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Harvester.

No. 204,613. **Patented June 4, 1878.**

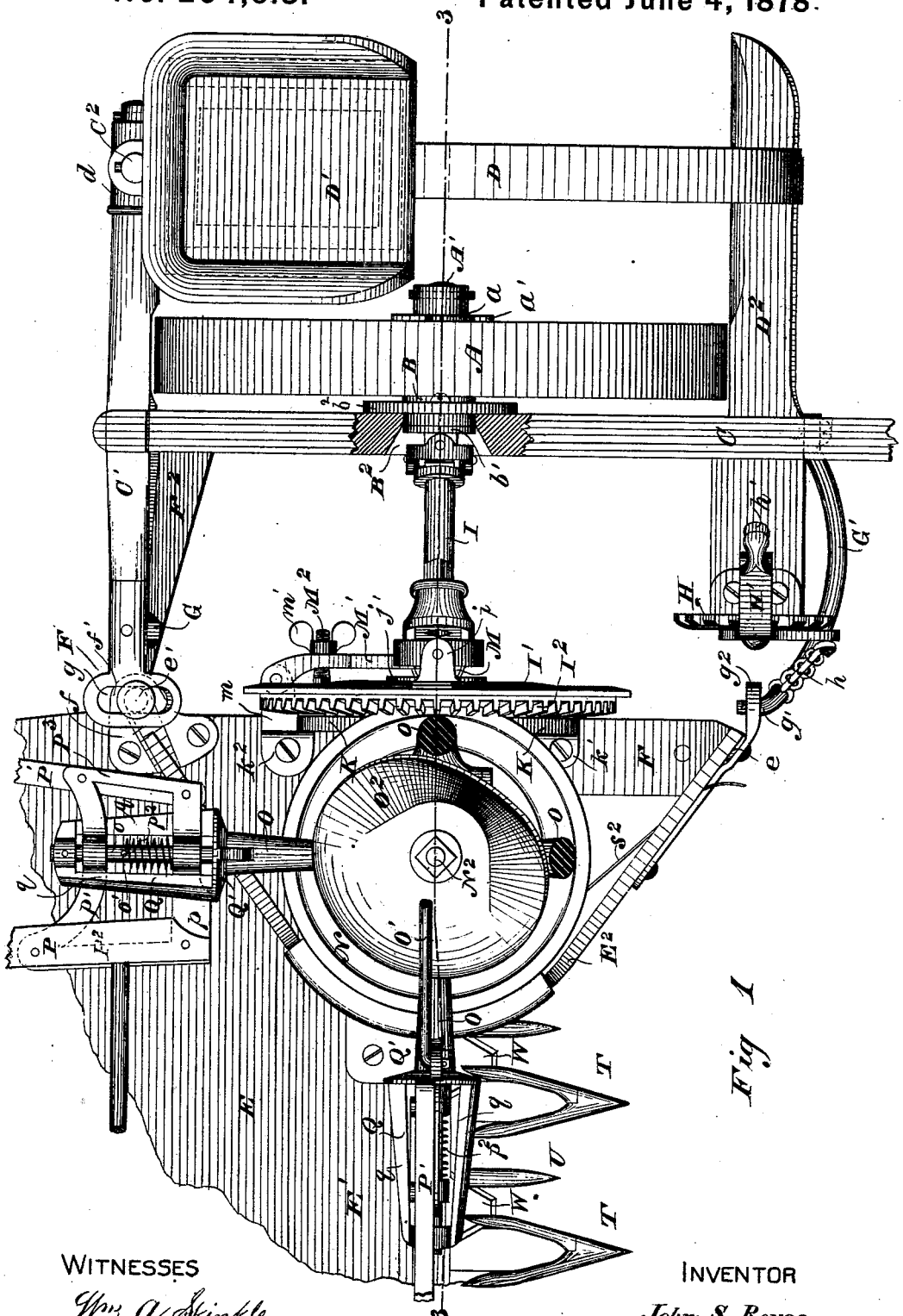

Fig 1

WITNESSES

Wm A Skinkle

Geo. W. Breck

INVENTOR

John S Royce

BY HIS ATTORNEYS

Baldwin Hopkins & Peyton

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J. S. ROYCE.

Harvester.

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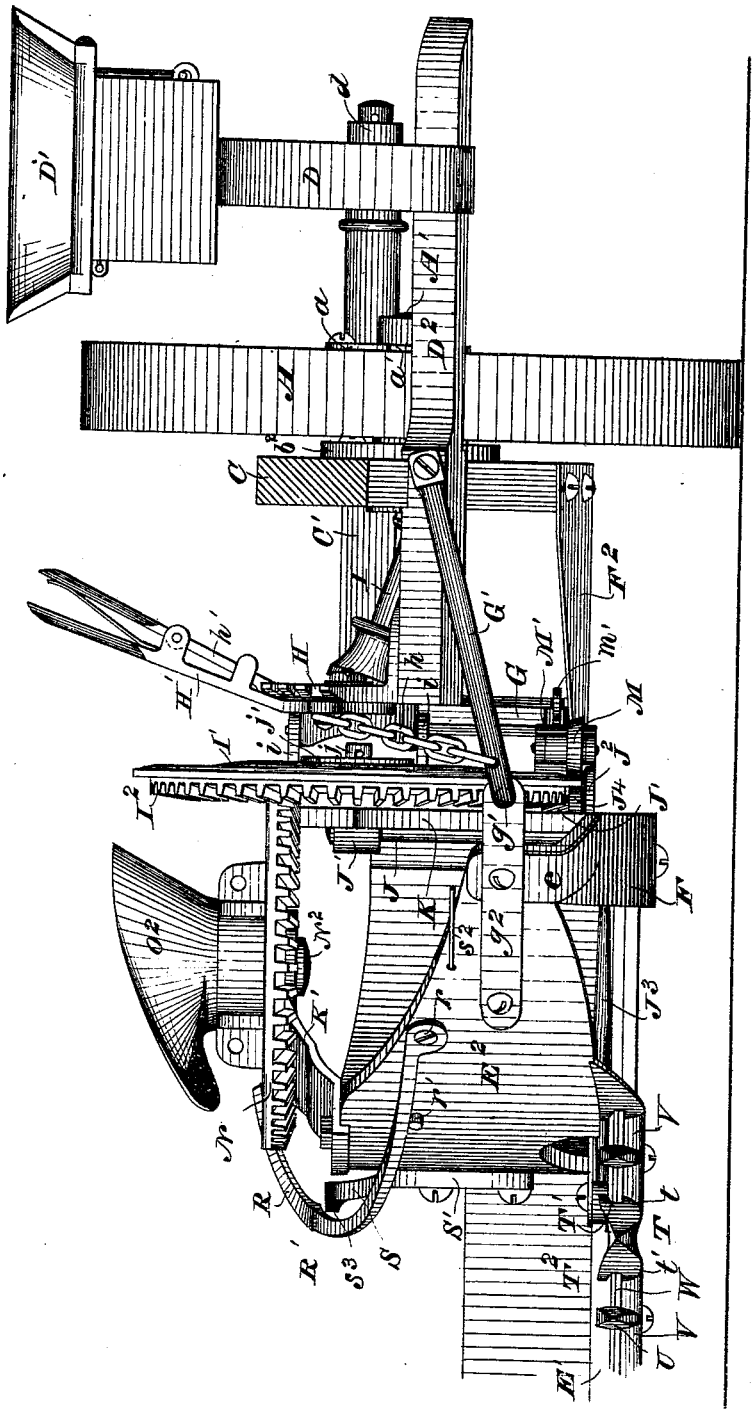

