(No Model.)

4 Sheets—Sheet 1.

W. E. FOOTE.

COTTON HARVESTER.

No. 475,979. Patented May 31, 1892.

Fig. 1.

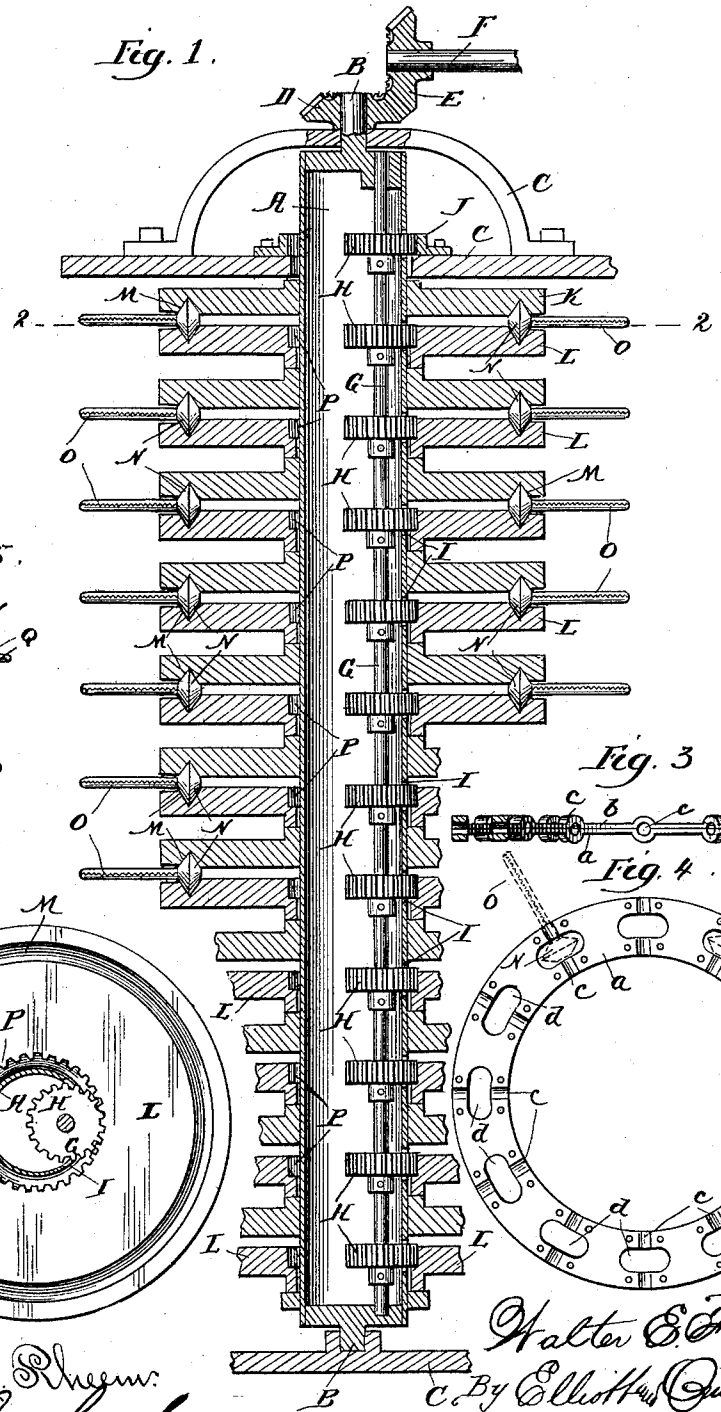

Fig. 5.

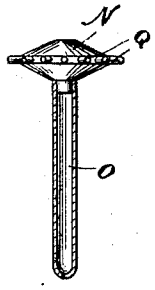

Fig. 2.

Fig. 3.

Fig. 4.

Witnesses.

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Attorneys.

(No Model.) 4 Sheets—Sheet 2.

W. E. FOOTE.

COTTON HARVESTER.

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Fig. 6.

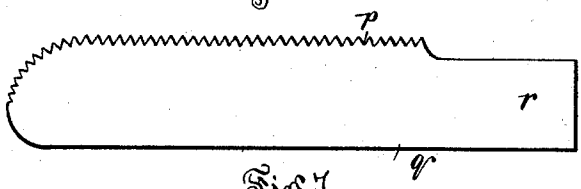


Fig. 7.

