No. 825,601. PATENTED JULY 10, 1906.

W. F. JACOBS.

SEED PLANTER.

APPLICATION FILED MAY 25, 1905.

6 SHEETS—SHEET 1.

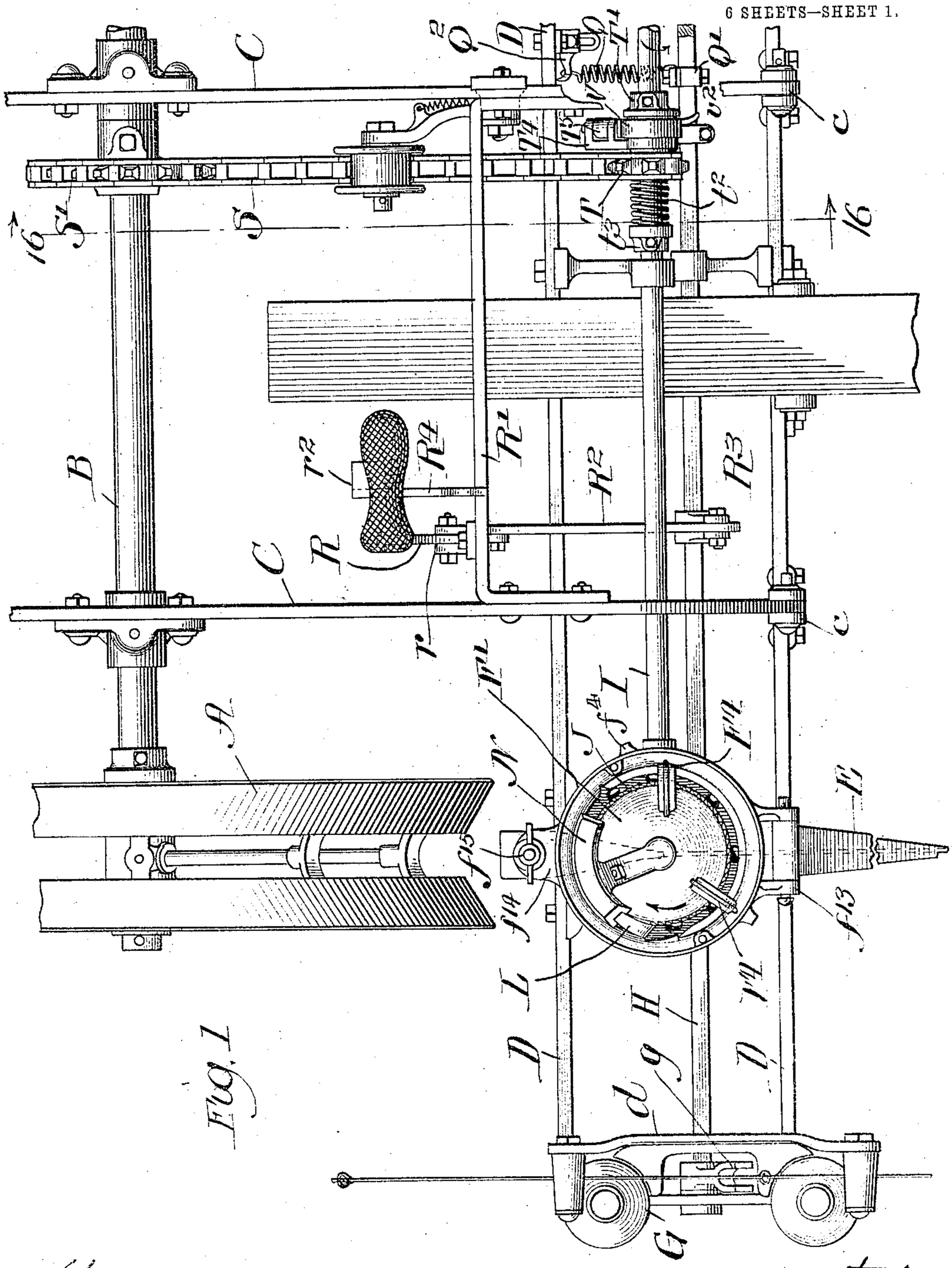

FIG. 1

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6 SHEETS—SHEET 2.

Fig. 2

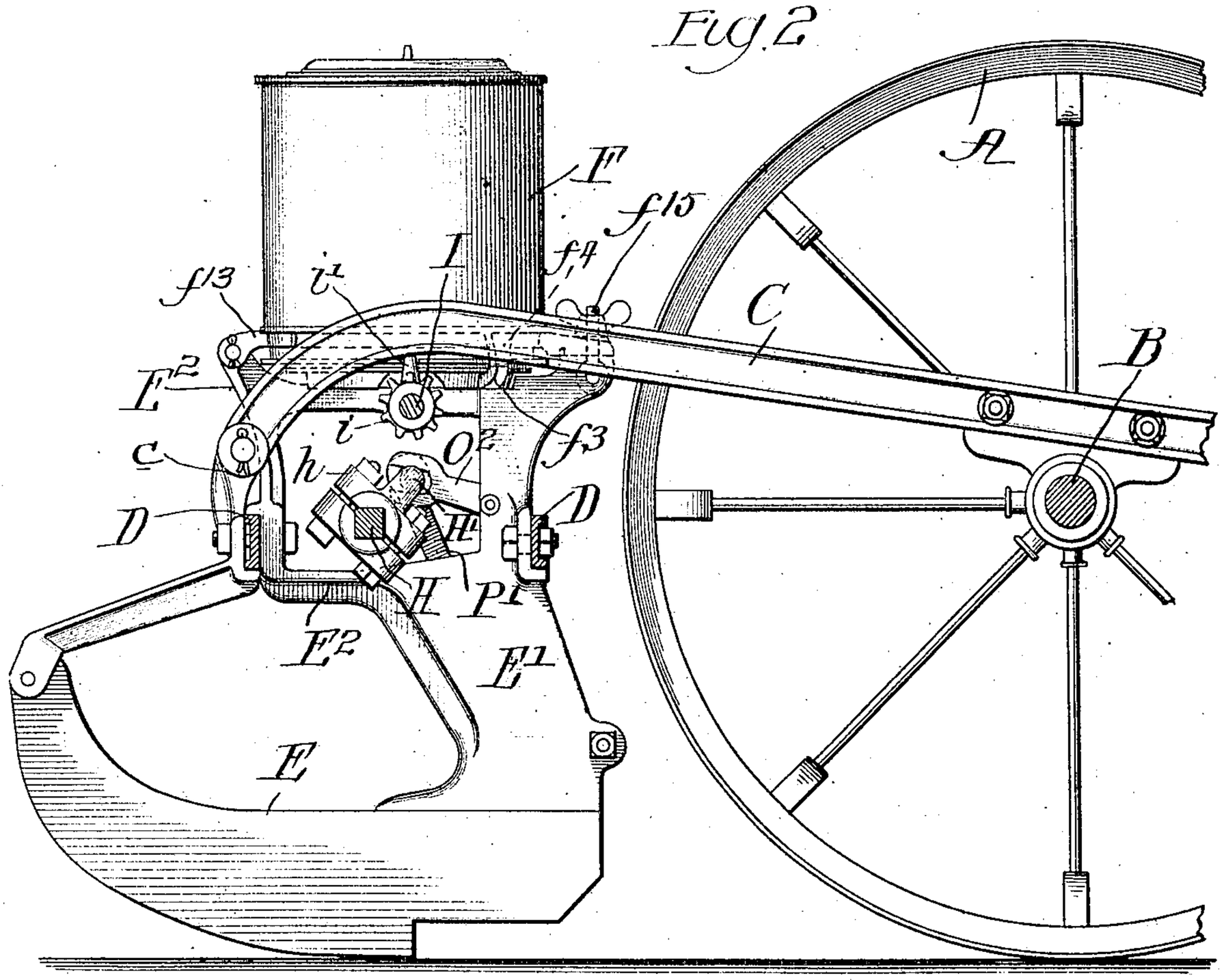
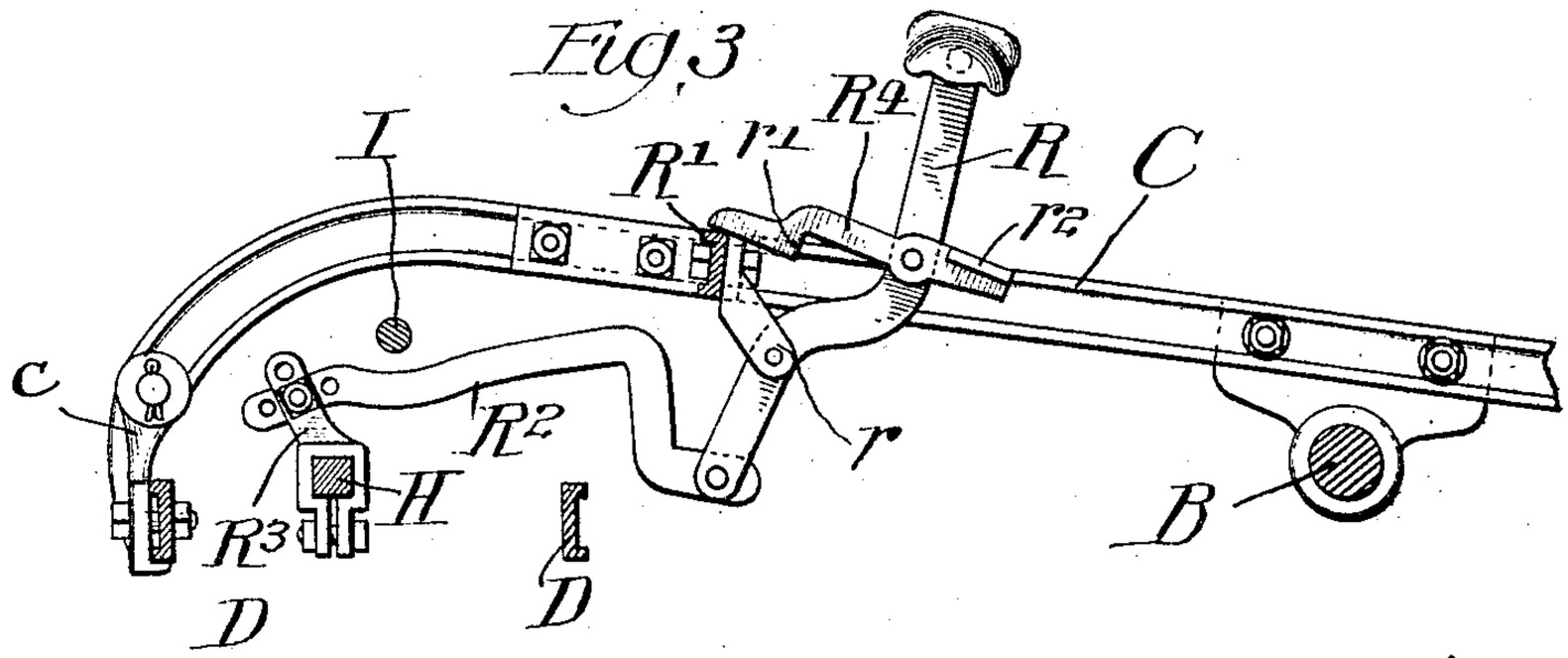


Fig. 3



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6 SHEETS—SHEET 3.