Fig 2.

WITNESSES

Wm A Skinkle

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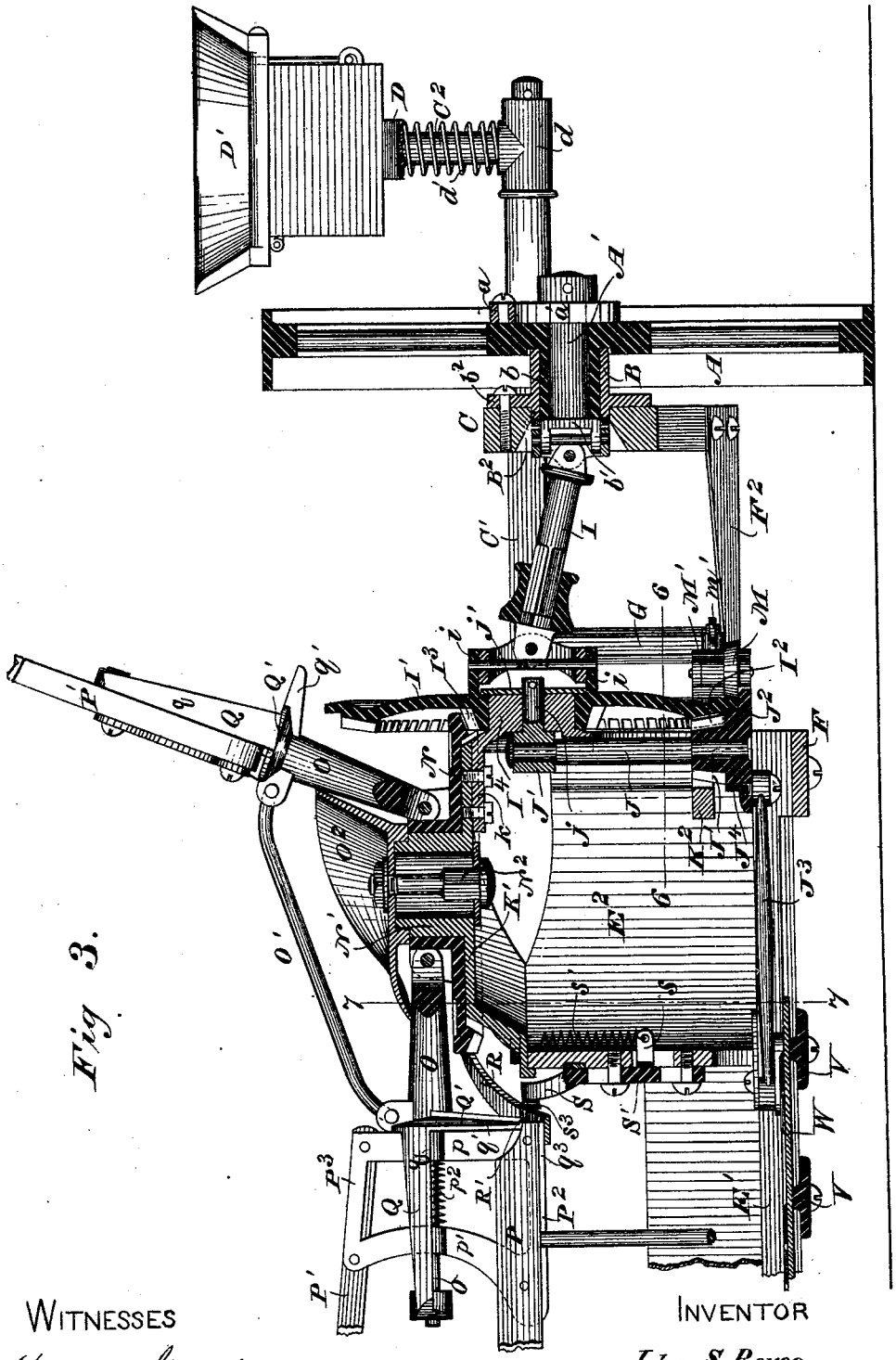

Fig 3.

WITNESSES

Wm A Stinkle.

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J. S. ROYCE.

Harvester.