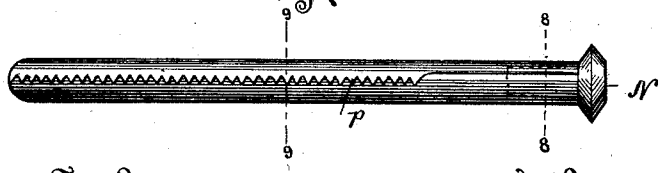


Fig. 8.

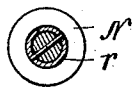


Fig. 9.

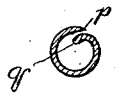


Fig. 10.

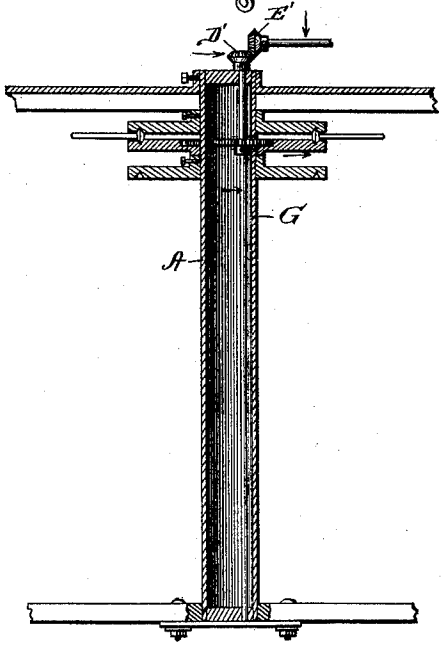
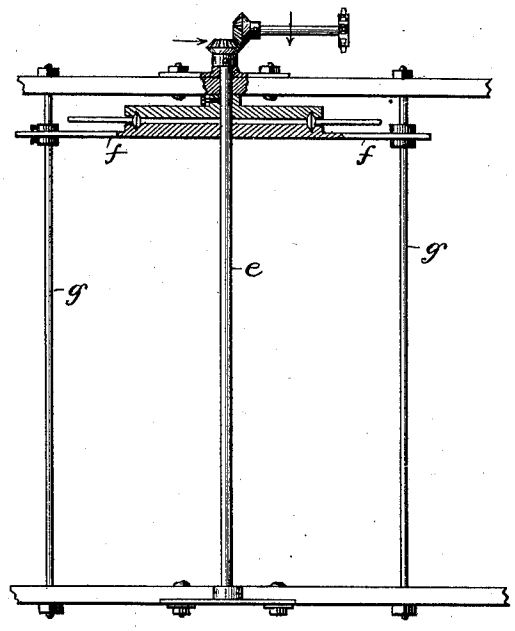


Fig. 11.



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(No Model.) 4 Sheets—Sheet 3.

W. E. FOOTE.

COTTON HARVESTER.

No. 475,979. Patented May 31, 1892.

Fig. 12.

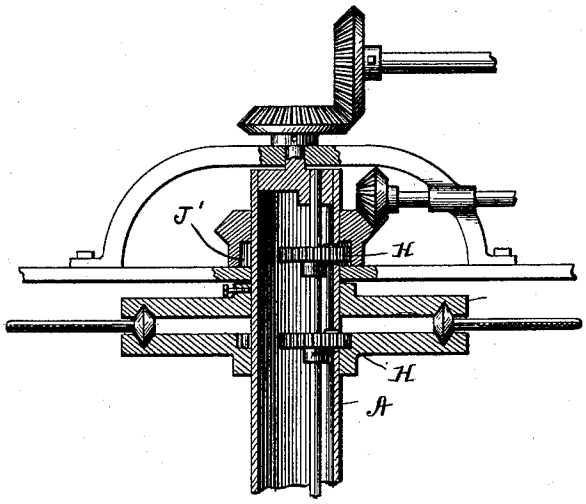


Fig. 15.

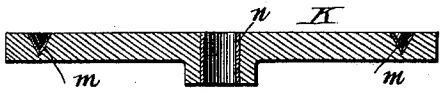


Fig. 16.

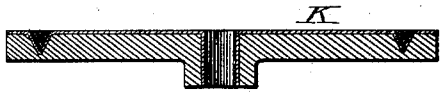


Fig. 13.