Fig. 4

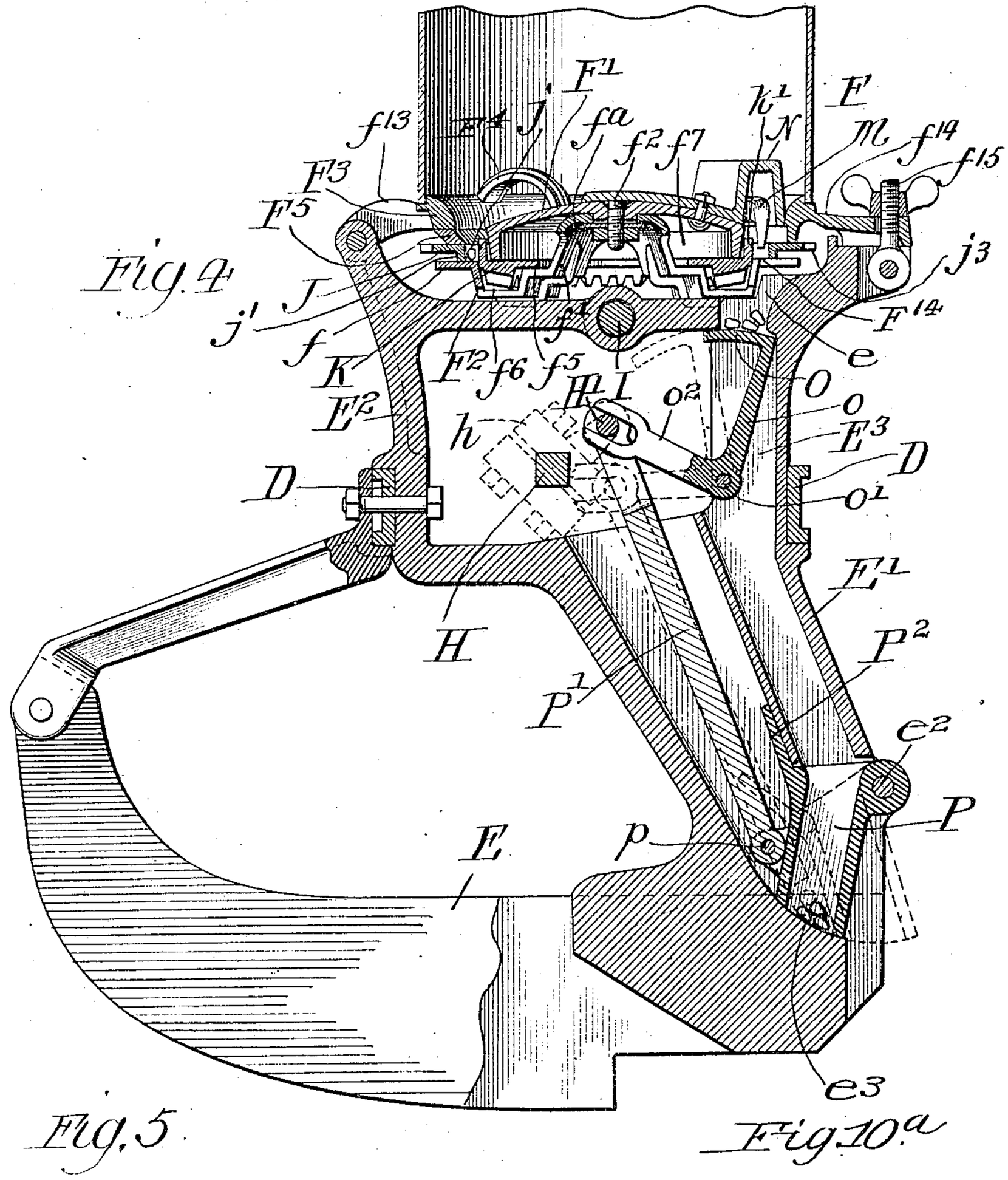

Fig. 5

Fig. 10a

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6 SHEETS—SHEET 4.