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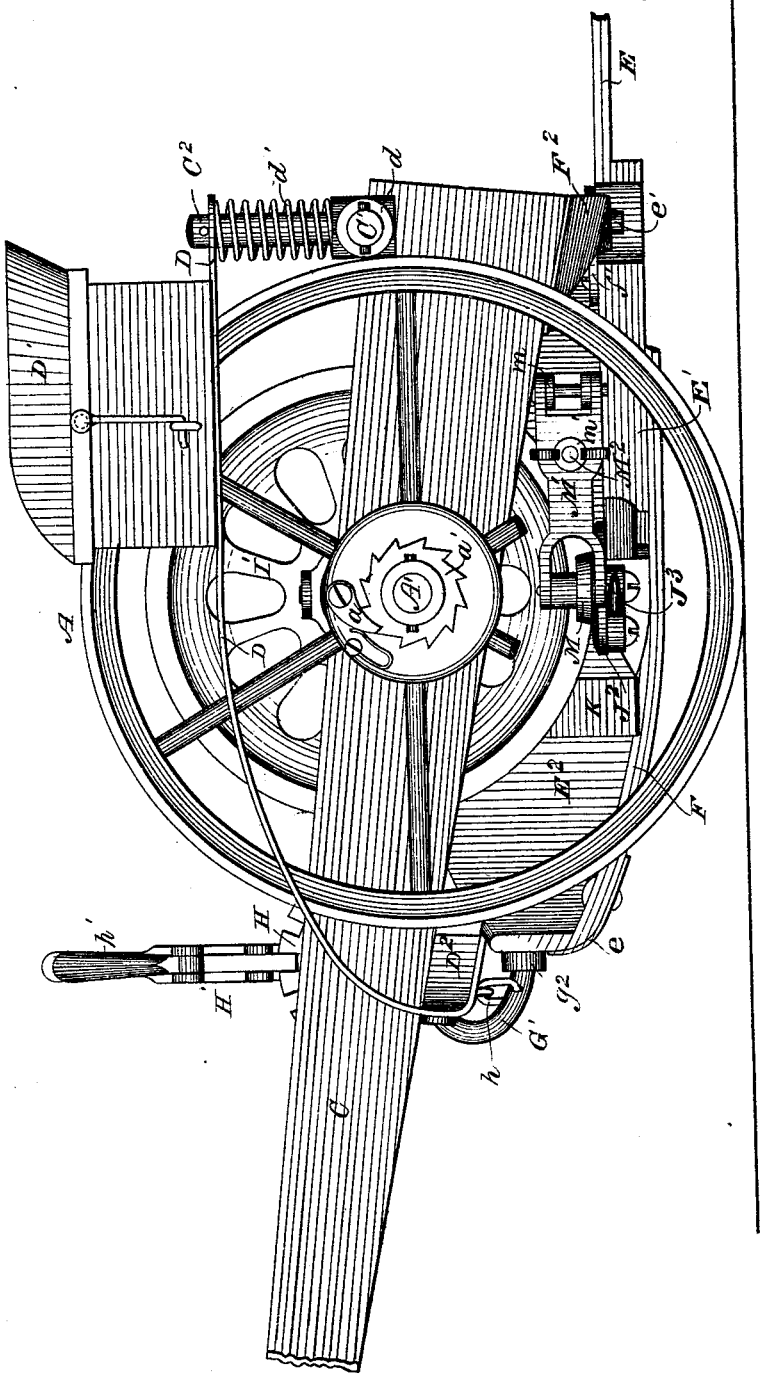

Fig 4

WITNESSES

Wm A. Skinkle

Geo. W. Breck

INVENTOR

John. S. Royce.

BY HIS ATTORNEYS

Baldwin Hopkins & Peyton

J. S. ROYCE.

Harvester.

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Fig 7

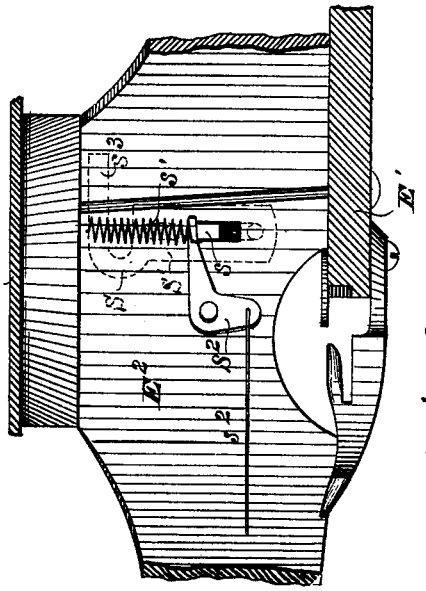

Fig 8.

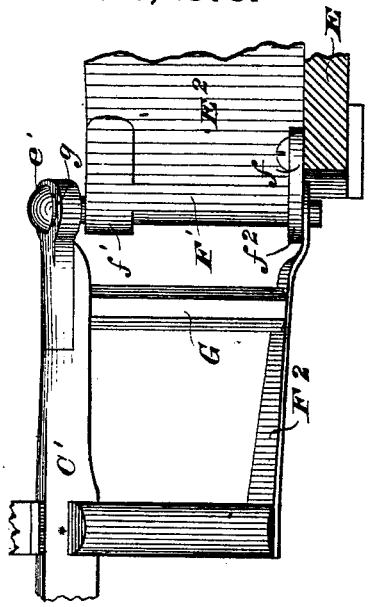

Fig 5.

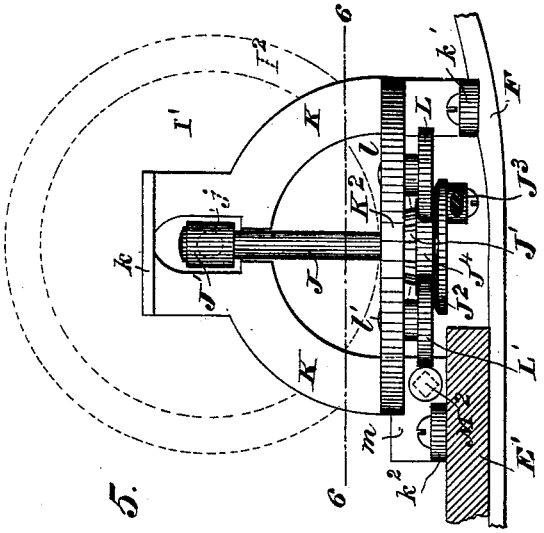

Fig 6.

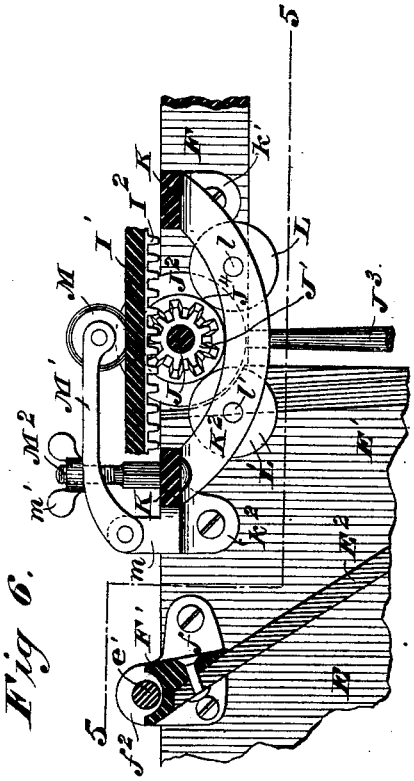

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Fig 13.

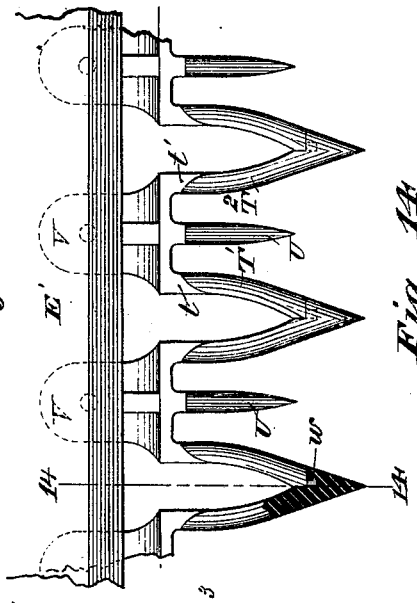


Fig 14.

