J. DAIN.

HAY RAKE.

APPLICATION FILED MAR. 9, 1908.

1,007,676.

Patented Nov. 7, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

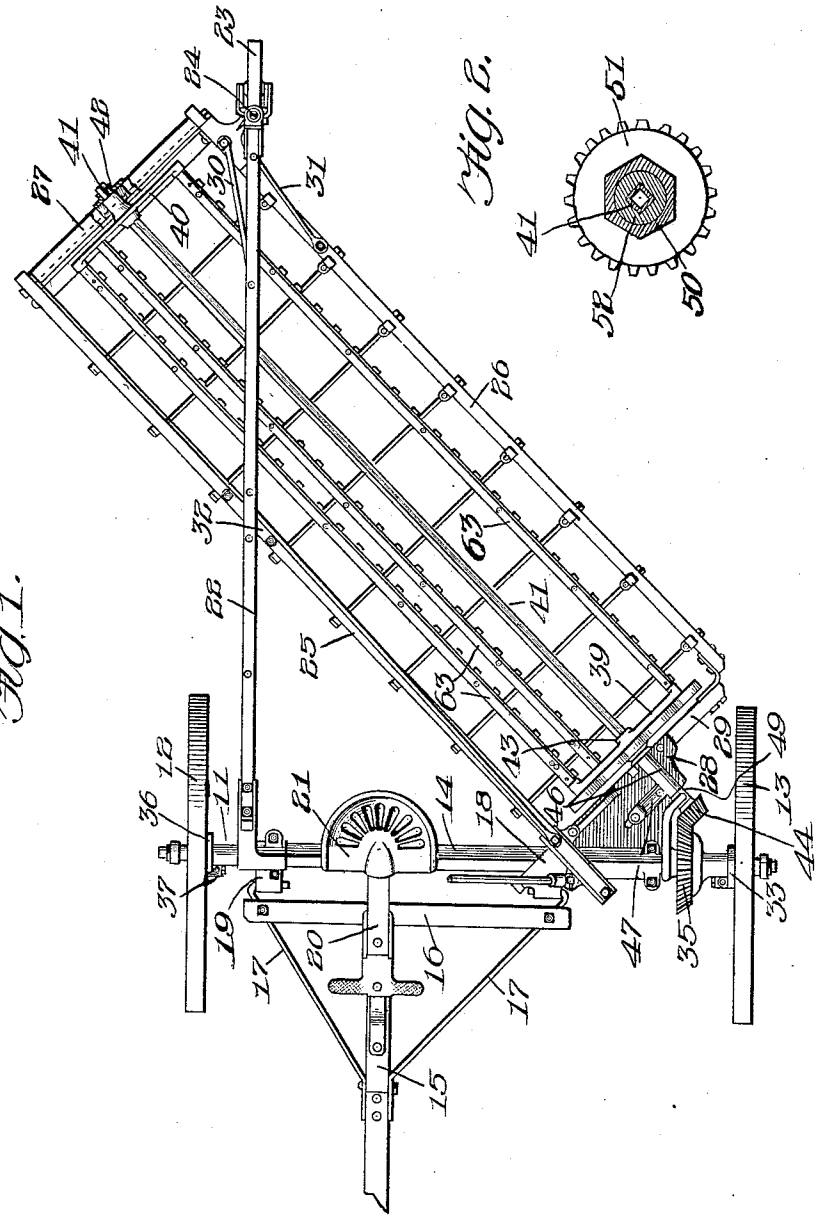

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

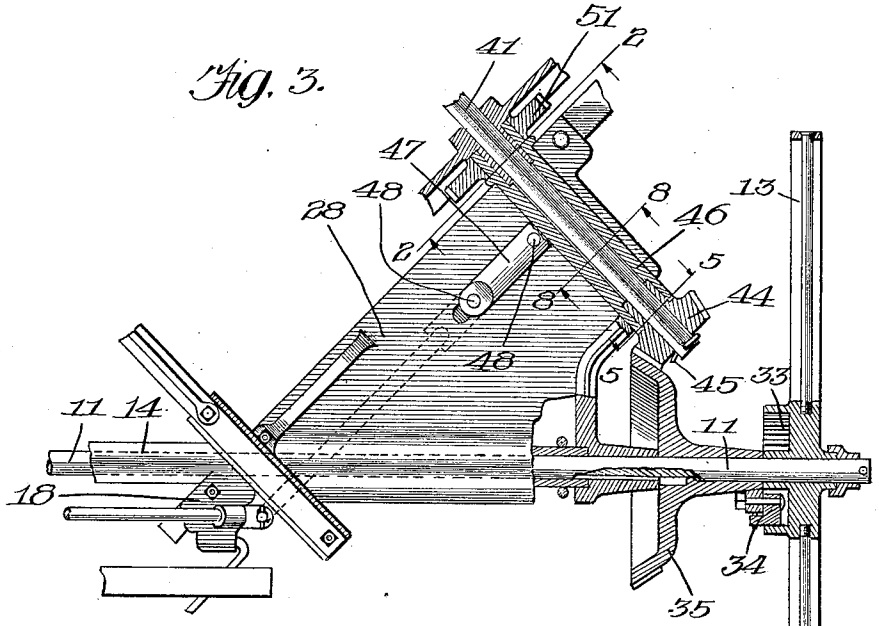


Fig. 4.