Fig. 6

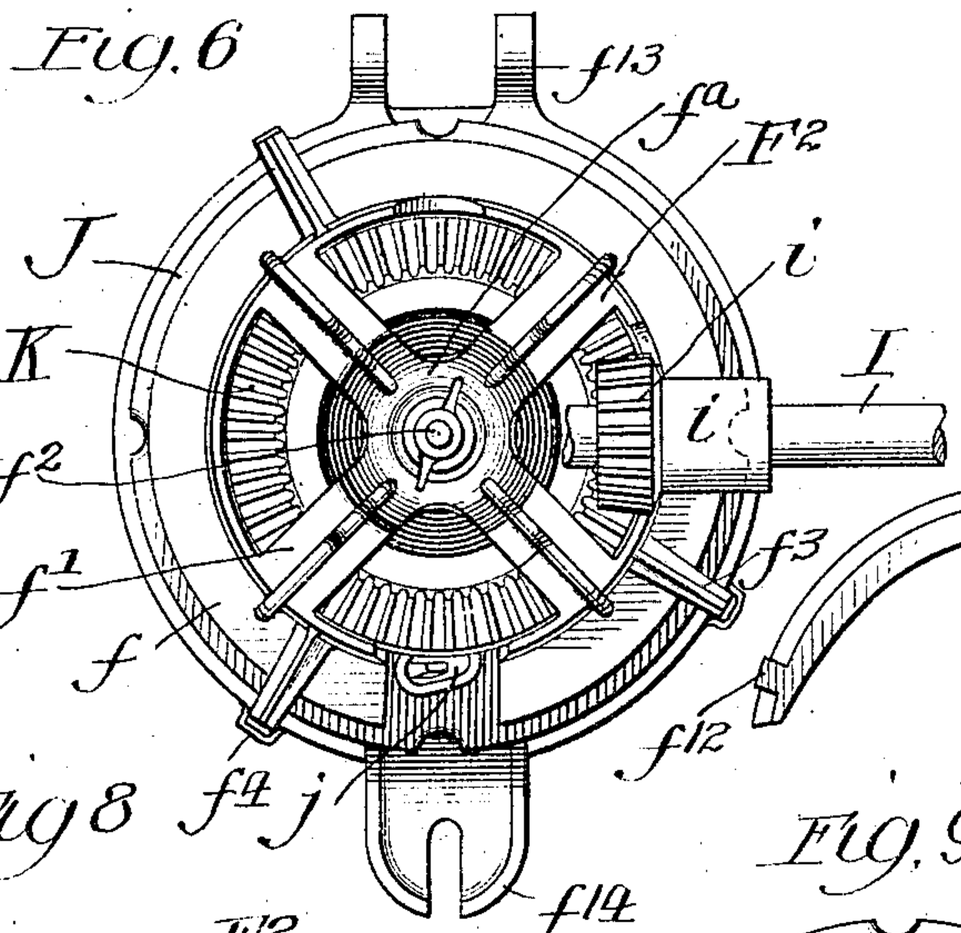

Fig 7

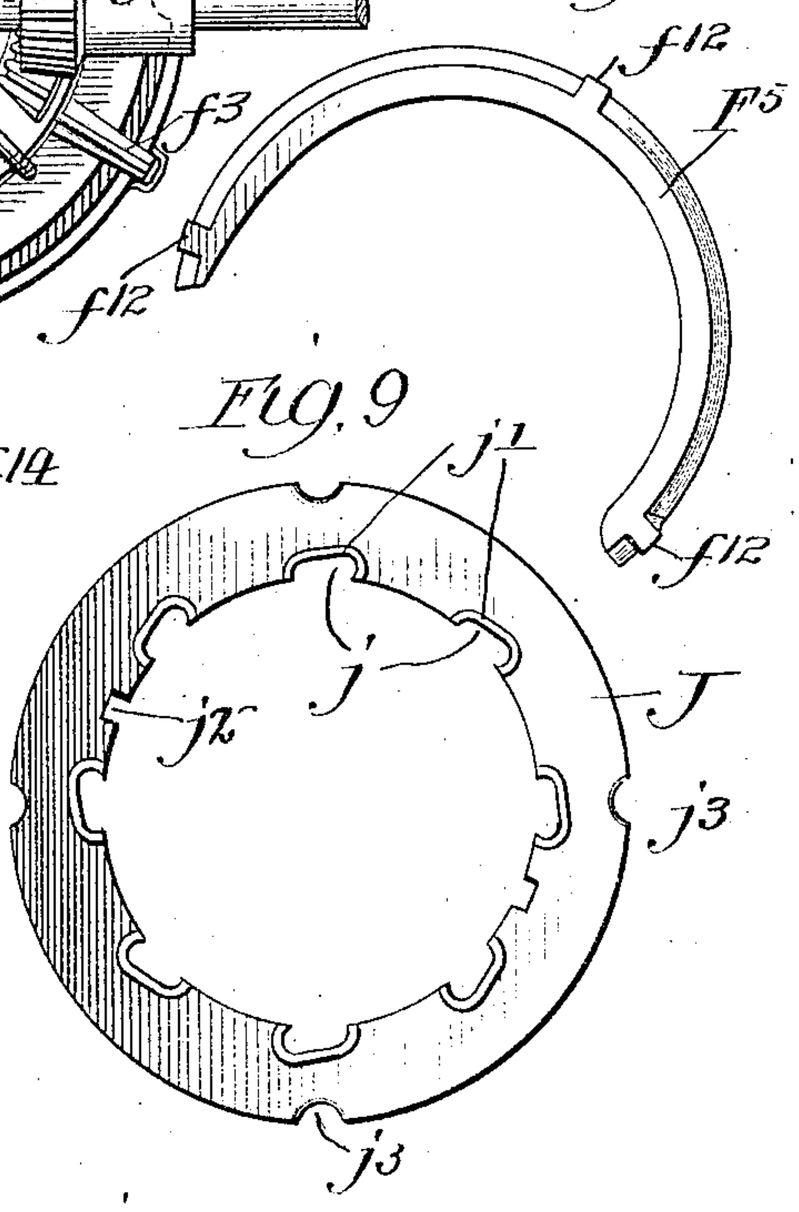

Fig 8

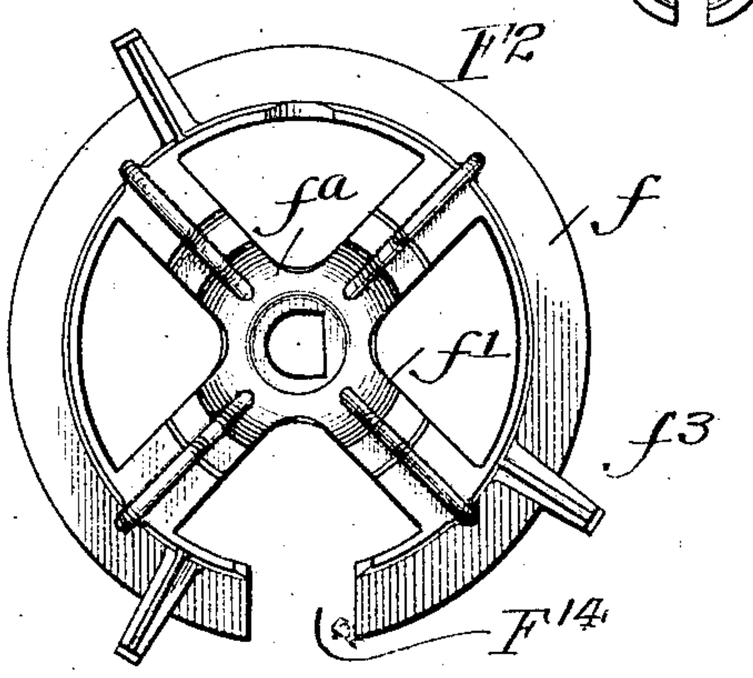

Fig. 9

Fig. 10

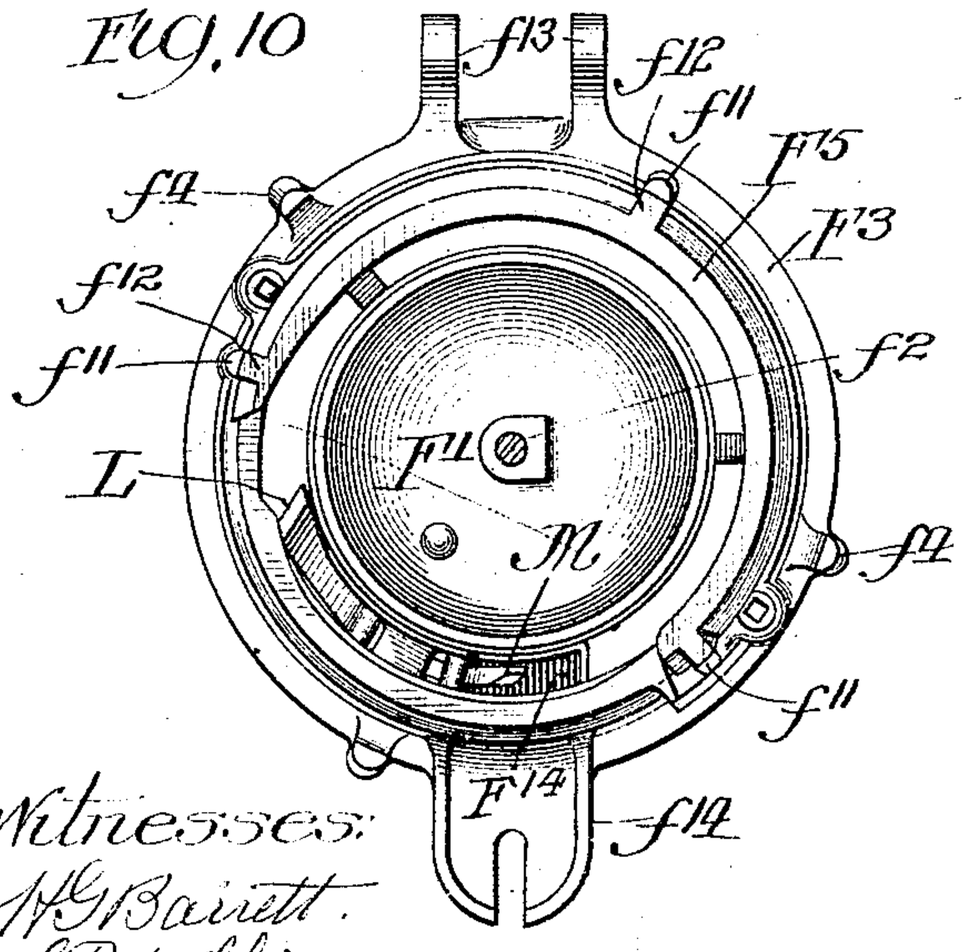

Fig 11

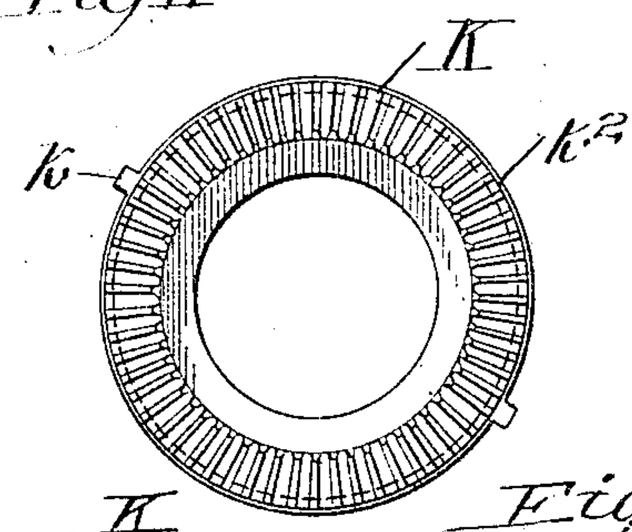

Fig 11a

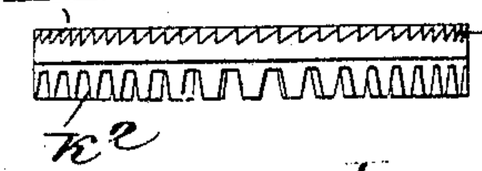

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Fig. 12