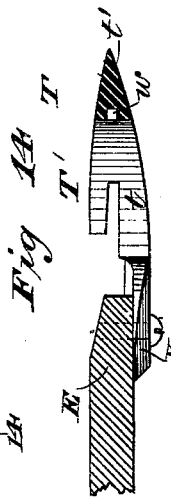


Fig 15.

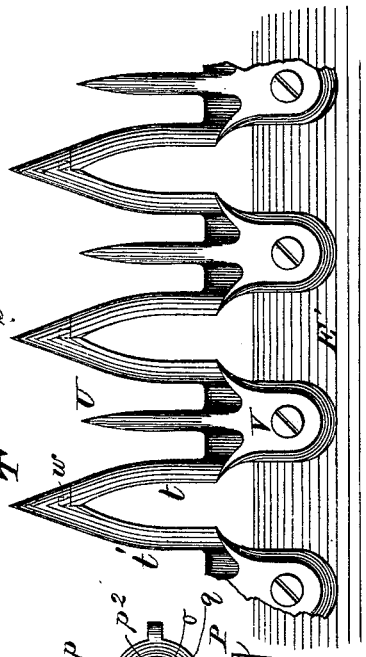


Fig 10.

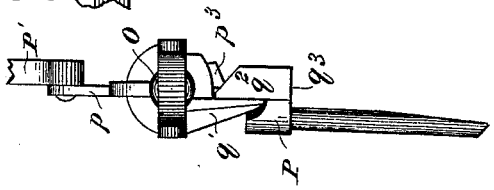


Fig 12.

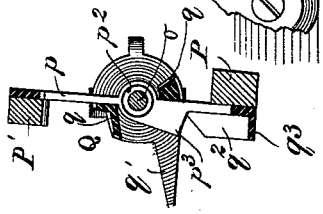


Fig 9.

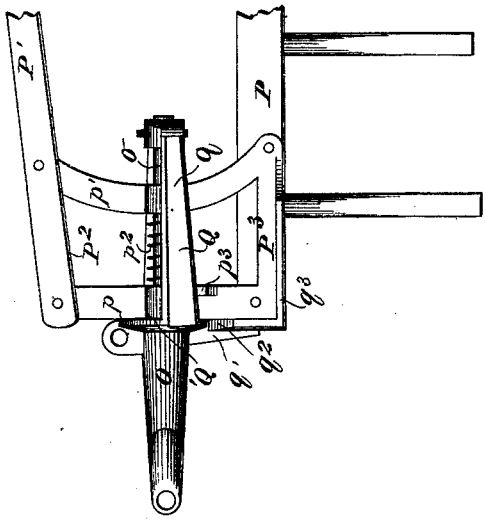
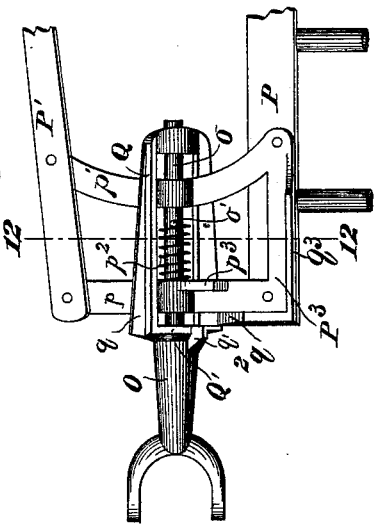


Fig 11.



WITNESSES

Wm. A Skinkle.

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INVENTOR

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UNITED STATES PATENT OFFICE.

JOHN S. ROYCE, OF CUYLERVILLE, NEW YORK.

IMPROVEMENT IN HARVESTERS.

Specification forming part of Letters Patent No. **204,613**, dated June 4, 1878; application filed March 20, 1878.

To all whom it may concern:

Be it known that I, JOHN SEARS ROYCE, of Cuylerville, in the county of Livingston and State of New York, have invented certain new and useful Improvements in Harvesters, of which the following is a specification:

My improvements chiefly relate to a harvester of the class known as "one-wheel machines," and more especially to such machines of this class as are shown in Letters Patent of the United States granted me March 10, 1874, Nos. 148,326 and 148,327, and in an application for Letters Patent of the United States filed by me June 2, 1876. The subject-matter claimed consists in certain novel constructions of parts and combinations of devices, hereinafter specifically designated.

In the accompanying drawings all my improvements are shown as embodied in the best way now known to me. Obviously, however, some of these improvements may be used without the others, and in machines differing in some respects in construction and organization from the one therein shown and hereinafter described.

Figure 1 is a plan or top view of so much of my improved machine as is necessary to illustrate the subject-matter claimed, portions of the machine being in section, and other parts broken away; Fig. 2, a front elevation, the rake-arms being removed, the cutting apparatus and platform partly broken away, and the tongue in section; Fig. 3, a view, partly in front elevation and partly in section, on the line 3 3 of Fig. 1. Fig. 4 is a view, in elevation, as seen from the outer or stubble side of the machine without the raking devices. Fig. 5 is a view, partly in elevation and partly in section, on the line 5 5 of Fig. 6, as seen from the inner or grain side of the machine, showing portions of the gearing, the gearing-supporting bracket, crank-shaft, &c.; Fig. 6, a plan or top view of the same, partly in section, on the lines 6 6 of Figs. 3 and 5. Fig. 7 is a view, partly in elevation and partly in section, on the line 7 7 of Fig. 3, showing the inside of the guard-fence or fender, as seen from the outer or stubble side of the machine, and parts connected therewith and supported thereby. Fig. 8 is a rear elevation of a portion of the machine, showing the connection between the platform and tongue. Fig. 9 is a view, showing one of the rake-arms and rake-heads. Fig. 10 is an end view of parts shown by Fig. 9; Fig. 11, a view of the same parts, but occupying positions different from those represented by Fig. 9; Fig. 12, a section on the line 12 12 of Fig. 11; Fig. 13, a plan view, with parts broken away, showing the guard-fingers; Fig. 14, a section of one of the guard-fingers on the line 14 14 of Fig. 13, a view, as seen from the under side, showing the guard-fingers and their connection with the finger-beam.