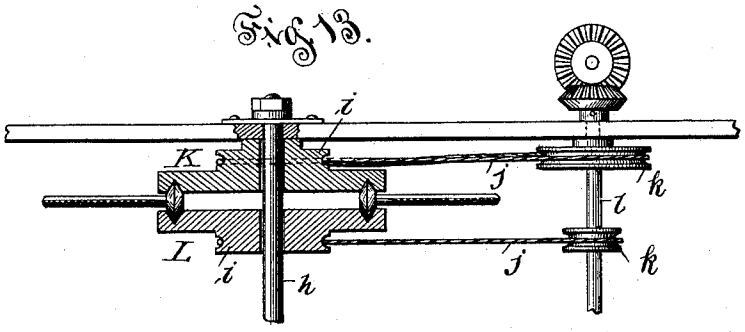
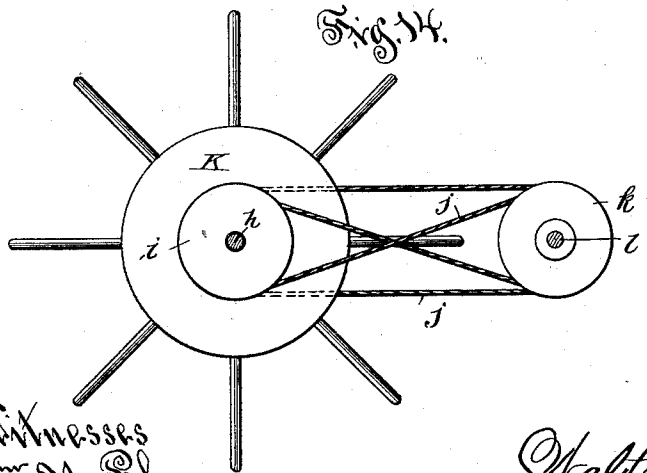


Fig. 14.



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COTTON HARVESTER.

No. 475,979. Patented May 31, 1892.

Fig. 17.

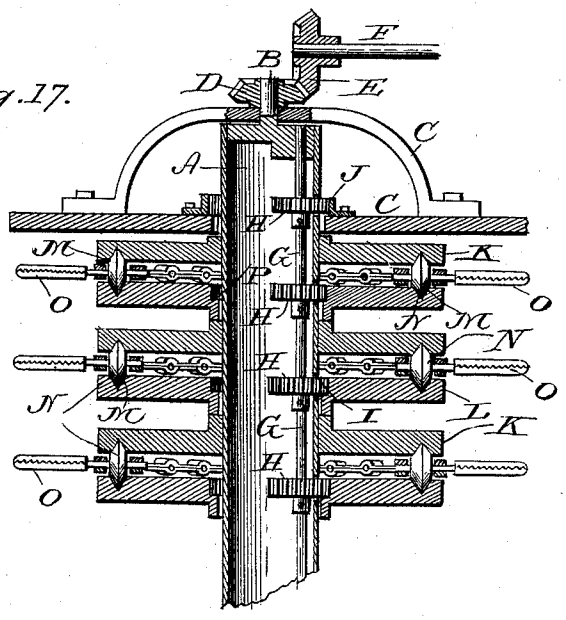
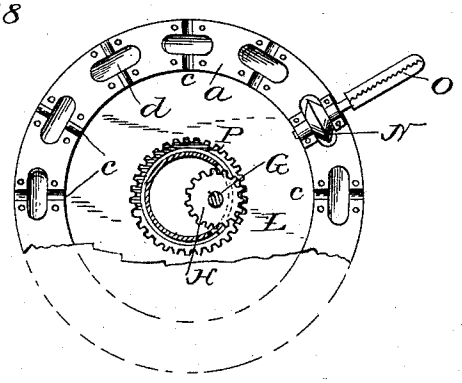


Fig. 18



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UNITED STATES PATENT OFFICE.

WALTER E. FOOTE, OF CHICAGO, ILLINOIS, ASSIGNOR TO GEORGE N. TODD, OF SAME PLACE.

COTTON-HARVESTER.

SPECIFICATION forming part of Letters Patent No. 475,979, dated May 31, 1892.

Application filed December 29, 1891. Serial No. 416,458. (No model.)

To all whom it may concern:

Be it known that I, WALTER EDWARD FOOTE, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Cotton-Harvesters, of which the following is a specification.