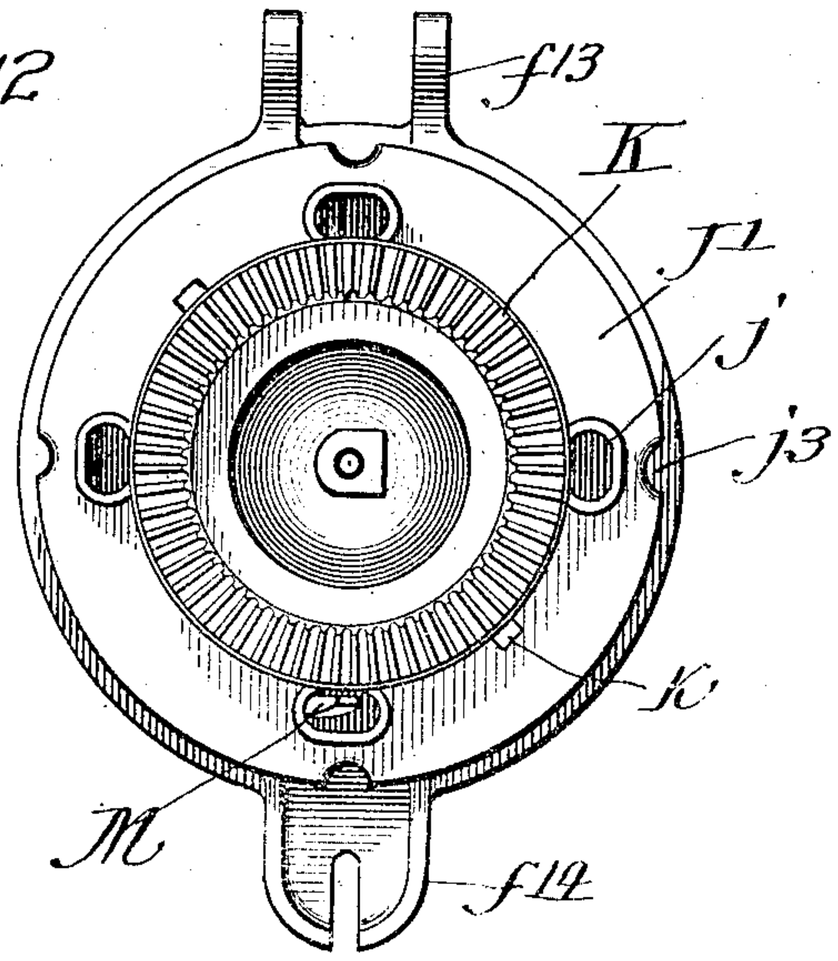

Fig. 13

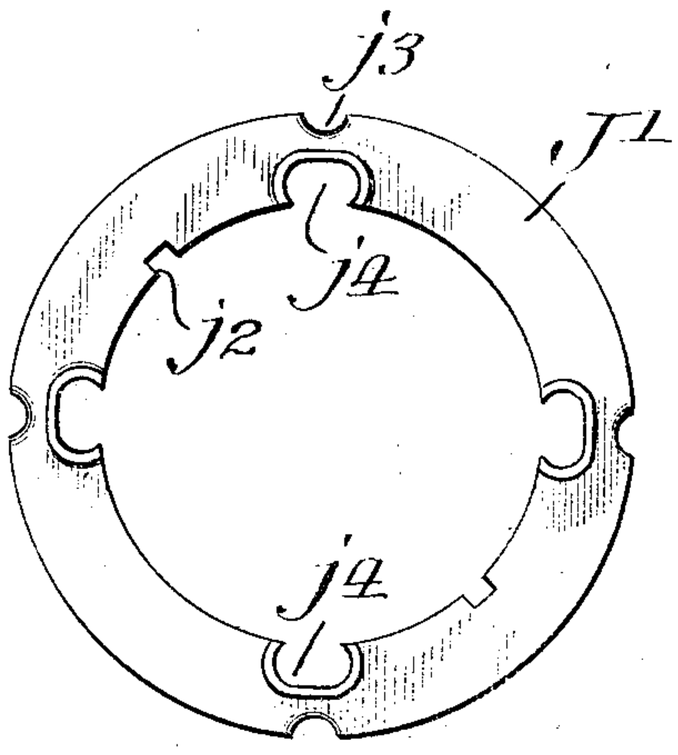

Fig. 14

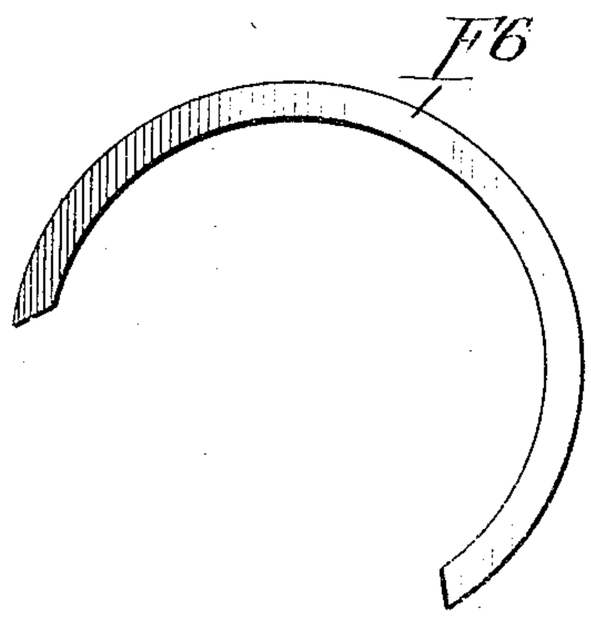

Fig. 15

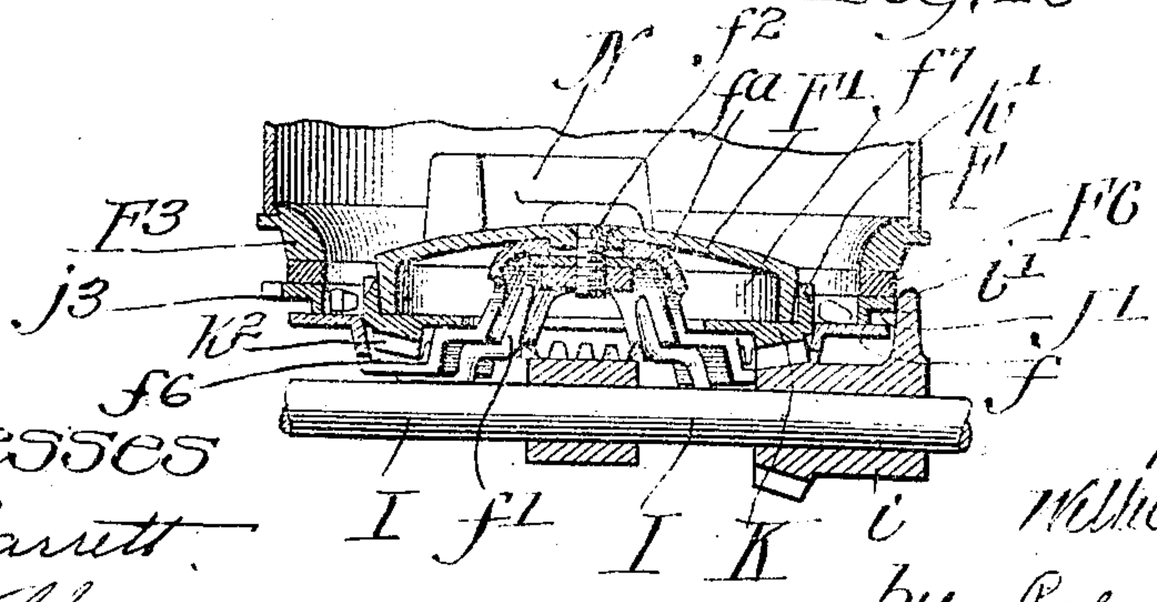

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Fig. 16

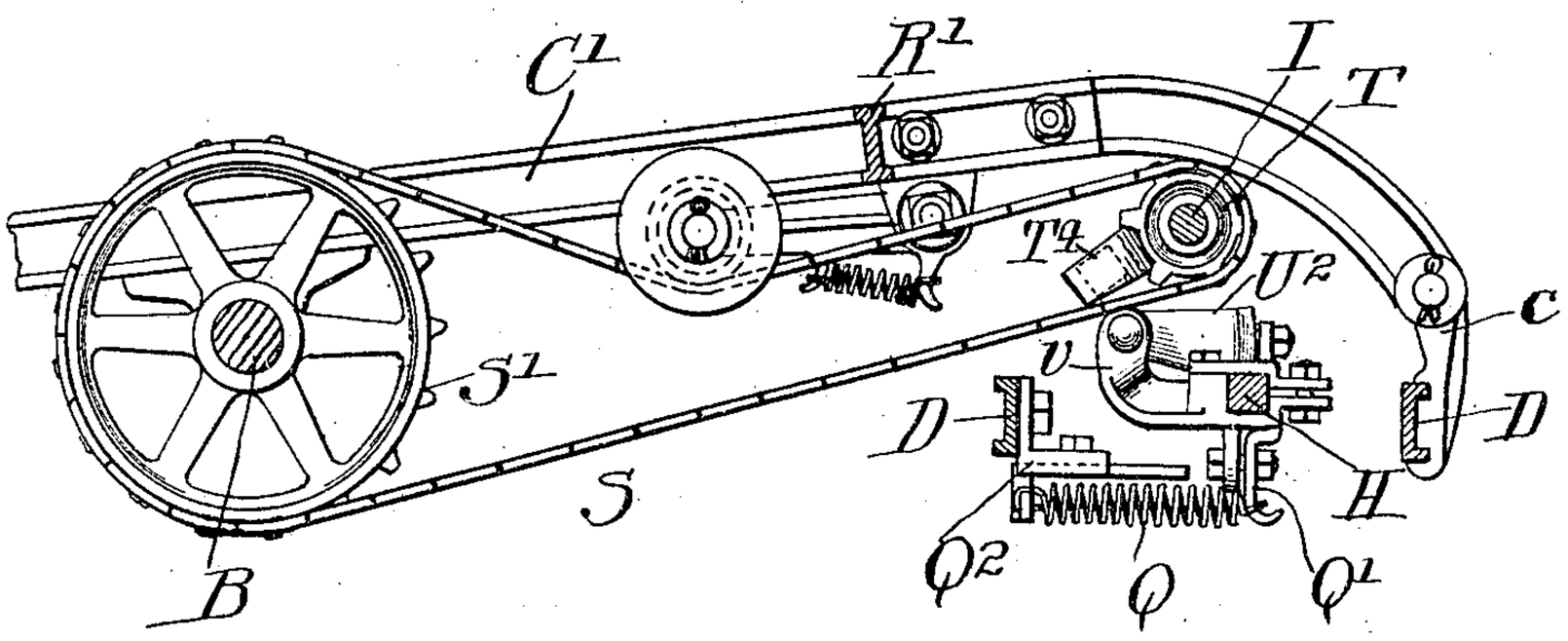


Fig. 17

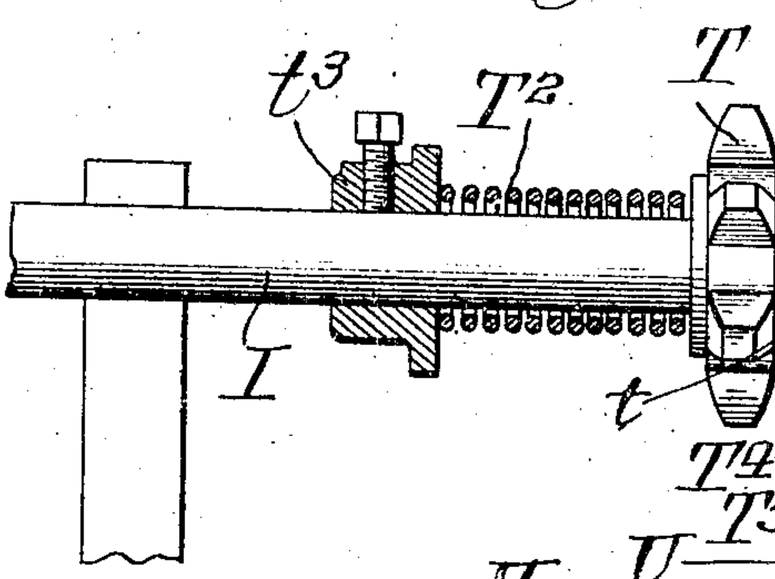
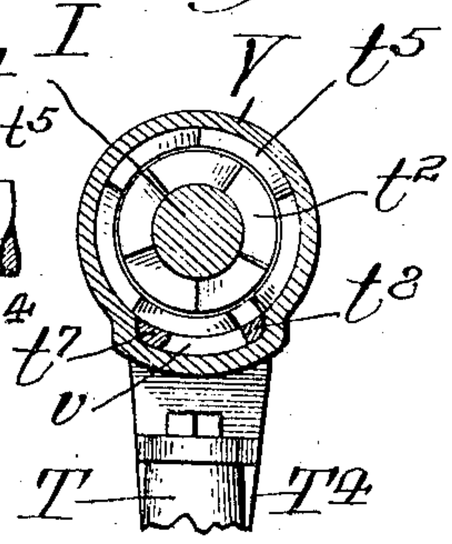