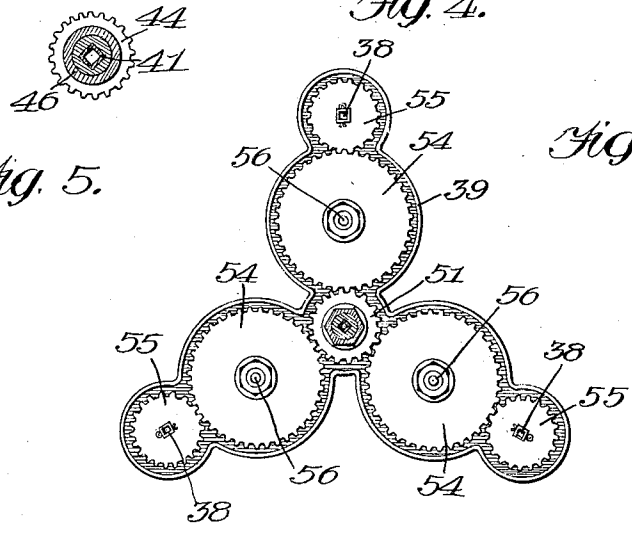
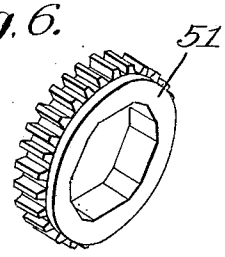


Fig. 5.

Fig. 6.



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HAY RAKE.

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3 SHEETS—SHEET 3.

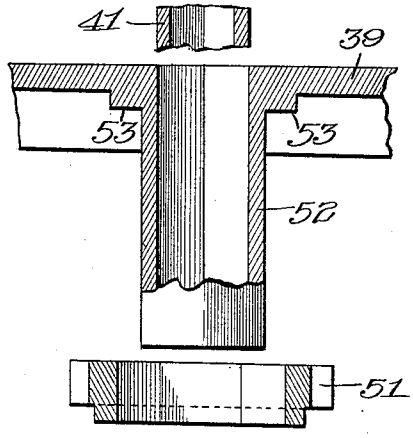
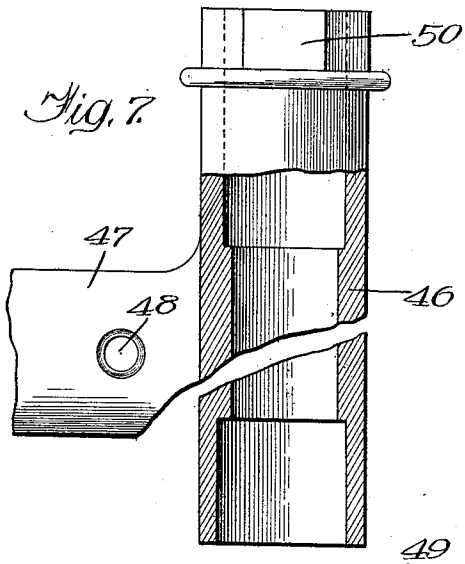