This invention relates to improvements on that class of cotton-harvesters in which rotatable picker-stems are journaled in and project radially from a revolving drum or support and are caused to rotate on their individual axes by means of internal gears within the drum meshing with pinions upon the inner ends of the picker-stems. In this class of machines heretofore it will be understood that the bodily travel of the picker-stems is produced by the drum and the individual axial rotation of the stems is produced by separate driving-gears over which the pinions on the picker-stems are drawn by the revolution of the drum. In such prior machines the friction between the driving-gears and the pinions and between the picker-stem journals and their bearings is so great as to place an objectionable limit upon the number of stems which it is possible to operate in an ordinary cotton-harvester of the "straddle-row" type, in which two vertical drums or supports are employed, operating upon opposite sides of a row of cotton-plants, beside which a great number of driving-gears and stems endangers the binding or tying up of the machine and involves expensive nicety in the construction thereof to avoid such danger.

The prime object of this invention is to impart to the picker-stems both a bodily travel and an axial rotation by the stem-support alone, whereby I am enabled to dispense with the employment of separate driving-gears for the stems and also with separate and individual journals and bearings for the picker-stems, thereby greatly reducing the objectionable friction heretofore encountered in this class of machine.

A further object is to impart an axial rotation to each picker-stem by rolling the same between moving supports as contradistinguished from driving the stem when journaled in suitable bearings by means of gears, whereby separate journals, bearings, and gears for the stems may be dispensed with, the necessity for oiling the bearings and gears of each stem is avoided, the friction consequent upon the use of such parts is in a great measure overcome, and the cost of construction, as well as the power required for operating, is materially reduced, while the number of picker-stems which may be employed in the machine is greatly increased and the effectiveness of the machine correspondingly promoted.

A still further object is to provide a picker-stem of novel construction, combining simplicity, durability, and economy in the maximum degree.

These objects are attained by the devices illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical sectional elevation of the picker-stem-operating mechanism of a cotton-harvester embodying my invention; Fig. 2, a horizontal section on the line 2 2 of Fig. 1; Figs. 3 and 4, detail section and plan views, respectively, of spacing-rings for maintaining the picker-stems at equal distances from each other (not shown in Fig. 1;) Figs. 5, 6, 7, 8, and 9, detail views of a picker-stem embodying my invention; and Figs. 10 to 16, inclusive, illustrate modifications of my invention; Figs. 17 and 18, detail vertical and horizontal sections, respectively, of a machine similar to that shown in Fig. 1, illustrating the use of the spacing-rings shown in detail in Figs. 3 and 4.

Similar letters of reference indicate the same parts in the several figures of the drawings.

Referring by letter to the accompanying drawings, A indicates a central sleeve, pipe, or hollow shaft provided at each end with journals B, bearing in the frame C of the machine, the upper journal being preferably extended beyond its bearing to receive a beveled gear D, meshing with and driven by a corresponding beveled gear E upon a shaft F, suitably journaled in the frame of the machine and to which power is preferably communicated from the ground-wheel of the machine in any well-known and convenient manner, so many forms of which will readily suggest themselves to a skilled mechanic that it

is not deemed necessary to herein illustrate or describe the same in detail. It will thus be seen that a continuous rotation is imparted to the cylinder or hollow shaft A by the ground-wheels during the travel of the machine.