Fig. 18



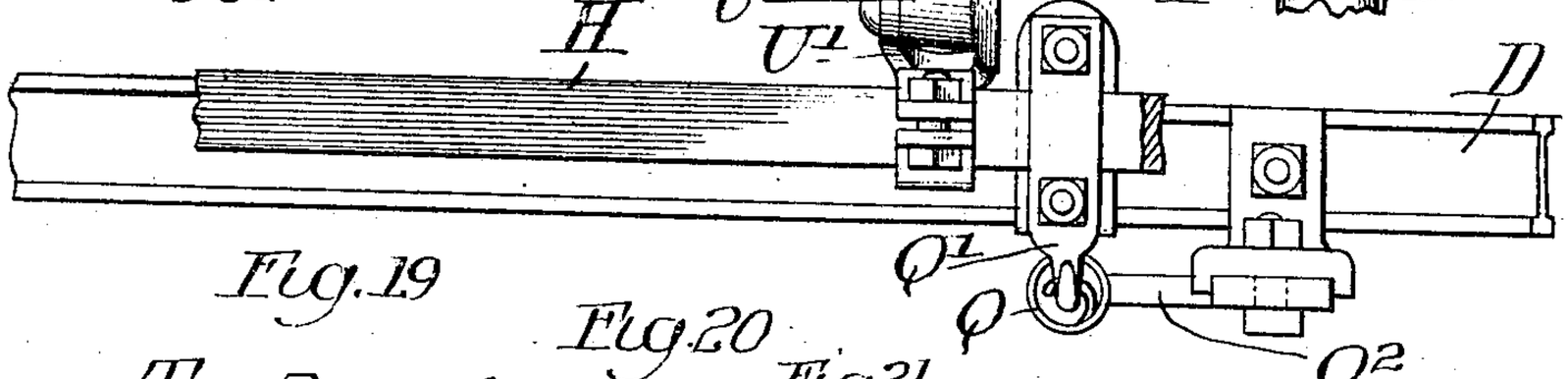


Fig. 19

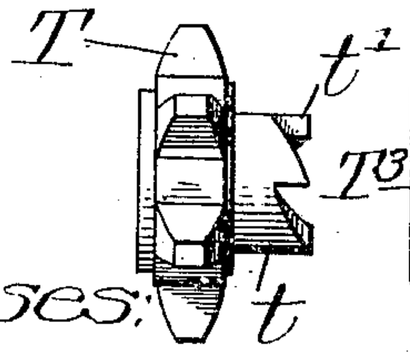


Fig. 20

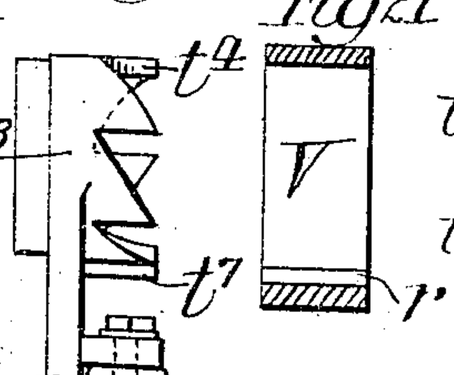


Fig. 21

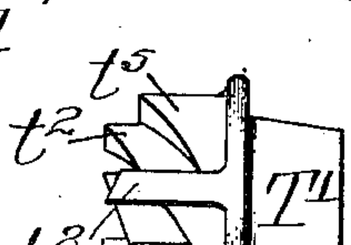


Fig. 22

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UNITED STATES PATENT OFFICE.

WILLIAM F. JACOBS, OF OTTAWA, ILLINOIS.

SEED-PLANTER.

No. 825,601. Specification of Letters Patent. Patented July 10, 1906.

Application filed May 25, 1905. Serial No. 262,212.

To all whom it may concern:

Be it known that I, WILLIAM F. JACOBS, a citizen of the United States, residing at Ottawa, in the county of Lasalle and State of Illinois, have invented certain new and useful Improvements in Seed-Planters; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in corn-planters, and it embraces, first, an improved mechanism for dropping or discharging the kernels or seeds from the seed box or hopper; secondly, an improved mechanism used in check-row planters for successively directing the groups of kernels discharged by the seed-dropping mechanism to the prepared furrow in the ground, and, thirdly, an improved mechanism for operating the seed discharging and directing mechanism so constructed as to permit the planter to be readily converted from a check-row planter to a drill-planter, and vice versa.

The seed-discharging mechanism embraces an annular plate rotatively mounted in the bottom of the seed box or hopper and provided with a plurality of seed-receiving cells to which the seeds are delivered by gravity and by which said seeds are carried to a discharge-opening in the bottom of the seed-box, said discharge-opening leading to the seed-tube, by which the seeds are directed in their passage to the ground. The seed-plate constitutes the bottom of an annular channel formed in the bottom of the seedbox and by which the seeds are directed to the seed-cells.

My improvements in this feature of the device embody a simplified construction of the seedbox-bottom and the parts which cooperate with the seed-plate to effect the delivery of the seed therefrom and include also an improved seed-discharge mechanism which is so constructed as to be readily adapted to seeds or kernels of varying sizes, while maintaining the proper relation of the side walls of the seed-channel to the cells of the seed-plate. The parts are also so devised as to permit and facilitate the interchangeable use of accumulative-drop seed-plates and edge-drop seed-plates either for drilling or for check-row planting.

My improvements relating to the means for conveying the seed through the seed-tube to the ground embrace a novel construction and arrangement of upper and lower valves in the seed-tube adapted for use in check-row planting and the operating mechanism therefor, said parts being so arranged that the upper valve temporarily retards a charge or group of kernels delivered from the seed-box to the upper end of the tube and subsequently delivers said group to the lower valve after a group previously received in the lower valve has been discharged into the furrow prepared in the ground by the usual runner or furrow-opener, whereby the several groups of seed are separately dropped from the upper to the lower valve and finally dropped immediately from the lower valve to the ground.

My improvements relating to the third feature of the invention relate to improved mechanism for effecting the intermittent rotation of the seed-plate in unison with the operation of the valve of the seed-tube in check-row planting and for readily converting the planter from a check-row to a drill-planter. Said last-mentioned improvements embody a shaft which is rotated from the cover-wheels and continuously operates the seed-plates when the planter is used as a drill-planter and coöperates with a clutch mechanism which is actuated by the check-row mechanism when the planter is operated as a check-row planter, these parts being so arranged that the shaft is intermittently rotated by its driving mechanism at each operation of the check-row mechanism to effect the turning of the seed-plate to the extent required for delivering from the seedbox the number of seeds or kernels needed for planting in a single hill.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a partial plan view of a corn-planter embodying my improvements, showing one of the covering-wheels, one seedbox and its associated check-row mechanism, and the means for converting the planter from a drill-planter to a check-row planter. Fig. 2 is a vertical section of the machine, illustrating one of the cover-wheels and one seedbox and runner. Fig. 3 is a detail showing the mechanism for converting the machine from a check-row planter to a drilling-planter. Fig. 4 is an enlarged view illustrating in cross-section the seed-

dropping mechanism or discharge devices in the bottom of the box, the seed-tube and its valves and their operating mechanism, and also the furrow-opener or runner. Fig. 5 is a detail vertical section of the seedbox, showing in section the seed-discharge mechanism. Fig. 6 is a bottom plan view of the seedbox-bottom and the discharge mechanism. Fig. 7 is a perspective view of a curved filling-piece whose function it is to regulate the width of the channel leading to the seed-ring cells. Fig. 8 is a bottom plan view of the spider-like bottom plate of the seedbox. Fig. 9 is a bottom plan view of one form of seed-ring. Fig. 10 is a bottom plan view of dismembered parts of the bottom of the seedbox, showing the position of the curved filling-piece illustrated in Fig. 7. Fig. 10ª is a fragmentary side elevation of the seedbox, showing the connection between the upper and lower members of the seedbox-bottom frame members. Fig. 11 is a bottom plan view of the gear for operating the seed-plate. Fig. 11ª is a side elevation of the gear K. Fig. 12 is a bottom plan view of a portion of the bottom of the seedbox, illustrating another form of seed-ring and the gear for driving the same. Fig. 13 is a bottom plan view of the form of seed-plate illustrated in Fig. 12. Fig. 14 illustrates another form of curved filling-piece similar to that shown in Fig. 7. Fig. 15 is a vertical section similar to Fig. 5, illustrating the form of seed-plate and filling-piece shown in Figs. 13 and 14. Fig. 16 is a vertical section taken on line 16 16 of Fig. 1. Fig. 17 is an enlarged detail view of the clutch and clutch-tripping mechanism which operates to intermittently rotate the shaft that drives the seed-plates for check-row planting. Fig. 18 is a face view of one of the clutch members and a cam operating to separate the clutch members and showing in section a ring encircling said parts. Figs. 19, 20, 21, and 22 are details of the clutch mechanism shown in Fig. 17.

As shown in the drawings, A, Figs. 1 and 2, designates one of the cover-wheels of the planter, B the shaft or axle on which the cover-wheels are mounted, and C C the side members of the rear or main frame.

D D designate the transverse members of the runner and seedbox-supporting frame joined at their ends by cross-pieces *d*. The side frames C of the main frame are pivotally connected with the front runner-frame member D by joint connections *c*, Figs. 1, 2, and 3.