The main supporting and drive wheel A is mounted loosely upon a stud-axle, A′, with which it is connected by a pawl, *a*, on the wheel and a backing-ratchet, *a′*, fast on the axle in well-known way. The inwardly-projecting hollow trunnion or tubular extension *b* of the hub of the wheel is mounted and turns freely in a flanged sleeve-bearing, B, bolted securely by its vertical flange b^2 to the outer side or vertical face of the wide prolongation or heel-extension of the tongue C. The short axle A′ is formed with, or has rigidly secured to its inner end, a disk, b^1, which forms a vertical flange or shoulder around the axle, to prevent endwise movement thereof in the hub, which, as well as the tubular bearing B, abuts against this flange. This bearing B extends inward slightly beyond its flange b^2, and fits in a socket, B^2, cut transversely through the tongue-extension. By unkeying the backing-ratchet the axle and wheel may be removed.

The tongue is made quite wide vertically, and extends backward beyond the driving-wheel A, and has a transverse box or cross-piece, C^1, securely fastened upon its top at the rear end. This bar is supported intermediate its ends and near about its middle upon the heel of the tongue, and projects outside the driving-wheel some distance. Upon its outer end a vertical seat-standard, C^2, is secured. This upright is formed with a supporting-sleeve, *d*, fitting upon the rounded end of the cross-bar, so that it may turn thereon, and a spring, *d′*, encircles the standard, and bears at its lower end upon the sleeve, and at its upper end against the under side of the rear end of a plate-spring, D, which supports the dri-

ver's seat D^1 outside the drive-wheel. The rear end of the seat-spring D is perforated, and is fitted upon the top of the seat-standard C^2. A pin, passing through the seat-standard above the seat-supporting spring D, holds the parts together.

A transverse bar or cross-piece, D^2, secured firmly to the under side of the tongue in front of the drive-wheels, projects laterally both inwardly and outwardly therefrom. The outer end of this front cross-piece forms a foot-rest for the driver, and supports the front end of the spring D, which is bent downward around the cross-piece and secured to its under side sufficiently far from its end to leave room for one of the feet of the driver outside the spring.

I dispense entirely with a bed-plate or main frame proper, and connect the platform E, the finger-beam E^1, (represented in the drawings by the front edge of the grain-platform,) and the cutting apparatus with the driving-wheel, through the tongue C, by hinged connections.

A curved grain guard or fender, E^2, firmly secured upon the front inner corner of the platform, is connected at its front end to the tip of the shoe F by an angle-bracket, *e*, or in other suitable and equivalent way, and at its rear end terminates at the inner edge of the platform in a vertical bracket, F^1, secured by its flanged base *f* to the platform by bolts or screws. This bracket is formed with a socket to clamp the end of the curb or fender E^2 for its full height, and is provided at top and bottom with perforated lugs or bearings f^1 f^2, overhanging the edge of the platform, and between these lugs the bracket is preferably provided with a vertical half-round groove to form a bearing for a strong coupling-pin or pivot-rod, e'. A brace-bar or connecting-arm, F^2, is firmly secured at one end to the under side of the heel of the tongue beneath the rear cross-piece C^1, and firmly braced to said cross-piece by a vertical rod, G, near the platform. The pivot-rod e' fits at its lower end in the perforated end of the bar F^2, which extends beneath and bears upward against the lower lug f^2, through which the pivot-rod passes. The end of the cross-bar C^1 over the edge of the platform is provided with an elongated slot, *g*, above the upper lug f^1 of the bracket. The pivot-rod passes through this slot, and is headed to keep it from dropping out of place. A coupling-arm, G′, is hinged at one end to the front cross-bar D^2 beneath the tongue, and at its opposite end is jointed to the shoe F and front end of the fender E^2. The coupling-arm extends downward from the tongue, is curved to the rear, and bent at right angles at its end g^1 to enter a socket in the end of a plate, g^2, at the juncture of the fender and shoe. A notched detent, H, is secured upon the end of the front cross-piece D^2 over the coupling-arm, and the coupling-arm is connected by a chain, *h*, close to its outer end, with a lifting-lever, H′, provided with a suitable handle, and a stop, *h*′, engaging the detent.

By the above construction it will be seen that the driver can raise and lower the cutting apparatus to rock the guards and hold them at any inclination desired. As the platform rocks, the pivot-pin e' plays in the slot *g* of the rear cross-piece C^1, which cross-piece, it should be noticed, serves also as a support for the driver's seat, to partially counterbalance the weight of the platform and cutting apparatus.

Motion is imparted to the gearing for driving the cutters and raking and reeling devices from the driving-wheel through the axle A′ and a universally-jointed self-adjusting or sectional driving-shaft, I, of suitable and well-known construction. This shaft is coupled at one end to the axle by lugs on its flanged end or disk b^1, and at its opposite end is connected directly to a doubly-geared master-wheel or main driving-gear, I^1, through which both the cutters and rake are driven. The driving-shaft is coupled to lugs *i i* on the face of the gear-wheel, (clearly shown by Figs. 1 and 3,) and has two sets of teeth, I^2 I^3, arranged on its opposite face, or next the cutting apparatus. The larger circle of teeth, near the periphery of the wheel, serve to communicate motion to the cutters, and the smaller circle of teeth mesh with a wheel for driving the rake, as will hereinafter be explained. This main gear is mounted on and revolves freely around a stud or boss, I^4, formed upon a skeleton gear-supporting frame or bracket, soon to be described, secured over the heel of the finger-beam or inner front corner of the platform.

A vertically-arranged crank-shaft, J, is shouldered and journaled at its upper end, and revolves in a collar or bearing, J^1, having a short shaft, *j*, by which the collar is supported in the boss I^4 and the shaft held in its pendent position. The upper end of the crank-shaft is headed, or it may be provided with a nut or pin, to prevent it from moving downward. The stud-shaft *j* passes through a disk or washer, *j*′, and a pin passed through the end of this shaft holds the washer in place, to prevent movement of the wheel I^1 endwise of its boss, and also keeps the shaft in place, with its collar close to the boss. At its lower end the crank-shaft is also shouldered and journaled, and has mounted upon it a pinion, J^1, meshing with the teeth I^2 of the main gear. Below this pinion, and formed with it, is the crank-wheel J^2, to which a cutter-driving pitman, J^3, low down, or about on the level of the cutters, is connected. The crank-wheel is shouldered or formed with a collar, J^4, of less diameter than the flange thus formed, or base of the wheel, for a purpose presently to be explained.

