clockwise direction against the action of the spring 87, the roller 88 finally passing over the end of the bracket 79. The spring 87 thereupon turns the arm 84 in a counter-clockwise direction forcing the dog 80 in a clockwise direction relative to its pivotal mounting on the bracket 79, forcing the roller 82 out of engagement with the groove 83, the parts being then again in the position shown in Fig. 4. Whenever it is desired to use the machine as a drill and not as a check-rower, the spring 39 is detached from the arm 38 as above described and made fast upon the arm 37 holding the tappet lever in its rear-most position and holding the arm 84 out of the path of rotation of the bracket 78 and the dog 80. In such case, the dog 80 has continuous engagement with the drum 78, whereby the seed-shaft 24 is continuously driven while the machine is being drawn along, the kernels dropping one at a time for planting a single kernel at a point instead of planting the kernels in hills. As will be readily understood, the distance at which the kernels are planted from each other in drilling depends upon the rate of rotation of the gear-plate 42 relative to the rate of rotation of the seed-shaft 24. This of course is variable in drilling by the use of the lever 72 just as in the use of the machine as a check-rower.

So far as I am aware, I am the first in the art to provide a plurality of rows of gear teeth for driving a seed-plate, between two rows of which gear teeth is positioned the row of seed-cells which deliver the kernels to the seed-tube, and this construction is accordingly claimed broadly, inasmuch as it enables me to attain a thor-

oughly practical workable construction overcoming completely the difficulties encountered in the many efforts heretofore made to provide a practical construction in which the seed-plate is driven by gears rotating with the seed-plate. So far as I am aware, I am the first in the art to provide a gear-plate, formed separately from the seed-plate and adapted to rotate therewith, with a plurality of openings one directly in line with each of the seed-cells of the seed-plate, by which expedient I am enabled to accomplish my object in the construction shown, and this feature also is claimed broadly.

That which I claim as my invention and desire to secure by Letters Patent is,—

1. In a corn planter, the combination of a front frame, a seed-shaft adapted to be shifted longitudinally of itself therein, a seed-plate, connections between said seed-plate and said seed-shaft whereby said seed-plate may be driven from said seed-shaft at a rate variable relative to said seed-shaft, means for intermittently driving said seed-shaft, a collar fixed on said shaft, means co-operating with said collar for holding said shaft against shifting, said collar being cut away at one side whereby when said shaft is in a predetermined position said collar is freed from said holding means permitting said shaft to be shifted, and means adapted to operate upon said collar for shifting said shaft.

2. In a corn planter, the combination of a front frame, a seed-shaft adapted to be shifted longitudinally of itself therein, a seed-plate, connections between said seed-plate and said seed-shaft whereby said seed-plate may be driven from said seed-shaft at a rate variable relative to said seed-shaft, means for intermittently driving said seed-shaft, a collar fixed on said shaft, a lug on said frame adjacent to which said collar rotates whereby said shaft is held against longitudinal movement relative to said frame, said collar being cut away at one side whereby when said shaft is in a certain predetermined position said shaft may be shifted, and means adapted to operate upon said collar for shifting said shaft.

3. In a corn planter, the combination of a front frame, a seed-shaft adapted to be shifted longitudinally of itself therein, a seed-plate, connections between said seed-plate and said seed-shaft whereby said seed-plate may be driven from said seed-shaft at a rate variable relative to said seed-shaft, means for intermittently driving said seed-shaft, two collars fixed on said shaft at a distance from each other, and a lug on said frame adapted to work between said two collars whereby said shaft is held against longitudinal movement relative to said frame, said collars being cut away at one

side whereby when said shaft is in a certain predetermined position said shaft may be shifted.

4. In a corn planter, the combination of a front frame, a seed-shaft adapted to be shifted longitudinally of itself therein, a seed-plate, connections between said seed-plate and said seed-shaft whereby said seed-plate may be driven from said seed-shaft at a rate variable relative to said seed-shaft, two collars fixed on said shaft at a distance from each other, and two lugs on said frame between which either one of said collars is adapted to work whereby said shaft is held against longitudinal movement relative to said frame, said collars being cut away at one side whereby when said shaft is in a certain predetermined position said shaft may be shifted.

5. In a corn planter, the combination of a front frame, a seed-shaft adapted to be shifted longitudinally of itself therein, a seed-plate, connections between said seed-plate and said seed-shaft whereby said seed-plate may be driven from said seed-shaft at a rate variable relative to said seed-shaft, two collars fixed on said shaft at a distance from each other, and two lugs on said frame between which either one of said collars is adapted to work whereby said shaft is held against longitudinal movement relative to said frame, said collars being cut away at one side whereby when said shaft is in a certain predetermined position said shaft may be shifted, the ends of said collars where they are cut away and the engaging ends of said lugs being beveled whereby if rotation of the seed-shaft is attempted with the seed-shaft out of normal position for rotation the shaft will be forced by said lugs into normal position.