E designates one of the runners or furrow-openers, of which there are two, and E′ the rear shank of said runner, the upper end of which consists of an irregular-shaped casting E^2, to which the members of the runner-frame are directly attached and upon which is supported the associated seedbox F. The runner-frame also supports outside the seed-box the usual check-row attachments, embracing a vertically-reciprocating lever *g*, that is operated by the buttons of the usual check-wire. Said lever *g* is fixed to a rock-shaft H, herein shown as made square, which operates the seed-tube valves and also actuates the clutch which controls the rotation of the seed-plate-driving shaft I.

Referring now to the seed-discharging mechanism located at the bottom of the seedbox F, said parts are made as follows: The bottom of said seedbox consists principally of upper and lower rigidly-connected parts, the upper part comprising a centrally-located convex-shaped cap-plate F′ and a surrounding ring F^3, to which the sheet-metal seedbox is directly attached and joined to said central plate F′ by arch-shaped connecting-pieces F^4, and the lower part comprising a spider-like frame F^2, Fig. 8, embracing a ring *f* and radiating upwardly and inwardly directed arms *f*′, joined at the center of said part to form a hub f^a. Said parts are secured rigidly together by means of a bolt f^2, which extends centrally through the cap-plate and said hub. The spider-shaped lower member of said bottom is provided with radially-directed lugs f^3, Figs. 2 and 8, which bear against similarly-located lugs f^4 of the ring F^3 on the upper or bottom member, as shown in Figs. 1 and 10ª.

J designates a rotary seed-plate, shown in the drawings as made in the form of a flat ring, Figs. 1, 4, 5, and 9. It is rotatively mounted between the upper and lower members of the bottom of the seedbox and is supported on the flat ring *f* of the lower spider-like member of the bottom. Said seed-plate is provided on its inner margin with a plurality of seed pockets or cells *j*, which receive the seed from an overlying mass and carry them during the rotative movement of the ring to and deposit them into a discharge-opening F^{14} of said lower member of the bottom, Figs. 4 and 8, to the throat *e* of the seed-tube E^3, formed in the standard E′ of the runner E, Fig. 4. In order to give proper depth to said seed-cells, they are formed partly in depending flanges *j*′, which extend around the outer and end walls of said cells *j*. The seed-plate J is rotated by means of a gear-wheel K, Figs. 5 and 11, which is located in the space inclosed by the annular seed-plate and is interlocked with the seed-plate by means of lugs K on the gear-wheel engaging notches j^2 on the inner margin of the seed-plate. The teeth K^2 on the lower side of the gear-wheel engage a gear-pinion *i*, fixed on a rotative shaft I, whereby said gear-wheel is rotated. Said gear-wheel is made flat and of ring shape and rests at its inner untoothed margin on an annular supporting-surface formed on the upper face of horizontal offset parts f^5, intermediate the radial arms *f*′ of the spider-like lower member of the seedbox-bottom, as more clearly shown in Figs. 4 and 5. Said

arms f' of said frame are formed to provide an annular channel or groove f^6, which receives the teeth of the gear-wheel. Said gear-wheel is provided at its outer margin with an upwardly-extending annular flange k', which, as shown, fits telescopically outside of a downwardly-directed annular flange f^7 of the cap-plate F′ and also fits closely against the inner margin of the seed-plate. Said flange constitutes, therefore, the inner walls of the seed cells or pockets, as more clearly shown in Fig. 1, and is shown as extending slightly above the level of the seed-plate. The flange k' is preferably serrated or roughened on its outer face, so as to constitute an agitating-ring by which the kernels are constantly shifted or agitated, and thereby caused to fall properly into the seed-cells. The annular upwardly-opening channel before referred to, through which the seed-kernels are guided to the seed-cells, is formed between said flanges of the cap-ring and gear on the one side and the downwardly and inwardly inclined ring F^3 on the other side. The seeds in the seedbox by gravity descend to the channel and fall indiscriminately therein and are confined by the walls of said channel in position to enter the said cells. It will thus be seen that the seed-plate and connected driving-gear are rotatively mounted between the upper and lower permanently-fixed members of the bottom of the seedbox and that free rotation of the seed-plate is assured by reason of the contacting of said upper and lower members at their central and circumferential parts, thereby avoiding clamping of the rotative parts between said upper and lower members of the bottom.

L and M designate the usual cut-off and ejecting devices located over that part of the seed-channel adjacent to the discharge-opening F^{14} of the seed-plate. Said devices operate in the usual manner and are inclosed by a housing N, removably secured to the cap-plate F′. Inasmuch as these features of the construction are well known and constitute no part of the present invention, they need not be herein described.

My improved seed-discharging mechanism is adapted to both edge-drop and accumulative-drop seed-plates. By the former is meant plates having cells of such width as to receive but one kernel, and that upon its edge, and by the latter is meant a plate having larger seed-cells adapted to receive at once two or more kernels and discharge them at one time. Said plates are designed to be used interchangeably, and either may be used when drilling and in check-row planting. When the edge-drop plates are used for check-row planting, they are intermittently rotated, the kernels are discharged one by one into the throat of the seed-tube during the periods of intermittent rotation, and the plates are arrested until the group last discharged from the seedbox is disposed of in the seed-tube, the valves of the seed-tube controlling the dropping of the groups of kernels through said tube. The alternate action of the seed-rings and seed-tube valves is thus continued so long as the check-row planting continues. The extent of rotation given to the edge-dropping seed-plates each time it is turned depends upon the number of seed-cells therein and the speed at which they are rotated. Usually the plates are turned through one-fourth of a rotation at each operation, and the number of kernels deposited during each operation will equal one-fourth of the number of cells in the plates. When drilling with the edge-drop plates, the plates are rotated continuously and a single kernel is dropped through the seed-tube each time a seed-cell passes thereover, the valves of the seed-tube being at this time open. When check-row planting with accumulative seed-plates, the operation is the same as with the edge-drop plates, except that the groups of seeds of the required number are delivered to the seed-tube at once. In the use of the latter plate while drilling all the kernels in each group are dropped at one time and drop drop freely through the seed-tube, the seed-tube valves being open. In this case the kernels in each group will not always be deposited in the furrow closely together, but will be to some extent strung along the furrow.

To insure the proper entrance of the kernels to the seed-cells, provision is made for changing the width of the annular channel to correspond with variations in width of the seed-cells of different plates. The construction of the seed-discharging mechanism is such that the larger seed-cells extend farther outward from the inner margin of the seed-plates than the smaller cells, the inner walls of the cells being fixed. For this purpose the ring part F^3 of the upper member of the bottom of the box is provided with a separate removable curved filling-piece F^5. (Shown separately in Fig 7 and assembled with the other parts in Figs. 4 and 5.) Said filling-piece is interposed between the principal part of the ring proper, F^3, and the seed-plate J and constitutes the outer wall of the lower part of the seed-channel throughout the principal part of said channel, as shown in Fig. 10, extending from one end to the other of the housing N, inclosing the ejecting and cut-off devices. Said filling-piece is held in place by means of coacting lugs f^{11} and f^{12} on the parts F^3 F^5, respectively. It will be understood that a filling-piece F^5 of a given width will accompany each plate having a given or corresponding width of seed-cells. When used with edge-drop seed-plates, the inner sides of the filling-piece F^5 are preferably inclined so as to uptilt the kernels and effect their edgewise entrance to the seed-cells. When used with accumulative-drop seed-plates the inner

sides of the filling-pieces may be made vertical, as shown in Fig. 15.

The accumulative-drop seed-ring is shown in Fig. 13 and is designated by the reference-letter J′, it being provided, as herein shown, with four seed-cells j^4. The curved filling-piece F^6, associated with the seed-plate J′, is shown separately in Fig. 14 and assembled in the mechanism in Fig. 15. In the latter figure the filling-piece F^6 is shown as being made narrower than the piece shown in Fig. 7 in order to enlarge the seed-channel and as having a vertical inner margin. The other parts of the device shown in Figs. 12 to 15, inclusive, are identical with the parts shown in Figs. 6 to 11, inclusive, and need not be further described.

In order that the cells may be brought into proper relation to or alinement with the discharge-orifice of the dropping mechanism when the parts are assembled, the seed-rings are provided on their peripheries with notches j^3, adapted to be engaged by a finger or lug i' on the gear-wheel i, that gives rotary motion to the seed-plate, Figs. 5, 9, 13, and 15. When the cells of the seed-plate are thus once properly alined, the alinement is maintained by reason of the gear connection described.

The parts are so arranged that the seed-plates and curved filling-pieces may be readily removed and replaced. Said parts are carried by the upper and lower stationary members of the bottom of the seedbox, and said seedbox is hinged to the frame E^2 of the runner by means of a hinged lug f^{13} at one side and locked in place by means of a lug f^{14} at its other side, adapted for engagement by a suitable latch f^{15}. With this construction when the seedbox is swung forwardly on its hinge, which may be done when the seedbox is filled with corn, the bottom of the box and the dropping mechanism is exposed so as to be readily accessible for removal and replacement of the parts thereof.

Referring now to the valves for controlling the discharge of the seed through the seed-tube E^3 and the manner of their operation, the same are made as follows: The passage of the seed-kernels through the seed-tube is controlled by a pair of valves—an upper check or retarding valve O, normally extending across the throat of the seed-tube, and a lower drop-valve P, which, as herein shown, has the form of a tube that is normally held out of line with the adjacent part of the seed-tube and into engagement with a suitable seat, but is adapted to be swung into line with the seed-tube to permit the kernels to drop to the prepared furrow in the ground. The upper or retarding valve O is mounted on or forms part of one arm o of a bell-crank lever that is pivoted on a stud o' in the seed-tube, Fig. 4. The other arm o^2 of said lever is forked and adapted for engagement by an L-shaped stud H′, affixed to the rock-shaft H of the check-row mechanism before mentioned. As herein shown, the arm H′ is made part of a block or bar h, that is clamped to the rock-shaft H. The lower dropping-valve P has the form of a short tube that is pivoted at the rear side of its upper end to a stud e^2 to swing forwardly and rearwardly. When in its forward position, the lower end thereof, which is curved, engages a curved seat e^3, formed on the lower part of the runner-standard, Fig. 4, whereby the valve is closed. The valve is opened by swinging it rearwardly in line with the seed-tube. (Shown in said Fig. 4.) Said lower valve is connected also with the L-shaped stud H′ of the rock-shaft H by means of a connecting link or bar P′, said link being connected without lost motion at both ends with said stud and with a stud p at the lower inner side of the valve P. The valve P is provided on its upper inner side with a lip P^2, which when the valve is in its closed position lies against the wall of the seed-tube and serves to prevent the grain from escaping or leaking between the upper end of the valve and the seed-tube when the valve is partially open. Said seed-tube valves are operated to open during the backward rocking of the rock-shaft H, which is occasioned by the engagement of a button on the check-wire with the forked arm g of the check-row mechanism. The valves are closed during the reverse movement of the rock-shaft under the influence of a spring Q, Figs. 1 and 16, which is attached at one end to a depending arm Q′, rigidly affixed to the rock-shaft H in any suitable manner and fixed at its other end to an arm or hook Q^2, that is adjustably fastened to the rear member D of the runner-frame, as shown in Fig. 1. With this mechanism the valves are quickly closed when the fork-arms of the check-row rock-shaft is released from the buttons or knots of the check-wire.