Fig. 7.



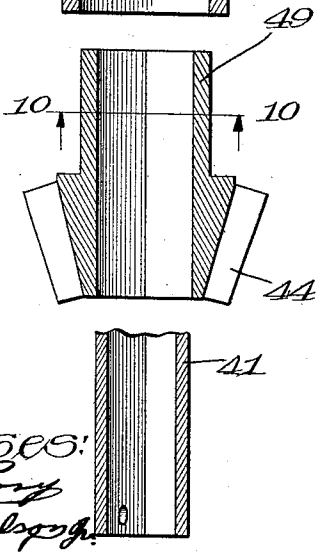


Fig. 11.

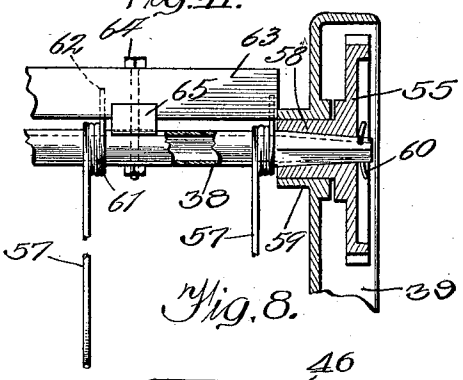


Fig. 8.

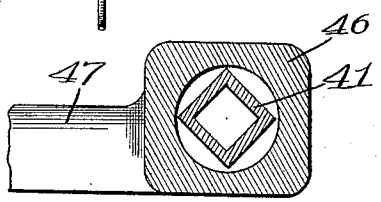


Fig. 9.

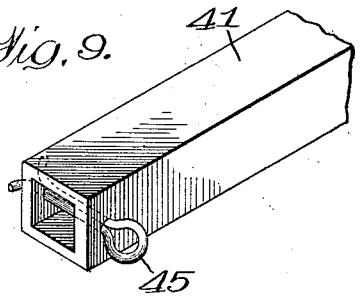
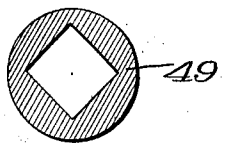


Fig. 10.



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UNITED STATES PATENT OFFICE.

JOSEPH DAIN, OF OTTUMWA, IOWA.

HAY-RAKE.

1,007,676. Specification of Letters Patent. Patented Nov. 7, 1911.

Application filed March 9, 1908. Serial No. 419,972.

To all whom it may concern:

Be it known that I, JOSEPH DAIN, a citizen of the United States, residing at Ottumwa, in the county of Wapello and State of Iowa, have invented certain new and useful Improvements in Hay-Rakes, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to hay-rakes, and particularly to that type known as "side delivery" rakes, in which there is a revolving frame carrying pendent teeth which are maintained in a vertical position and operate to throw the hay out to one side in windrows.

The object of my invention is to provide a construction by which the rake may readily be taken apart for shipment so that it will pack more closely in cars and consume less space for storage in warehouses; also to so construct the separable parts of the driving mechanism that the farmer, however inexperienced he may be, will have no difficulty in putting them together properly. In prior constructions it has been common to employ a solid center shaft for driving the sets of teeth, and the most satisfactory way to attach the power-transmitting members to the shaft was by means of keys driven in keyways cut in the shaft and in said power-transmitting members. When rakes having such construction are set out in a knocked down condition to be set up by the farmer, the result has been either that the parts have not been tightly connected, with disastrous results to the implement, or the keys have been driven in so tight as to burst the power-transmitting members at the keyways. Also in driving in the keys the power-transmitting members have sometimes slipped on the shaft without being observed until after undertaking to operate the machine, when it would be a very difficult task to loosen the keys and get the parts back in proper place and correctly keyed.