Journaled eccentrically in the ends of the hollow shaft A is a shaft G, having keyed thereon at regular intervals a series of gears H, which are of sufficient diameter to project through corresponding openings I in the side of the hollow shaft nearest the eccentric shaft. The upper one of said gears meshes with and is driven by a stationary annular toothed rack rigidly secured to the frame of the machine, surrounding the hollow shaft A and arranged concentric therewith, so that as the said shaft is rotated, carrying with it the eccentric shaft, the latter, through the medium of its gear meshing with the stationary rack J, will have imparted thereto an axial rotation in the opposite direction to that in which the hollow shaft by which it is carried is rotated. To the hollow shaft is rigidly secured a vertical series of annular plates or disks K, and alternating therewith, but loosely journaled upon said shaft, is a corresponding series of annular plates or disks L, each fixed plate K constituting the upper and each loose plate L the lower plate of a pair, the opposing faces of which are provided with annular grooves M of any desired contour in cross-section, but preferably V-shaped, as shown in the drawings. In these grooves are confined and work correspondingly-shaped rollers N, fixed upon the inner ends of picker-stems O, which project axially from the outer side of the rollers, and consequently radially from the upper and lower plates K and L, between which the rollers are confined. Around the edge of the central perforation in the loose plates L and in a plane with the openings in the hollow shaft A, through which the gears H project, are formed annular racks or internal gears P, with which mesh the said gears H at one side where they project through the openings in the hollow shaft, as clearly illustrated in Figs. 1 and 2. It will thus be seen that with the picker-stem rollers confined between the upper and lower plates which revolve in opposite directions the picker-stems will be rolled or rotated upon their individual axes, and the relative speed of rotation of these two plates will at the same time determine not only the direction, but also the speed, of the bodily travel of the picker-stems. For instance, if both plates revolved in opposite directions at the same rate of speed all of the picker-stems would simply spin or revolve upon their individual axes, but would not travel about the axis of the plates, or, in other words, would have no bodily travel; but if the upper plate alone revolved, then the picker-stem would not only be rotated upon its own axis, but would travel bodily about the axis of the upper plate, rolling along upon the lower plate. On the other hand, if both the upper and lower plates revolved, but in different times, and the upper plate outtraveled the lower one, then each stem would revolve upon its individual axis and have a bodily travel about the axis of said plate in the direction of rotation of the upper plate; but if the lower plate outtraveled the upper plate, then the bodily travel of the picker-stem would be in the direction of rotation of the lower plate. As shown in Figs. 1 and 2, the parts are so geared that the loose plate will be held stationary by the individual rotation of the pinion H, while the upper plate, which is fixed to the hollow shaft, makes one revolution for every revolution of such shaft, and hence the direction of bodily travel of the picker-stem will be the same as the direction of rotation of said upper plate. It will therefore be readily understood that by a proper proportion between the driving-gears and the driven gears of the hollow and the eccentric shafts the axial rotation and bodily travel of the picker-stems may be simultaneously increased or decreased, or the axial rotation of the stems may be increased or decreased, without changing the speed of bodily travel thereof, or the speed of bodily travel of the stems about their orbit may be increased or decreased without changing their speed of axial rotation.

The number of picker-stems which may be employed in a machine of this kind is practically limited only by the number of stem-rollers which may be laid in the grooves in the driving-plates without touching each other, and in order to prevent any tendency of these rollers to squeak or outtravel one another each roller may be provided with a peripheral series of pins or teeth Q, (see Fig. 5,) which engage corresponding holes or recesses formed in the grooves in the upper and lower plates; or, if desired, still greater assurance in this direction may be secured by employing the spacing-rings shown in Figs. 3 and 4, of which there is one for each horizontal series of stems, which rings are preferably formed in two sections *a b*, having half-bearings *c* therein for the journals of the picker-stems and openings *d*, in which the rollers N of the picker-stems work, these rings of course revolving with the picker-stems in their bodily travel about their orbit. The employment of the teeth upon the rollers is, however, preferable to these spacing-rings, because the additional friction resulting from the use of these rings is avoided thereby.

In Figs. 10 to 14, inclusive, I have shown modifications of my invention illustrating various modes of operating the picker-stems through the medium of the driving-plate, as hereinbefore suggested. For instance, in Fig. 10 I have shown the hollow shaft held stationary by being secured direct to the machine, while the eccentric shaft G is directly rotated by gears D′ and E′, corresponding with the gears D and E of the preferred construction illustrated in Fig. 1. In this case, of course, the eccentric shaft simply rotates

in its bearings in the ends of the hollow shaft and does not have a bodily travel about the axis of the hollow shaft, as in the construction shown in Fig. 1, and indeed in this mode of operation the shaft G need not necessarily be an eccentric shaft, but might be concentric with the plates, the lower ones of which could be keyed directly to the shaft, the hollow shaft A dispensed with, and the upper plates be independently supported from the frame of the machine, as are the lower plates in Fig. 11, which will now be described.

In Fig. 11 the upper plates are rotated and the lower plates remain stationary, the upper plates being keyed upon and rotating with a central driven shaft *e*, while the lower plates are directly supported from the frame of the machine by the arms *f*, secured at their ends to the tie-rods *g* or in any other manner to the frame of the machine.

In Fig. 12 the construction shown in Fig. 1 is duplicated, excepting that the gear or internal rack J′ is in this case driven, instead of being stationary, as in the preferred construction.