In the usual operation of the machine for check-row planting and during the interval between the dropping operation of the valve one group of kernels is supported on or retarded by the upper valve, while another group is contained in the lower valve. When the rock-shaft H is rocked rearwardly, the valve P opens immediately, due to the direct connection thereof with the stud H′ of said rock-shaft, while the opening movement of the valve O is retarded, due, first, to the loose connection of the arm o^2 of the operating-lever of said valve with the stud, and, further, to the fact that the opening edge of said valve sets a distance into the wall of the throat of the seed-tube. The kernels in the lower valve are therefore discharged before the upper valve has opened sufficiently to permit the upper group of kernels to drop off the said upper valve. The closing movement of the valves is so rapid under the action of the spring Q as to fully close the lower valve be-

fore the upper group of kernels reaches the lower valve, whereby during a single operation of the valves one charge of kernels will be dropped into the furrow and another transferred from the upper to the lower valve. In this manner, therefore, there is collected in each one-quarter or other partial movement of the seed-ring a group of kernels on the upper valve, which is subsequently deposited in the lower valve to be thereafter directed to the furrow opened by the runner E.

When the planter is to be used as a drill-planter, both valves are thrown into their open positions, so that the kernels pass directly from the discharge-opening of the dropping mechanism to the furrow. The mechanism for thus holding the valves open is shown more clearly in Figs. 1 to 3 and is made as follows:

R designates a foot-lever, which is pivoted between its ends to a bracket *r*, affixed to a transverse bar R′, extending between and attached at its ends to the frame-bars *c*. To the lower end of said foot-lever is pivoted a link R^2, which latter has pivotal connection at its front end with a stud R^3, affixed in any suitable manner to and rising from the rock-shaft H. Hinged to said foot-lever above its supporting-bracket *r* is a pawl R^4, having an offset or tooth adapted when the upper end of the foot-lever is swung forwardly to engage the adjacent bar R′ and hold the lever in its forward position. When said foot-lever is thus swung forwardly, it acts on the rock-shaft H in the same direction as does the check-row mechanism to open the upper and lower valves of the seed-tube, and the pawl R^4 holds the said valves open. Said pawl is provided with a tailpiece r^2, by which it may be released from the bar R′, whereupon the spring G returns the valves and their operating mechanism to a normal position.

The seed-plates are rotatively driven from the cover-wheels through the medium of the shaft I, as before stated, and during the drilling operation of the planter said seed-plates are continuously driven. During the check-row operation of the planter the shaft I and seed-plate are intermittently rotated. To this end a clutch device is interposed between the shaft I and its driving mechanism, and said clutch device is controlled by the check-row mechanism, including the rock-shaft H, in such manner that the shaft I and seed-plates are rotated during such part of the rotative movement of the seed-plates as required to deposit the required number of kernels on the upper valve of the seed-tube, after which the clutch is tripped by a part on said rock-shaft H to arrest the seed-plates and the shaft I. Subsequently the shaft H is rocked by the check-row mechanism to drop a group of kernels from the lower valve, and the same rocking movement of the shaft H operates to release the clutch and effect a further rotation of the rock-shaft and connected seed-plates to deposit another group of kernels on the upper valve and release a group from the lower valve.

Referring now in detail to the clutch device, whereby the shaft I and seed-plates are intermittently rotated and the seed-tube valves operated alternately therewith, said shaft I is rotated from the main shaft B through the medium of the sprocket-belt S, trained about a sprocket-wheel S′ on the shaft B and a sprocket-wheel T on the shaft I, constituting part of the clutch device. Two or more sprocket-wheels S′ of different sizes may be employed for operating the seed-plates at different speeds. The sprocket-wheel T is attached to or made a part of a sleeve *t*, Figs 17 and 19, provided on its ends with ratchet-shaped clutch-teeth *t′*, which are adapted to engage like-shaped teeth t^2 on a sleeve T′, that is fixed rigidly to the shaft I. The sleeve *t* and sprocket-wheel T slide endwise on the shaft I and are forced toward the sleeve T′ to bring the clutch-teeth *t′* t^2 normally into engagement by means of a spiral spring T^2, surrounding the shaft I and interposed between the sprocket-wheel and a collar t^3, adjustably fixed to said shaft. Surrounding the sleeve *t* is a sleeve T^3, which is provided with ratchet or cam teeth t^4, that engage a second set of cam-teeth t^5, formed on the sleeve T′, radially outside of the clutch-teeth t^2. As herein shown, the cam-teeth encircle the clutch-teeth; but a less number of such cam-teeth may be provided, if desired. The cam-teeth t^4 t^5 on the sleeve T^3 T′ are deeper than the clutch-teeth *t′* t^2, and both sets of teeth are adapted for engagement throughout their depth. The cam-teeth are inclined in the same manner as are the clutch-teeth, and when, therefore, the ring T^3 and ring T′ are rotated in opposite directions the cam-teeth act to force the sleeve T^3 away from the sleeve T′, and thereby separate the clutch teeth or members *t′* t^2 and disconnect the shaft I from its driving-power. By reason of the greater depth of the cam-teeth relatively to the clutch-teeth said clutch-teeth are entirely separated in the usual operation of the device before the cam-teeth become disengaged, so that the set of rotative cam-teeth on the endwise-movable sleeve T^3 does not become angularly displaced to an extent to release the opposing normally engaging cam-teeth of the two cam members. As before stated, the shaft I in the organization shown rotates once for each intermittent rotary movement of the seed-plates, and the clutch members are separated to effect the arrest of said shaft by means of a tripping device on the rock-shaft H at the time said shaft is rocked to operate the valves of the seed-tube.

The clutch-tripping device is made as follows: The cam-sleeve T^3 is provided with a

radial arm T^4, which rotates in a path normally occupied by a contact-piece U, carried by the outer end of a fork-arm or bracket which is affixed to and rises from said rock-shaft H. Said contact-piece U stands in the path of said arm T^4 during the inoperative period of the check-row mechanism, the spring T^2 holding the parts in this position. After a complete rotation of the shaft I and said clutch device as the mechanism shown is organized the arm T^4 strikes the contact U and arrests further rotation of the arm and sleeve T^3, to which it is attached or on which it is formed. When said parts are thus arrested, the continued rotation of the sprocket-pinion T and the sleeve *t*, as well as the sleeve T′, acts by reason of the coacting inclined cam and clutch-teeth to thrust the sleeves T^3 and *t* and the sprocket-wheel T endwise of the shaft I against the action of the spring T^2 until the clutch-teeth t' i' are disengaged from each other, thereby stopping further rotation of the shaft I, notwithstanding the continued rotation of the sprocket-wheel T. The arrest of the shaft I stops rotation of the seed-plates. The parts are held in this position until the rock-shaft H is again rocked rearwardly by the action of the check-row mechanism described for the purpose of operating the seed-tube valves. Such rearward rocking motion of the rock-shaft H carries the contact-piece U and its supporting-arm rearwardly out of the path of the arm T^4 of the clutch device, whereupon the spring T^2 acts to force the clutch elements into engagement and effect rotation of the shaft I until the arm T again engages the contact-piece U, whereupon the clutch is disengaged and the shaft I arrested, as before. It will thus be seen that the shaft I and seed-plates are rotated the required extent or distance to eject or discharge a determined number of seeds or kernels from the seedbox upon the upper valve of the seed-tube, said valve being at this time in a closed position, and will be arrested at the termination of such extent of rotation, and that when the forked lever *g* of the rock-shaft H is again tripped by the check-row wire the rock-shaft H is rocked backwardly and acts both to release the arm T^4 of the clutch device and to operate the valves of the seed-tube to drop a group of kernels, as before described. It will of course be understood that the turning movement to deposit the required number of seeds upon the upper valve of the seed-tube will occur in a less time than will be required for the planter to pass from one check or cross row to another, this being effected by properly gearing the operating parts. The operation effected by the rocking of the shaft H to drop the seeds through the seed-tube and release the clutch-tripping mechanism is very quickly effected by reason of the action of the spring Q, so that the upper valves will be in position to obstruct the seed-tube before the plate has rotated sufficiently to drop a kernel or a number of kernels on the upper valve in the succeeding rotation of the seed-plate.

In order to prevent the momentum of the parts from disengaging the cam-teeth after the required separation of the clutch-teeth, a suitable stop mechanism is employed, which consists in the present instance of two ribs t^7 t^8, formed, respectively, on the sleeves T^3 and T′ and occupying a recess t^9 in a ring V, which loosely encircles the abutting ends of the cam-teeth t^3 t^4. When the clutch device is rotating, the ribs t^7 t^8 occupy the positions shown in Fig. 18 at the ends of the recesses, and when the arms T^4 and its sleeve T^3 are arrested by engagement with the contact-piece U the ribs t^7 and t^8 are brought together by the relative rotation of the parts during the separation of the clutch-teeth and prevents such extent of movement as will separate the cam-teeth.

It is to be understood that the structural details of the parts described may be varied without departure from the spirit of my invention, and the invention is not limited to the illustrated details except as hereinafter made the subject of specific claims.