By the means hereinafter described I have produced a construction which permits of the parts being easily disassembled to permit close packing in cars and yet makes it easy and certain for the farmer to assemble the parts properly when setting up the machine. Furthermore, they increase the efficiency of the rake as well as reduce the cost of manufacture.

In the accompanying drawings,—Figure 1 is a plan view of a side-delivery rake embodying my improvements; Fig. 2 is a cross-section on line 2—2 of Fig. 3; Fig. 3 is an enlarged detail, partly in section, showing the construction of the driving mechanism and the parts that support it; Fig. 4 is an elevation showing the gears which control the position of the rake teeth; Fig. 5 is a section on line 5—5 of Fig. 3; Fig. 6 is a perspective view of the gear; Fig. 7 is an enlarged detail, partly in section, showing the construction and arrangement of the driving mechanism; Fig. 8 is a cross-section on line 8—8 of Fig. 3; Fig. 9 is a perspective view of one end of the drive shaft; Fig. 10 is a cross-section on line 10—10 of Fig. 7; and Fig. 11 is a detail, partly in section, illustrating the manner of connecting the rake bars with the pinions which control their position.

In the drawings I have shown my improvements as applied to a rake having the general construction illustrated and described in my application No. 234,007, filed November 23, 1904, in which the main frame of the implement is made up of an axle 11 having carrying wheels 12—13, said axle being journaled in a cross-bar 14 preferably internally square in cross-section. Said cross-bar 14 forms a means of attachment for the draft devices, 15 being the tongue, 16 a cross-bar, and 17 braces connecting said cross-bar with the tongue and with the bar 14 through brackets 18—19. 20 indicates the seat-support, and 21 the seat, the seat-support being connected with the tongue in the usual way. 22 indicates a beam connected at its forward end with the cross-bar 14 and extending rearwardly, where it is supported by a caster-wheel 23 in such manner as to be free to rise and fall, being preferably spring-supported on the spindle 24 of the caster-wheel, as described in my said application. 25—26 indicate the side bars of the rake frame, which are connected at their outer ends by an end-bar 27 and at their inner ends by a casting or plate 28 and an end-bar 29, as shown in Fig. 1 and as described in said application. Said bars form a rectangular frame, in which the rotary rake is mounted, said rake being supported from the bar 22 by braces 30—31 and bracket 32, as shown in Fig. 1. These parts

are described in my said application and have nothing specially to do with my present invention.

The wheels 12—13 are loosely mounted on the axle 11 and are provided with suitable ratchet mechanism so that they may rotate reversely independently of said axle. The wheel 13 is provided with a ratchet hub 33 which is engaged by a pawl 34 carried on the hub of a beveled gear 35 mounted on the axle 11 adjacent to the ratchet hub 33, as shown in Fig. 3, the arrangement being such that forward rotation of the wheel 13 operates to rotate the gear 35, but said wheel may rotate backward independently of said gear. If desired, the other wheel 12 may be provided with a similar ratchet and hub 36 connected by a pawl 37 with the axle 11, as shown in Fig. 1.

The rotary rake is composed of a series of rake bars 38 supported by end castings 39—40, which are mounted upon the square shaft 41 extending longitudinally of the rake frame, as best shown in Figs. 1 and 11. The shape of the castings 39—40 is best shown in Fig. 4, from which it will be seen that they are triangular in general outline,—the rake bars 38 being mounted in the outer portions of the several arms of said castings. The casting 40 at the outer end of the rake frame is a simple casting having a hub fitted to the squared shaft 41 so as to rotate therewith, so that the outer casting is positively driven. The outer end of the shaft 41 is fitted in a suitable sleeve 42 on the end bar 27 so that it is rotatably supported by said end bar, as illustrated in Fig. 1.