In Figs. 13 and 14 the upper and lower plates are loosely journaled upon a central shaft *h* and are each provided with belt-pulleys *i*, driven by belts *j* from corresponding pulleys *k*, keyed upon a rotating or driven shaft *l* at one side of the shaft upon which the plates are mounted, one of the belts being twisted in order to drive its plate in the reverse direction to the other plate, and one of the pulleys *i* or *k* being smaller than the other for the purpose of giving a different speed of rotation to the plates. Obviously one of these plates might be fixed upon the shaft *h* and the other be driven; but I may here state that in all of the constructions herein shown I believe that in which both plates are rotated and in opposite directions will prove most efficacious in the gathering of cotton.

From the foregoing it will be seen that a wide range of possibilities exist in the construction and mode of operation of a cotton-harvester embodying the broad principle of my invention, and I therefore do not desire to limit myself to any particular construction or mode of operation so long as the desired object is accomplished, the various modifications of my invention being incorporated herein simply as examples of the variations of which the invention is susceptible and to demonstrate the statements hereinbefore made, that any desired speed of axial rotation or of bodily travel of the picker-stems may be produced and that the speed of bodily rotation may be changed without changing the speed of axial rotation, or the speed of axial rotation may be changed without changing the speed of bodily travel by simply changing the speed of rotation of one or both of the driving-plates. It will also be observed that the upper and lower plates between which the rollers of the picker-stems are confined and by which they are operated constitute both the sole support or bearing of the picker-stems, or, more properly speaking, of their rollers, and the sole means for rotating the picker-stems upon their individual axes, and therefore I am able to dispense with the separate bearing and driving mechanism for the picker-stems, which has heretofore been invariably necessary, the picker-stems being supported and caused to travel bodily by one set of mechanism and driven or caused to rotate axially by a separate and independent set of mechanism, all of which renders the machine, as a whole, both weighty and expensive and requires an objectionable amount of power to drive the same. The great friction between the picker-stem journals and their bearing and the picker-stem pinion and their driving-gear places an objectionable limit upon the number of stems which may be employed, and the great number of beveled driving-gears and pinions involves a very expensive nicety of construction to avoid the liability of tying up or binding between the parts, which would render the machine inoperative. The construction of my machine is both light and inexpensive, and therefore three or four times the number of picker-stems may be employed in a machine without increasing the cost thereof or the amount of power required to operate the machine, but on the contrary reducing both.

As illustrated in Figs. 15 and 16, the upper and lower plates may be made of wood and the grooves thereof lined with sheet metal, as illustrated at *m*, to improve the wearing-surfaces thereof, as well as increase the longevity of the same, and the central openings therein may also be provided with a metallic lining or sleeve *n* for the same purpose; or, as illustrated in Fig. 16, the sleeve and the groove-lining may be formed in a single piece to give a metallic facing to the plates, which may be backed up and stiffened by the wooden body, and, in fact, many other modes of constructing these plates may be adopted, in which lightness and durability may be combined in an advantageous degree. Toward the same end—that of lightness and durability—I prefer to employ in connection with my machine a picker-stem constructed in the manner illustrated in Figs. 5 to 9, inclusive, although I do not wish to be understood as limiting the use of this picker-stem to this particular machine or one of substantially the same construction or mode of operation, for obviously by substituting any desirable form of friction or gear wheel for the roller therein shown the picker-stem may be employed in connection with any other cotton-harvester. This stem is formed by a stamping out of sheet metal (the blank illustrated in Fig. 6) and then rolling the same transversely into approximately a spiral or cylindrical form, such as shown by the transverse section in Fig. 9, taken on the line 9 9 of Fig. 7, in which the serrated or toothed edge *p* is shown as overlapping the smooth edge *q*, so

as to leave the teeth exposed for the purpose of gathering the cotton. The shank *r* of the stem when rolled forms approximately a perfect cylinder or tube of slightly less diameter than the main body of the stem, as shown by the cross-section 8, taken on the line 8 8 of Fig. 7, into which is fitted the stem or axle of the roller N, which is secured therein by pins or any other suitable fastening device. This stem combines in the maximum degree lightness, durability, and economy of construction, while at the same time it makes a most efficient stem for the gathering of the cotton, the single line of teeth being amply sufficient to engage and hold the cotton with which the stem comes in contact and at the same time renders this form of stem particularly easy to clean off the cotton gathered thereby, as the cotton may be readily stripped or removed therefrom by suitable cleaner devices, many forms of which are now well known in the art, but none of which it is deemed necessary to illustrate in connection therewith.