The gear-supporting frame or bracket is formed with two curved posts or arms, K K, united at their tops and forming an arch, as best shown by Figs. 5 and 6. A recess for the crank-shaft collar or upper bearing J^1 is made at the top of the arch, and above the crank-shaft and main gear-wheel boss I^4 the frame is formed with an angular projection or

flange, k, overhanging the crank-shaft. (Most clearly shown by Figs. 3 and 5.) This flange is firmly secured by bolts or screws, or otherwise rigidly united with the under side of a plate, K^1, forming the top support of the gear-frame. This plate is bolted or screwed firmly to the fender E^2. Near the bottom of the frame the arms are connected by a strong curved piece or brace, K^2, preferably cast with them. The arms are flanged at their bottoms, and bolts or screws connect these flanges k^1 k^2, respectively, to the shoe F and the finger-beam or platform.

The crank-shaft J is stayed in an upright or substantially vertical position, and supported in the gear-frame against lateral movement at its lower end in the following way: The curved connecting piece or brace K^2 has two pendent stud-shafts, l l', carrying, beneath said brace, rollers L L′, rotating freely above the flanged portion of the base of the crank-wheel, close to the top surface of said base, and between it and the crank-wheel pinion J^1. These anti-friction rollers L L′ bear at their peripheries against the crank-wheel collar J^4. (Best shown by Figs. 5 and 6.) An adjustable freely-revolving roller, M, carried by one end of a horizontally-swinging arm, M^1, hinged or pivoted at its opposite end to a lug or projection, m, of the rear arm K of the frame-arch, serves to brace and sustain the crank-shaft from the side opposite that on which the rollers L L′ are located. This adjustable roller overlaps the base or flange of the crank-wheel, and revolves upon or close to its upper surface. The main gear-wheel I^1 revolves with its rim or edge between the anti-friction roller M and the collar J^4 of the crank-wheel pinion J^1, and with its opposite faces, at or near the periphery, close to or in contact, respectively, with said roller and collar. An adjusting-nut, m', and screw M^2 serve to hold up the roller M to its place. This screw-bolt is mounted on the rear arm of the arch of the gear-frame.

From the above description it will be seen that the main gear is mounted upon the hinged platform or finger-beam and shoe over the cutting apparatus, above the heel of the floating finger-beam, and in line with the driving-axle of the supporting-wheel; that the crank-shaft pinion is driven directly by the master-wheel or main driving-gear, thus differing essentially, in the manner of driving the cutters, from my prior invention shown in my application hereinbefore referred to; that a strong, firm support for the gearing is provided; and that the rollers serve both to sustain the crank-shaft and keep the main gear up to the crank-wheel pinion, and prevent it from wabbling on its boss. The fender E^2 serves as a protection to the gearing.

An inverted rake-carrying crown-wheel, N, revolves about a tubular stud or boss, N^1, on the top part or plate K^1 of the gear-supporting frame. The teeth upon the under side of this wheel mesh with the main gear-teeth I^3. A series of rising and falling short rake-arms, O, connected in pairs by link-rods, O^1, are pivoted to lugs on the crown-wheel, as usual. A single cam, O^2, above and between the rake arms, is secured in a fixed position upon the top of the boss N^1, over the hub of the crown-wheel, by a screw bolt, N^2, passing through the boss and its attachments.

Oscillating rake-heads are formed of a straight bar or rake-head proper, P, carrying the rake teeth, and a brace-bar, P^1, above said toothed arm, bowed at its outer end and connected to the corresponding end of the toothed bar in a well-known way. The outer ends of the rake-heads are not shown in the drawings, being of well-known construction. At their inner ends each of the rake-heads is provided with a skeleton frame or bracket, connecting and firmly bracing together the bars P P^1. The bracket may be cast in a single piece, and it is formed with cross-bars p p^1, connecting the sides P^2 P^3, which are fastened to the bars P P^1 of the rake-head. The cross-pieces p p^1 are perforated about their middles to form journals, in which the reduced end o of each rake-arm O fits so as to turn freely. These extensions or outer ends o of the rake-arms are round rods formed separately from the arms and fitted to them, as will presently be explained. Between the arm p, which forms the base of the bracket, and a cross-pin, o', in the rake-arm rod is a spring, p^2, acting with a tendency to prevent the rake-head from moving outward by the sliding of the bracket endwise along the rod o. An open-sided stud or yoke, Q, is formed with each rake-arm, and the rake-head bracket is mounted between the arms q q of this yoke on the rod o, so that in its normal position the base of the bracket rests upon the base Q′ of the yoke. The rod o passes through the perforated end of the yoke, and rests at its inner end in a socket in the base Q′. A pin passing through the end of the yoke and the rod o serves to hold it in place. To admit of the connection and separation of the rake-head, the bracket, the rod, and the yoke, the bracket sides P^2 P^3 are detachably secured, by screws or otherwise, to the rake-head. By detaching the bracket from one of the rake-head bars (say, the brace-bar P^1) and removing the pins which respectively connect the ends of the rod o and yoke and limit the movement of the spring p^2, it will be obvious that the rod can first be withdrawn and then the bracket be slipped out of the yoke. The lower arm or base p of the bracket has a lug, p^3, formed on its side, which, when the parts occupy their normal position, so that the rake will sweep the platform, comes in contact with one of the arms of the yoke. A downwardly-projecting short-arm, q^1, on the yoke-base fits, when the parts are in the position just described, behind an offset or shoulder, q^2, on the bracket-base.

By the above-described construction it will be seen that by giving the rake-head bracket a slight outward or sliding movement on the rod o, so as to disengage the locking-arm q^1

and shoulder q^2, the rake-head will be free to oscillate on the rake-arm to an extent limited by the yoke-arms, in contact with which the bracket-arms come when the rake-head is given about a quarter-turn, so as to cause its teeth to assume a horizontal, or nearly horizontal, position. When the lug p^3 is locked with the yoke-arm and the arm q^1 locked against the offset q^2, the rake-head follows the movements of the rake-arm, and is caused to sweep the cut grain from the platform.

The construction of parts just described will readily be understood by reference to Figs. 1, 3, 9, 10, 11, and 12.

A yielding rake, guide, or cam track, R, is traversed by the rake-head brackets as the rake sweeps over the platform. In the drawings this guide is shown as composed of a flat bar, made of spring metal, supported at its front end upon the feeder E^2 by a fastening bolt or screw, r, and a pin, r'. It curves upward and backwardly around the fender. Obviously this curved guide might be yieldingly supported at its rear end, and still operate in the manner hereinafter explained. The rake-head brackets traverse this guide in moving over the platform, whether acting as rakes or reel-arms, the guide, by reason of its elasticity, following up the brackets as they are turned when the rake is not to operate, and giving way when the rake is to operate, and the bracket projects downward, with its lower side some distance below the rake-arm. These brackets are preferably constructed with an edge rib or flange, q^3, upon their under sides, which moves in contact with the guide as the rakes sweep over the platform with their teeth thrown up clear of the platform.