The inner end casting 39, which is best shown in Figs. 1 and 4, is also provided with a squared hub 43 which fits upon the inner end portion of the shaft 41 so that it also is positively driven by said shaft. The inner end of the shaft 41 extends through said casting and through suitable bearings carried by the casting or plate 28 to a point adjacent to the beveled gear 35, where it is provided on its inner end with a beveled pinion 44 which meshes with the gear 35, as best shown in Fig. 3. Thus the shaft 41 is driven by the forward movement of the machine so as to rotate the reel or rake.

45 indicates a cotter-pin which holds the pinion 44 in place on the shaft 41. The construction of the bearings and the connections of the shaft 41 are best shown in Figs. 1 and 7 to 10, form an examination of which it will be seen that the shaft 41 is a tubular shaft square in cross-section, as shown in Fig. 8, and that it passes through a sleeve 46, which is arranged to be secured to the casting 28 by means of a laterally-projecting arm 47, best shown in Figs. 3 and 7, in the manner described in my former application above referred to,—the casting 28 being provided with a suitable recess in which the arm 47 fits and is secured by bolts 48 so that it may readily be removed. The sleeve 46 is of sufficient diameter so that the shaft 41 may rotate therein, and its ends are somewhat enlarged for purposes which will be hereinafter stated. It will be noted from an inspection of Figs. 1 and 3 that the sleeve 46 extends diagonally in line with the shaft 41, and at its forward end receives the projecting hub 49 of the beveled pinion 44 which fits closely in the enlarged end of the sleeve, as best shown in Fig. 3. The parts are shown separated in Fig. 7. The opposite or rear end of the sleeve 46 is externally non-circular, being preferably hexagonal, as shown at 50 in Fig. 7, to receive a ring gear 51, best shown in Fig. 6, which fits upon such hexagonal portion of the sleeve 46, as best shown in Fig. 3 and 7. Thus the gear 51 is held against rotation by the sleeve 46 which, of course, is fixed in position by its connection with the casting 28.

The end casting 39 is rotatably fitted to the sleeve 46 by means of a projecting hub 52 which extends into the enlarged bore at the end of the sleeve 46, in which it fits snugly, as shown in Fig. 3 and illustrated in Fig. 7. The inner end portion of the hub 52 is enlarged, as shown at 53 in Fig. 7, so as to engage the adjacent ends of the ring gear 51 and hold it against displacement, as shown in Fig. 3. The sleeve 52 is square in cross-section to fit upon the shaft 41, and so also is the hub 49 of the pinion 44. Thus the hubs 49 and 52 support the shaft 41, and as they are journaled in the sleeve 46 they form bearings for said shaft so that it may rotate freely in said sleeve. By thus using a single drive shaft I secure a large contact surface for the power-transmitting members, and, moreover, the shaft being hollow is not as heavy as a solid shaft would be and does not sag in the center; besides I avoid the use of keyways and not only reduce the expense incident to cutting them, but also make the fitting together of the parts much simpler and prevent mistakes in assembling.

The gear 51 operates to hold the rake bars so that the rake teeth are always in a vertical position, by means of three sets of gears 54—55, the gears 54 being mounted on studs 56 carried by the several arms of the end casting 39 and meshing with the ring gear 51 while the gears 55 are mounted on and keyed to the ends of the rake bars 38 and mesh with the gears 54, as best shown in Figs. 4 and 11. As shown in Fig. 11, the rake bars are round tubular rods or pipes, each having one end tapered and squared to fit into hubs 58 of the gears 55. Said hubs are journaled in suitable bearings 59 in the castings 39. Thus the gears 55 are non-rotatably connected with the rake bars

38 and are journaled so that they may rotate as the casing rotates and operate to hold the rake teeth constantly in a vertical position. The gears 55 may readily be removed from the rake bars 38 and held in position by a cotter-pin 60.