6. In a corn planter, the combination of a front frame, a seed-shaft adapted to be shifted longitudinally of itself therein, a seed-plate, connections between said seed-plate and said seed-shaft whereby said seed-plate may be driven from said seed-shaft at a rate variable relative to said seed-shaft, means for intermittently driving said seed-shaft, two collars fixed on said shaft at a distance from each other, a lug on said frame adapted to work between said two collars whereby said shaft is held against longitudinal movement relative to said frame, said collars being cut away at one side whereby when said shaft is in a certain predetermined position said shaft may be shifted, and means adapted to work between said two collars for shifting said shaft at the proper moment and for locking the shaft in such adjusted position.

7. In a corn planter, the combination of a front frame, a seed-shaft adapted to be shifted longitudinally of itself therein, a seed-plate, connections between said seed-

plate and said seed-shaft whereby said seed-plate may be driven from said seed-shaft at a rate variable relative to said seed-shaft, means for intermittently driving said seed-shaft, two collars fixed on said shaft at a distance from each other; a lug on said frame adapted to work between said two collars whereby said shaft is held against longitudinal movement relative to said frame, said collars being cut away at one side whereby when said shaft is in a certain predetermined position said shaft may be shifted, a lever adapted to work between said two collars for shifting said shaft, and means for locking said lever in adjusted position.

8. The combination of a seed-plate having a plurality of seed-cells arranged thereabout, and means for rotating said seed-plate, said rotating means comprising a row of gear teeth arranged outside of said seed-cells, another row of gear teeth arranged inside of said seed-cells, and gears adapted to mesh alternatively with said rows of gear teeth.

9. The combination of a seed-plate having a plurality of seed-cells arranged concentrically about its axis of rotation, and means for rotating said seed-plate, said rotating means comprising a row of gear teeth arranged concentrically about the axis of rotation of said seed-plate at a greater distance from the axis than are the seed-cells, another row of gear teeth arranged concentrically about the axis of rotation of said seed-plate at a smaller distance from the axis than are said seed-cells, and gears adapted to mesh alternatively with said rows of gear teeth.

10. The combination of a seed-plate having a plurality of seed-cells arranged concentrically about its axis of rotation, and means for rotating said seed-plate, said rotating means comprising a row of gear teeth arranged concentrically about the axis of rotation of said seed-plate at a greater distance from the axis than are the seed-cells, another row of gear teeth arranged concentrically about the axis of rotation of said seed-plate at a smaller distance from the axis than are said seed-cells, a seed-shaft, means for driving said seed-shaft, a pinion mounted on said shaft adapted to be brought into engagement with the teeth arranged outside of said seed-cells, and another pinion mounted on said shaft adapted to be brought into engagement with the teeth arranged inside of said seed-cells.

11. The combination of a seed-plate having a plurality of seed-cells arranged concentrically about its axis of rotation, and means for rotating said seed-plate, said rotating means comprising a row of gear teeth arranged concentrically about the axis of rotation of said seed-plate at a greater dis-

tance from the axis than are the seed-cells, another row of gear teeth arranged concentrically about the axis of rotation of said seed-plate at a smaller distance from the axis than are said seed-cells, a seed-shaft, means for driving said shaft, two pinions mounted on said shaft and spaced apart thereon, and means for shifting said shaft longitudinally of itself for bringing said pinions alternatively into mesh with said two sets of gear teeth.

12. The combination of a seed-plate having a plurality of seed-cells arranged concentrically about its axis of rotation, and means for rotating said seed-plate, said rotating means comprising a row of gear teeth arranged concentrically about the axis of rotation of said plate at a greater distance from the axis than are the seed-cells, another row of gear teeth arranged at equal distances apart concentrically about the axis of rotation of said seed-plate at a smaller distance from the axis than are said seed-cells, a seed-shaft, means for driving said seed-shaft, two pinions of equal size mounted on the seed-shaft and spaced apart thereon, and means for shifting said shaft longitudinally of itself for bringing said pinions alternatively into mesh with said two sets of gear teeth.

13. The combination of a seed-plate having a plurality of seed-cells arranged concentrically about its axis of rotation, and means for rotating said seed-plate, said rotating means comprising a row of gear teeth arranged at equal distances apart concentrically about the axis of rotation of said seed-plate at a greater distance from the axis than are the seed-cells, two other rows of gear teeth each arranged at the same distance apart concentrically about the axis of rotation of said seed-plate both at smaller distances from the axis than are said seed-cells, a seed-shaft, means for driving said seed-shaft, two pinions of equal size mounted on said shaft and spaced apart thereon, and means for shifting said shaft longitudinally of itself for bringing one of said pinions into mesh with the row of teeth arranged outside of said row of seed-cells or for bringing the other of said pinions into mesh with either of the rows of gear teeth arranged inside of said row of seed-cells.

14. In a variable seed-plate drive, the combination of a rotatable gear plate having a plurality of openings therein arranged in series about its axis of rotation, and means for driving said gear plate, said driving means comprising a set of gear teeth arranged outside of the row of openings in said gear plate, another set of gear teeth arranged inside of said row of openings, and gears adapted to mesh alternatively with said rows of gear teeth.

15. In a variable seed-plate drive, the

combination of a rotatable gear plate having a plurality of openings therein arranged concentrically about its axis of rotation, and means for driving said gear plate, said driving means comprising a set of gear teeth arranged outside of the row of openings therein, two sets of gear teeth arranged inside

of said row of openings, and gears adapted to mesh alternatively with said rows of gear teeth.

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Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