I claim as my invention—

1. In a planter, a seed-dropping mechanism comprising, in combination with a seed-box-bottom having an annular feed-channel, means for varying the width of said channel comprising a removable outer side-wall section for the channel adapted for use interchangeably with other like sections of varying widths.

2. In a planter, a seed-dropping mechanism comprising, in combination with a seed-box-bottom having an annular feed-channel, said bottom being designed to interchangeably receive seed-plates having seed-cells of varying widths, means for varying the width of the feed-channel radially outwardly from the inner wall of the channel to adapt the width of the channel to seed-plates of different widths.

3. In a planter, a seed-dropping mechanism, comprising, in combination with the seedbox-bottom provided with an upwardly-opening, annular channel, a removable, rotative seed-plate having cells which receive seed from said channel and designed for interchangeable use with plates having seed-cells of different widths, and a removable outer side-wall section for said channel designed for interchangeable use with like sections of different widths.

4. In a planter, a seed-dropping mechanism, comprising, in combination with the seedbox-bottom formed with an upwardly-opening, annular channel, a removable seed-plate constituting the bottom of said channel and provided at its inner margin with a plurality of seed-cells, and designed for inter-

changeable use with other plates having seed-cells of different widths, and a removable outer side-wall section for said channel designed for interchangeable use with like sections of different widths.

5. In a planter, a seed-dropping mechanism, comprising, in combination with the seedbox-bottom having therein an annular channel, a removable, rotative, annular seed-plate, having seed-cells formed on its inner margin, and receiving seeds from said channel and adapted for interchangeable use with other seed-plates having different-width seed-cells, an annular part constituting the inner walls of seed-cells of different plates adapted interchangeably to said seedbox-bottom, and means for varying the distance of the outer from the inner wall of said channel to correspond with the varying widths of cells in different seed-plates.

6. In a planter, a seed-dropping mechanism, comprising, in combination with the seedbox-bottom formed to constitute an upwardly-opening, annular channel, a rotative, annular seed-plate constituting the bottom of said channel and having seed-cells formed in its inner margin, said plate being removable and adapted to be used interchangeably with plates having seed-cells of different widths, an annular part constituting the inner walls of the seed-cells, and a removable curved wall section constituting part of the outer-wall of said channel and adapted to be used interchangeably with like sections of different widths to vary the width of the said channel.

7. In a planter, a seed-dropping mechanism comprising, in combination with a seedbox-bottom provided with an upwardly-opening, annular channel, a rotative, annular seed-plate constituting the bottom of said channel and having seed-cells formed in its inner margin, a rotating gear-ring interlocked with said seed-plate and provided with a vertical flange which fits within the seed-plate and constitutes the inner sides of said channel and the seed-cells.

8. In a planter, a seed-dropping mechanism comprising, in combination with the seedbox-bottom formed with an annular, upwardly-opening channel, a rotative, annular seed-plate constituting the bottom of said channel and provided at its inner margin with seed-cells, and a rotative gear-ring interlocked with said plate and provided with an annular flange which fits within the seed-plate and constitutes the inner sides of said channel and the seed-cells, said flange being serrated on its upper margin to constitute an agitating-ring.

9. In a planter, a seed-dropping mechanism comprising, in combination with the seedbox-bottom formed with an upwardly-opening, annular channel, a removable, rotative seed-plate constituting the bottom of said channel and provided at its inner margin with seed-cells, a rotative gear-ring located within and interlocked with the seed-plate and provided with an annular flange constituting the inner sides of said channel and cells, and a removable curved wall section constituting the outer side of said channel and adapted to be used interchangeably with like sections of different widths to vary the width of the channel.

10. In a planter, a seed-dropping mechanism including a rotative seed-plate having the form of a flat, annular ring provided on its inner margin with a plurality of seed-cells, said cells being inclosed at one side by flanges to increase the depth of the cells.

11. In a planter, a seed-dropping mechanism including a rotative, annular seed-plate provided on its inner margin with seed-cells, combined with a gear-ring located within and interlocked with the seed-plate and provided with an annular flange constituting the inner sides of said seed-cells.

12. In a planter, a seed-dropping mechanism including a rotative, annular seed-plate provided on its inner margin with seed-cells, combined with a gear-ring located within and interlocked with the seed-plate and provided with an annular flange constituting the inner sides of said seed-cells, the upper margin of said flange being roughened or serrated to constitute an agitating-ring.

13. In a planter, a seedbox-bottom including an annular, rotative seed-plate provided at its inner margin with a plurality of cells, combined with a gear-ring removably interlocked with said plate and provided on its margin adjacent to said cells with seed-agitating teeth or notches and at its inner margin with a downwardly-facing bearing-surface.

14. In a planter, a seed-dropping mechanism including a rotative, annular flat seed-plate provided on its inner margin with seed-cells, combined with a gear-ring located within and interlocked to the seed-plate and provided with an annular flange constituting the inner sides of said seed-cells, the seed-cells being surrounded at one side of the ring by flanges to increase the depths thereof, and the upper margin of said gear-flange extending above the level of the seed-plate.

15. In a planter, a seed-dropping mechanism including an annular seed-plate provided on its inner margin with seed-cells and on its outer margin with equidistant notches, combined with a gear-pinion for driving said seed-plate and a radial arm rotating with the gear-pinion, adapted to engage one of the notches during each rotation of said arm.

16. In a planter, a seed-dropping mechanism including an annular seed-plate provided on its inner margin with seed-cells and on its outer margin with equidistant notches, combined with a gear-wheel located within and

interlocked with the seed-plate, a rotative pinion for driving said gear-wheel, and a radial arm rotating with said gear-pinion and adapted for engagement with the marginal notches of the seed-plate once during each rotation of said pinion.

17. In a planter, a seed-dropping mechanism comprising, in combination with the seed-box-bottom consisting of upper and lower members fixed to each other at their centers, an annular, rotative seed-plate provided on its inner margin with a plurality of seed-cells and having rotative bearing on said lower bottom member near the outer margin of the latter, a rotative gear-ring located witnin and interlocked with said seed-ring and having rotative bearing on the lower member of the bottom radially inside of the bearing for the seed-plate.

18. In a planter, a seed-dropping mechanism comprising, in combination with the seedbox-bottom consisting of upper and lower fixed members, the upper member comprising an outer ring and a central arched or cap plate, and the lower member being provided with inner and outer upwardly-facing bearing-surfaces and connected centrally with the upper member, an annular seed-plate provided on its inner margin with a plurality of seed-cells, said plate being interposed between said upper and lower members and having bearing on the outer bearing-surface of the lower member, and a gear-ring located radially within and interlocked to the seed-plate and having rotative bearing on the inner upwardly-facing bearing-surface of the lower member.

19. In a planter, a seed-dropping mechanism comprising, in combination with the seedbox-bottom consisting of upper and lower fixed members, the upper member comprising an outer ring and a central arched or cap plate, and the lower member being provided with inner and outer upwardly-facing bearing-surfaces and connected centrally with the upper member, an annular seed-plate provided on its inner margin with a plurality of seed-cells, said plate being interposed between said upper and lower members and having bearing on the outer bearing-surface of the lower member, and a gear-ring located within and interlocked to the seed-plate and having rotative bearing on the inner upwardly-facing bearing-surface of the lower member, and provided with a marginal vertical flange which constitutes the inner sides of said cells.

20. In a planter, a seed-dropping mechanism comprising, in combination with a seed-box consisting of upper and lower members, the upper member comprising an outer ring and a central arched or cap plate, and the bottom member being attached centrally thereof to the said central portion of the upper member and provided with inwardly and outwardly upwardly-facing bearing-surfaces, an annular seed-plate interposed between the ring part of the upper member and the outer upwardly-facing bearing-surface of the lower member and provided on its inner margin with a plurality of seed-cells, a gear-ring rotating on the inner upwardly-facing bearing-surface of the lower member and provided with an annular flange constituting the inner sides of said cells, said latter flange overlapping the central part of the upper member.

21. In a planter, the combination with the seedbox and the dropping mechanism thereof, of a seed-tube receiving seed from said dropping mechanism, a retarding-valve at the upper end of said seed-tube, a dropping-valve at the lower end of the seed-tube comprising a tube-section pivoted at its upper end to the lower end of the seed-tube and adapted to swing into and out of alinement with said seed-tube, said tube-section coöperating at its lower end with a stationary seat, when out of alinement with the seed-tube, to close said dropping-valve and in communication in all positions thereof with said seed-tube, and means for actuating said valves, constructed to first open the drop-valve, and thereafter the retarding-valve, and means whereby the drop-valve is closed before the charge of grain released from the retarding-valve falls to the level of the drop-valve.

22. In a planter, the combination with the seedbox and the dropping mechanism thereof, of a seed-tube receiving seed from said dropping mechanism, a retarding-valve at the upper end of said seed-tube, a dropping-valve at the lower end of the seed-tube embracing a tube-section pivoted at its upper end to the lower end of the seed-tube, and a stationary seat with which the lower end of said tube-section coöperates, a rock-shaft operated by the check-row mechanism of the planter and provided with an arm, a link connecting said arm with the tube-section of the lower drop-valve without lost motion, and a lever connecting the retarding-valve with said shaft by means permitting lost motion.

23. In a planter, the combination with the seedbox and the dropping mechanism thereof, of a seed-tube receiving seed from said dropping mechanism, a retarding-valve at the upper end of said seed-tube, a dropping-valve at the lower end of the tube, a rock-shaft operated by the check-row mechanism of the planter, provided with an arm, a link connecting said arm with the lower drop-valve without lost motion, a lever connecting the retarding-valve with said shaft by means permitting lost motion, and means for holding said upper and lower valves open for

drilling, comprising a foot-lever pivoted to the planter-frame, a link connecting said lever with an arm on said rock-shaft, and a latch or detent pivoted to said foot-lever and adapted to engage a stationary stop on the frame.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 16th day of May, A. D. 1905.

WILLIAM F. JACOBS.

Witnesses:
B. S. JORDAN,
L. E. PORTER.