57 indicates the rake teeth, which are mounted on the rake bars 38 at suitable intervals. As shown in Fig. 11, the rake teeth are preferably made of spring wire having a coil 61, which fits upon the rake bar 38, and an upward-projecting end 62 which fits in a suitable recess in the bar 63 which is secured to the rake bar 38, preferably by bolts 64, or other suitable means,—suitable blocks 65 being interposed to fit the bar 63 and rake bars 38 together. By forming the rake bars 38 and fitting the gears 55 thereto as described I provide a more efficient support for the coil of the spring teeth and also avoid the use of bolts through the gear and rake bar,—thus facilitating the fitting together of the parts, as well as their separation. If desired, the space in the sleeve 46 between the hubs 49—52 may be filled with oil, as it forms an excellent oil reservoir for lubricating the several bearings.

The construction above described provides a very efficient arrangement for applying the power derived from the wheels to the rotation of the rake and for holding the rake teeth in a vertical position when the machine is in operation. The several parts are so readily assembled that they can be properly put together by even the most inexperienced, no adjustments whatever being required, and they may be just as easily knocked down for purposes of transportation or storage.

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

1. In a rake, the combination of a shaft non-circular in cross-section, a sleeve through which said shaft passes, a frame non-rotatably supporting said sleeve, bearings rotatably supporting said shaft in said sleeve, a gear non-rotatably connected with said sleeve, rake-bars, frames non-rotatably connected with said shaft and supporting said rake-bars, rake-teeth carried by said rake-bars, and means connected with said rake-bars and coacting with said gear to hold the rake-teeth in a vertical position while said shaft rotates.

2. In a rake, the combination of a shaft non-circular in cross-section, a rotary rake mounted upon and rotating with said shaft, a sleeve through which said shaft passes, a frame non-rotatably supporting said sleeve, and bearings supporting said shaft and rotating in said sleeve.

3. In a rake, the combination of a shaft non-circular in cross-section, a sleeve through which said shaft passes, a frame non-rotatably supporting said sleeve, bearings supporting said shaft and rotating in said sleeve, a gear non-rotatably connected with said sleeve, rake-bars, frames non-rotatably connected with said shaft and supporting said rake-bars, rake-teeth carried by said rake-bars, means connected with said rake-bars and coacting with said gear to hold the rake-teeth in a vertical position while said shaft rotates, supporting wheels, and means operated by forward movement of the rake for rotating said shaft.

4. In a rake, the combination of a shaft non-circular in cross-section, a rotary rake mounted upon and rotating with said shaft, a sleeve through which said shaft passes, a frame non-rotatably supporting said sleeve, bearings rotatably supporting said shaft in said sleeve, supporting wheels, and means operated by forward movement of the rake for rotating said shaft.

5. In a rake, the combination of a wheeled frame, a sleeve carried thereby, one end portion of said sleeve being non-circular in cross-section, a pinion fitted upon such non-circular portion of said sleeve, a shaft journaled in said sleeve, rake-bars carried by said shaft and rotating therewith, rake-teeth carried by said rake-bars, and means connected with said rake-bars and with said pinion for holding said rake-teeth in a vertical position as said shaft rotates.

6. In a rake, the combination of a wheeled frame, a sleeve carried thereby, one end portion of said sleeve being non-circular in cross-section, a pinion fitted upon such non-circular portion of said sleeve, a shaft non-circular in cross-section journaled in said sleeve, rake-bars carried by said shaft and rotating therewith, rake-teeth carried by said rake-bars, and means connected with said rake-bars and with said pinion for holding said rake-teeth in a vertical position as said shaft rotates.