The action of the rakes is controlled by a vertically-reciprocated tripping-arm or spring-latch, S, located upon the fender E^2, between the fender and the rake-guide R, and projecting slightly above the level of the guide. Headed bolts or screws passing through elongated slots in the upright portion or shank S^1 of the tripping-arm secure it in its place, and admit of the requisite vertical movement being imparted to it. Normally, this tripper occupies its most elevated position. A lug, s, on the tripper-shank projects through a slot in the fender, and has secured to it one end of a spring, s^1, the opposite end of which is fastened to the inside of the fender. (See Figs. 3 and 7.) This spring acts with a tendency to hold up the tripper. A bell-crank lever, S^2, pivoted to the fender, bears at one end upon the lug s, and has a wire or cord, s^2, attached to its opposite end, and passing to a proper hand or foot lever, suitably located upon the tongue or front cross-piece of the machine, within reach of the driver from his seat. In its normal or elevated position the tripper acts upon the rake-head brackets to turn the rake-heads, which then act simply as reel-arms or beaters.

When a rake is to be caused to sweep the grain from the platform, the tripper is moved downward to bring it below the level of the rake-guide, and so as not to oscillate the rake-head.

The operation of the rakes is as follows: When the rakes are to serve as beaters only, the tripper S acts in turn by its lateral lug or outwardly-projecting end s^3 upon ends of the rake-head brackets, and causes the respective brackets and rake-heads to slide outward slightly, so as to disengage the locking-arms q^1 of the yoke-bases and the shoulders q^2 of the bracket-bases, thus leaving the rakes free to oscillate about the rake-arms on the rods o. A shoulder or short and abrupt incline, R′, on the guide R, next acts upon these brackets in turn, and oscillates the rake-head. The rake-teeth are quickly turned up by the action of this incline on the flange edge q^3 of the bracket, and as the rake continues to move over the platform this edge rib bears upon the curved spring-guide. By deepening this rib—that is to say, by making it more prominent, so as to project a much greater distance outward from the bracket—it is obvious that the amount of play or spring of the rake-guide will be inconsiderable, as that portion of the bracket in contact with the guide will thus be caused to traverse the same, or nearly the same, path whether the rake be oscillated or not. The rakes, after being thus oscillated, and as they continue to revolve after leaving the guide R, are caused to drop automatically into their vertical or operative positions before again entering the standing grain simply by the weight of the rake-heads and their brackets, and the bracket-bases and yoke-bases are, by the action of the springs p^2, which slide them inward upon the rods o, thus again locked together. When the gavel is to be swept from the platform the tripper is moved downward, so that the inner end or butt of the rake-head bracket does not come in contact with the tripper.

The cutting apparatus is peculiar. The guard-fingers are made alternately large and small. The large fingers T are pointed, as usual, and bifurcated, each being composed of two arms or forks, t t', and caps T^1 T^2, with slots between the caps and arms for the sickle W to reciprocate in. The small (commonly employed open) slotted guard-fingers U are arranged between these large guards.

The series of large and small guards are cast in sections, one small guard-finger and a section of two of the larger guard-fingers being formed together, with a common shank or base, V, which serves to secure the guards to the finger-beam. (See Figs. 13, 14, and 15.) Each section of the series of guards so formed consists of a base, V, a guard, U, an arm or fork, t, and its cap T^1 of one of the large centrally-open guards T on one side of the short guard, and the arm t', cap T^2, and point of another of said large guards on the opposite side of the guard U. A mortise and tenon-joint, w, consisting of the lugged and shouldered end of the shorter member of a large guard and the recessed base of the point of the longer section of the next large guard, (see

Fig. 14,) unites the sections of the series of guard-fingers. Each tooth or cutter W of the knife-bar plays through one of the small guards and through the slot of that fork or portion of each of the two adjacent large guards on either side of the small guard, thus cutting at those points on each reciprocation of the cutter-bar.

By the above construction of the guard-fingers I am enabled to cut at three points by each tooth at every reciprocation of the cutter by a shorter stroke than would be necessary were all the guards made large and of the usual size, and am, moreover, enabled to lessen the number of teeth or cutters on the cutter-bar and arrange them at intervals with spaces between them, as shown by Fig. 1, and as will readily be understood from the foregoing description. In this way the cost of making the cutter is lessened and its sharpening facilitated.

I claim as of my own invention—

1. The combination, substantially as hereinbefore set forth, of the wide tongue-extension, the sleeve-bearing secured thereto, the driving and supporting wheel, its projecting hub mounted in said bearing, and the stud-axle.

2. The combination, substantially as hereinbefore set forth, of the loose driving-wheel, the projecting tubular hub, the flanged sleeve-bearing, the tongue-extension, to which said bearing is bolted, the stud-axle, and the disk or flange upon its inner end, against which said bearing and hub abut.

3. The combination of the single driving or supporting wheel, the tongue or draft frame inside thereof, and the fender encircling the gearing and its supporting-frame and hinged at each end to the tongue, substantially as and for the purpose set forth.

4. The combination, substantially as hereinbefore set forth, of the single driving-wheel, the tongue-extension, the rear cross-piece secured upon the tongue and connected with the platform at its inner end, the seat, and the seat-supporting standard mounted upon and rocking on the outer end of said cross-bar outside the driving-wheel.

5. The combination, substantially as hereinbefore set forth, of the tongue, the driving-wheel supported thereby, the front and rear cross-bars secured to the tongue, the platform supported at the inner ends of said cross-bars, and the driver's seat supported upon the outer ends of said cross-bars outside the driving-wheel.

6. The combination of the tongue, the rear cross-bar, the front cross-bar, the driver's seat-supporting plate spring connected at one end to said front cross-bar, and the standard and spring connecting said supporting-spring with the rear cross-bar, substantially as hereinbefore set forth.

7. The combination, substantially as hereinbefore set forth, in a harvester having no main frame proper, of a main driving and supporting wheel, a tongue extending back of said wheel, a rear rigid cross-bar secured to the tongue at its heel, and the platform connected by a hinge to said cross-bar and capable of rocking thereon transversely thereto.

8. The combination, substantially as hereinbefore set forth, of the supporting-wheel, the tongue, cross-bars rigidly secured thereto in front and rear of the supporting-wheel, the cutting apparatus, the platform hinged to said rear cross-bar, the coupling-arm hinged to the shoe, and the lever for rocking the guards mounted upon the front cross-bar.