The class of machines to which this invention more especially relates is the straddle-row type, in which a suitable frame is mounted upon ground-wheels and provided with one of the upright picker-stem supporting and operating mechanisms upon each side of a central open passage-way for a row of cotton-plants, into which the picker-stems project radially from both sides, rotating upon their individual axes and at the same time having a bodily travel rearward, compensating for the forward travel of the machine.

In the foregoing specification and hereinafter in the claims I have denominated the wheels N, to which the picker-stems are axially secured, as "rollers," for the purpose of distinguishing them by their actual function in the machine, since they roll about the driving-plates K and L and by such rolling action are converted practically into gears for the picker-stems, and in fact, as previously described and illustrated in the drawings, these rollers might be gears in every sense of the word—that is, so far as being provided with intermeshing teeth is concerned—so long as they subserve the further purpose of the direct support and bearing for the picker-stems in both their axial rotation and bodily travel. It will therefore be understood that the plates K and L constitute both the support and driving-gears for the picker-stems, and by their employment I am able to dispense with the use of driving-gears separate and independent of the support as it has heretofore been necessary.

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

1. In a cotton-harvester, the combination of a support having two members, one of which is rotatable independently of the other, and a rotary picker-stem supported by and between the members of said support and adapted to be rotated by the movement thereof, substantially as set forth.

2. In a cotton-harvester, the combination, with a support composed of relatively-movable members, of picker-stems peripherally supported by and between the members of said support and actuated to have both an axial rotation on their own axes and a bodily travel about the axis of said support by the movements of one or both members of said support relative to the other, substantially as described.

3. In a cotton-harvester, the combination, with a peripherally supported and actuated roller, of a picker-stem projecting axially from and supported by said roller, substantially as described.

4. In a cotton-harvester, the combination, with a picker-stem and a roller to which the inner end of said stem is axially secured, of a pair of plates or supports by which said roller is supported and rotated, one or both of said plates being movable, substantially as described.

5. In a cotton-harvester, the combination, with a picker-stem and a roller to which said stem is axially secured, of a pair of plates or supports by which said rollers are peripherally supported and rotated, said plates being moved past each other in opposite directions, substantially as described.

6. In a cotton-harvester, the combination, with a picker-stem and a roller to which said stem is axially secured, of a pair of plates provided on their opposing faces with annular grooves in which said roller is confined and travels, one or both of said plates being rotatable, substantially as described.

7. In a cotton-harvester, the combination, with a picker-stem and a roller to which said stem is axially secured, of a pair of plates provided with annular grooves in their opposing faces, in which said roller is confined and travels and means for rotating said plates in opposite directions at different speeds, substantially as described.

8. In a cotton-harvester, the combination, with a series of picker-stems and a corresponding series of rollers to which said stems are axially secured, of a rotatable hollow shaft, a pair of plates provided in their opposing faces with grooves in which said series of stems are confined and travel, one of said plates being fixed and the other loose on said hollow shaft, and means for rotating one or both of said plates, substantially as described.

9. In a cotton-harvester, the combination, with a series of picker-stems and a corresponding series of rollers to which said stems are axially secured, of a rotatable hollow shaft, an internal rotating shaft eccentrically journaled therein, and a pair of plates provided with grooves in the opposing faces thereof, in which said series of rollers are confined and travel, one of said plates being fixed and the other loose on the hollow shaft and said loose

plate being geared to said eccentric shaft, substantially as described.

10. In a cotton-harvester, the combination, with a series of picker-stems and a corresponding series of rollers to which said stems are axially secured, of a rotatable hollow shaft, an internal shaft eccentrically journaled therein, a pair of plates provided with annular grooves in the opposing faces thereof in which said series of rollers are confined and travel, one of said plates being loose and the other fixed on the hollow shaft, a gear connection between said eccentric shaft and the loose plate, and means for rotating said shafts simultaneously in opposite directions, substantially as described.

11. In a cotton-harvester, a picker-stem formed of a sheet of metal rolled into tubular form and having one lateral edge serrated or toothed, substantially as described.

12. In a cotton-harvester, the combination, with a picker-stem formed of a sheet of metal rolled spirally into substantially a tubular form and having the outer lateral edge thereof toothed or serrated, of a wheel or gear, to which said stem is axially secured, substantially as described.

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