7. In a rake, the combination of a wheeled frame, a sleeve supported thereby, a non-rotary pinion connected with said sleeve, a shaft non-circular in cross-section extending through said sleeve, bearings for said shaft, rake-bars carried by and rotating with said shaft, rake-teeth carried by said rake-bars, and means connected with said pinion and operating to hold said rake-teeth in a vertical position as said shaft rotates.

8. In a rake, the combination of a wheeled frame, a sleeve supported thereby, a pinion non-rotatably connected with said sleeve, a shaft non-circular in cross-section, said shaft extending through said sleeve, a pinion having a hub adapted to fit upon said shaft, said hub being fitted into one end of said sleeve, forming a bearing for said shaft, a casting having a hub journaled in the other end of said sleeve and fitted upon said shaft so as to rotate therewith, a casting mounted upon the opposite end of said shaft, rake-

bars carried by said castings, rake-teeth carried by said rake-bars, and means connected with said rake-bars and with said pinion for holding said rake-teeth in a vertical position as the shaft rotates.

9. In a rake, the combination of a wheeled frame, a rake-supporting shaft rotatably supported by said frame, castings near the ends of said shaft and connected to rotate therewith, rake-bars having their ends journaled in said castings, rake-teeth mounted on said bars, said rake-bars being circular and having a non-circular end, sleeves fitted upon the non-circular ends of said rake-bars and journaled in one of said castings, and means connected with said sleeves and operated by the rotation of said casting for holding the rake-teeth in a vertical position as the casting rotates.

10. In a rake, the combination of a wheeled frame, a rake-supporting shaft having end portions non-circular in cross-section, means rotatably supporting the shaft on said frame, castings near the ends of said shaft and connected to rotate therewith, rake-bars having their ends journaled in said castings, rake-teeth mounted on said bars, said rake-bars being circular and having a non-circular end, gears mounted on the non-circular ends of said rake-bars, a non-rotary gear carried by the machine frame, and intermediate gears connecting said non-rotary gear with said first-mentioned gears.

11. In a rake, the combination of a wheeled frame, a sleeve carried thereby, said sleeve having an end portion externally non-circular in cross-section, a pinion fitted upon said non-circular portion, a beveled pinion journaled in the other end of said sleeve, a casting adjacent to said first-mentioned pinion and having a hub journaled in said sleeve, a non-circular shaft extending at one end through said sleeve and non-rotatably connected with said casting and said beveled pinion, a casting at the other end of said shaft, rake-bars carried by said castings, rake-teeth carried by said rake-bars, and means connected with said rake-bars and with said first-mentioned pinion for holding said rake-teeth in a vertical position as said shaft rotates.

12. In a rake, the combination of a shaft having its end portions non-circular in cross-section, a rotary rake mounted upon and rotating with said shaft, a sleeve through which said shaft passes, a frame non-rotatably supporting said sleeve, and bearings supporting said shaft and rotating in said sleeve.

13. In a rake, the combination of a shaft having its end portions non-circular in cross-section, a sleeve through which said shaft passes, a frame non-rotatably supporting said sleeve, bearings supporting said shaft and rotating in said sleeve, a gear non-rotatably connected with said sleeve, rake-bars, frames non-rotatably connected with said shaft and supporting said rake-bars, rake-teeth carried by said rake-bars, and means connected with said rake-bars and coacting with said gear to hold the rake-teeth in a vertical position while said shaft rotates.

14. In a rake, the combination of a wheeled frame, a rake-supporting shaft having end portions non-circular in cross-section, means rotatably supporting the shaft on said frame, castings near the ends of said shaft and connected to rotate therewith, rake-bars having their ends journaled in said castings, rake-teeth mounted on said bars, said bars having a non-circular end, gears mounted on and fitted to the non-circular ends of said rake-bars, a non-rotary gear carried by the machine frame, and intermediate gears connecting said non-rotary gear with said first-mentioned gears.

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