9. The combination, substantially as hereinbefore set forth, of the supporting-wheel, the tongue, the rear cross-bar rigidly secured upon the top of the tongue at its heel, the brace-bar rigidly secured to the under side of the heel of the tongue, and the platform and fender jointed to said cross-bar and brace and rocking thereon parallel with the tongue.

10. The combination, substantially as hereinbefore set forth, of the platform, the fender, the vertical bracket at its rear end, the bracket-bearings, the coupling-pin, the rear cross-bar slotted at its end, the perforated brace-bar, and the tongue.

11. The combination, substantially as hereinbefore set forth, in a harvester having no main frame proper, of a hinged platform, cutting apparatus, a main gear-wheel, its supporting frame or bracket mounted on the platform or finger-beam and shoe, and having a boss upon which said gear-wheel is mounted, the supporting-wheel, its axle, and the universal shaft connecting the axle and gear-wheel.

12. The combination, substantially as hereinbefore set forth, of the single driving or supporting wheel, the universal shaft, the main gear-wheel, its supporting-frame over the heel of the floating finger-beam, the vertical crank-shaft, and the pinion on its lower end meshing with the teeth of said main gear.

13. The combination of the gearing-supporting frame over the heel of the finger-beam, the main gear-wheel driven by its universal-shaft connection with the supporting-wheel axle, the boss on the gear-supporting frame about which said gear-wheel revolves, the vertical crank-shaft turning at its upper end in a collar supported in said boss, the crank-wheel and pinion at the lower end of the crank-shaft, and the pitman for driving the cutters, substantially as hereinbefore set forth.

14. The combination, substantially as hereinbefore set forth, of the frame supporting the gearing over the heel of the finger-beam, the main gear-wheel revolving about a boss on said frame, the upright crank-shaft, the collar in which said shaft is supported at its upper end, the collar-shaft mounted in and projecting through said boss, and the disk or washer on said shaft to keep the main gear-wheel in place.

15. The combination, substantially as hereinbefore set forth, of the main gear-wheel having an inner and an outer circle of teeth thereon, the crank-shaft directly driven by the

outer set of teeth, and the crown-wheel for driving the rakes by the inner set of teeth.

16. The combination of the rocking platform, the shoe, the gearing-supporting frame secured at its base upon the platform and shoe, the fender, the plate or top support of the gearing-frame secured thereto, the rake-driving crown-wheel mounted on said plate, and the doubly-toothed main gear directly driving both the rake and cutters, substantially as hereinbefore set forth.

17. The combination of the main gear-wheel, its peripheral flange, the crank-shaft pinion, its flange, crank-wheel, and the adjustable roller, whereby the two gears are kept securely interlocked.

18. The combination of the gearing-supporting frame, the crank-shaft, the crank-wheel and pinion provided with a collar, the gearing-supporting frame or bracket, the rollers carried thereby, the adjustable roller, and the main gear-wheel between said roller and the crank-shaft, these members being constructed and operating substantially as hereinbefore set forth, whereby the crank-shaft is sustained and wabbling of the main gear prevented.

19. The skeleton gear-supporting frame or bracket constructed with the posts flanged at their lower ends, the brace connecting the posts and carrying rollers, and the swinging arm carrying the adjustable roller, in combination with the gearing, substantially as and for the purpose set forth.

20. The combination, substantially as hereinbefore set forth, of a yoke on the rake-arm, and a rake-head bracket sliding and turning between the yoke-arms, whereby the rake-head may be oscillated in the yoke by first moving the bracket endwise.

21. The combination, substantially as hereinbefore set forth, of the short rake-arm, its yoke, the rake-head, its bracket movable endwise along and oscillating in the yoke, the rake-arm extension upon which said bracket is mounted, and the spring acting upon the bracket with a tendency to prevent endwise movement thereof.

22. The combination, substantially as hereinbefore set forth, of the short rake-arm, the oscillating rake-head, the bracket at the inner end of the rake-head turning and sliding upon an extension or rod of the rake-arm, the rake-arm yoke in which the bracket is secured, a locking-arm on the yoke-base, an engaging-shoulder on the bracket-base, and a spring acting upon the bracket-base with a tendency to keep the bracket and yoke locked together to prevent oscillation of the rake-head.

23. The combination, substantially as hereinbefore set forth, of the series of continuously revolving, rising, and falling short rake-arms, the oscillating rake-heads, yokes on the rake-arms, brackets secured to the rake-heads turning in said yokes and interlocking therewith, springs acting upon the brackets with a tendency to keep them locked with the rake-arm yokes, the curved-spring rake-guides traversed by the rake-head brackets, and the tripping-arm to oscillate the rake-heads.

24. The combination, substantially as hereinbefore set forth, of the yoke on the rake-arm, the bracket turning and moving endwise therein, the oscillating rake-head, the curved-spring rake-guide supported at one end on the fender and provided with a shoulder or abrupt incline, and the vertically-operating tripping-arm acting upon the rake-head bracket to unlock it from the rake-arm and cause the rake-head to be quickly oscillated by the contact of its bracket with said shoulder.

25. The combination, substantially as hereinbefore set forth, of the fender, the vertically-reciprocating tripper-arm outside thereof, the spring inside the fender and acting on the tripper with a tendency to keep it elevated, the bell-crank lever, and its cord or wire.

26. The rake-head bracket constructed with cross-arms perforated at their middles to turn upon the rake-arm rod *o*, the lug p^3 to abut against the yoke-arm, and the offset or shoulder q^2 to engage with the locking-arm on the yoke, substantially as set forth.

27. The rake-head bracket provided with the edge rib q^3, as and for the purpose specified.

28. The combination of the rake-arm, the yoke having the arm q^1 and perforated outer end, and the removable rake-arm rod *o*, substantially as and for the purposes set forth.

29. The combination, substantially as hereinbefore set forth, of the large forked guard-fingers, the small guard-fingers arranged between them, and the cutter-bar provided with teeth arranged at intervals with spaces between them, and each playing through one of the small guard-fingers and in one of the forks of each of the large fingers adjacent thereto, whereby the tooth cuts at three points at each reciprocation, as specified.

30. The series of large and small guard-fingers, constructed as hereinbefore set forth, cast in sections, each forming one small guard, and the adjacent parts of the large guards at each side thereof with a single shank.

31. The series of large and small guards connected together by means of the mortise and tenon connections between the large guards only, as set forth.

32. The combination, substantially as set forth, of the main gear-wheel, the crank-shaft pinion, and the crown-wheel carrying the rakes, whereby both rake and cutter are driven directly from the interposed main gear.

In testimony whereof I have hereunto subscribed my name.

JOHN S. ROYCE.

Witnesses:
WM. D. BALDWIN,
WM. J. PEYTON.