(No Model.)

C. LA DOW.

HARROW.

No. 494,538. Patented Mar. 28, 1893.

Fig. 1.

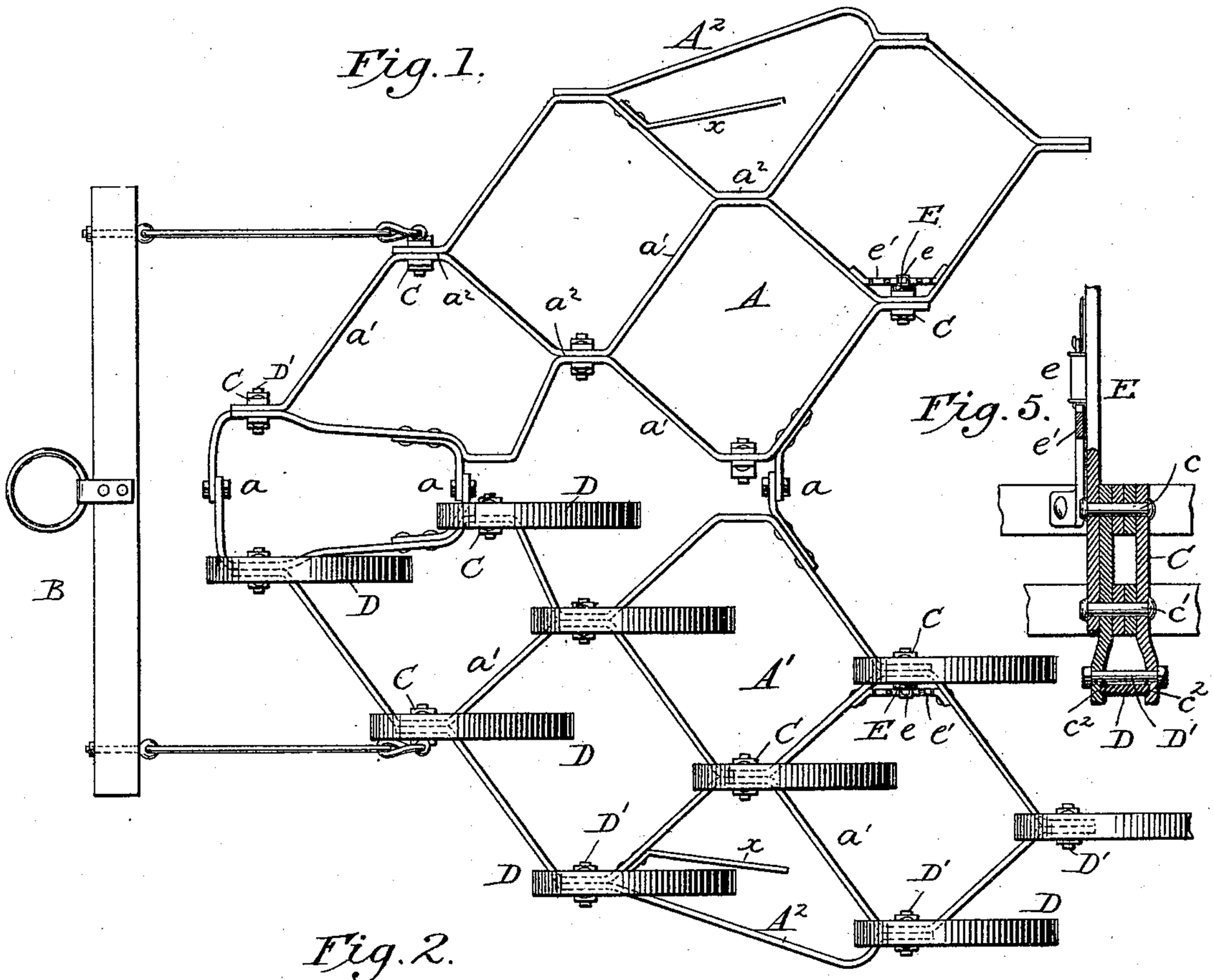


Fig. 2.

Fig. 5.

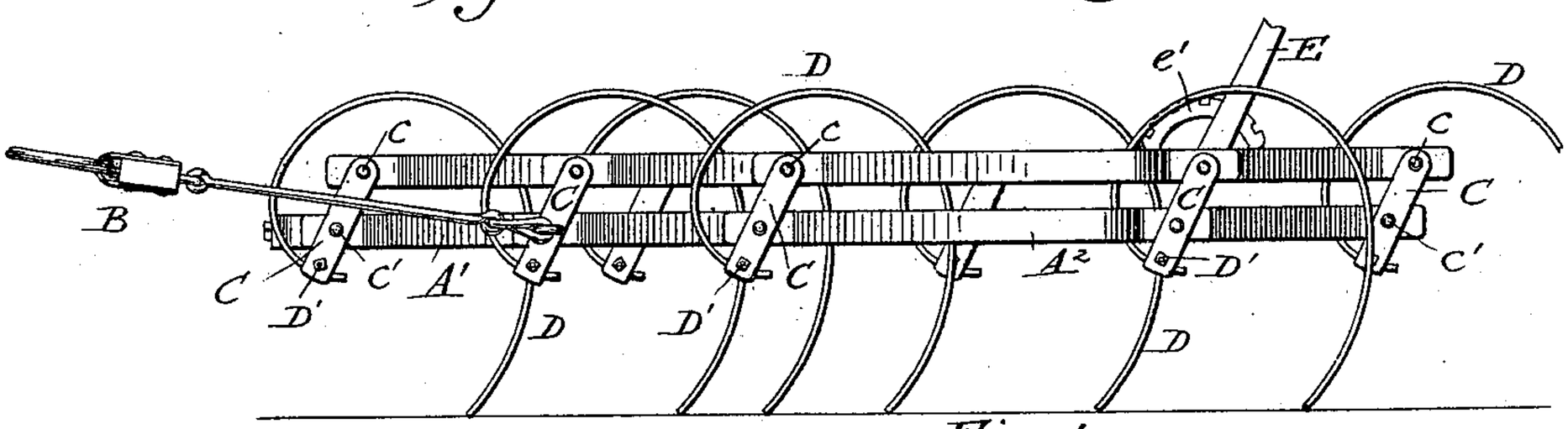


Fig. 3.

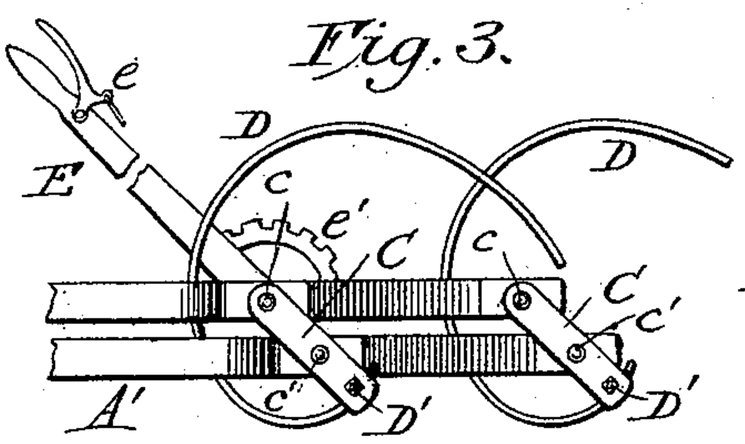
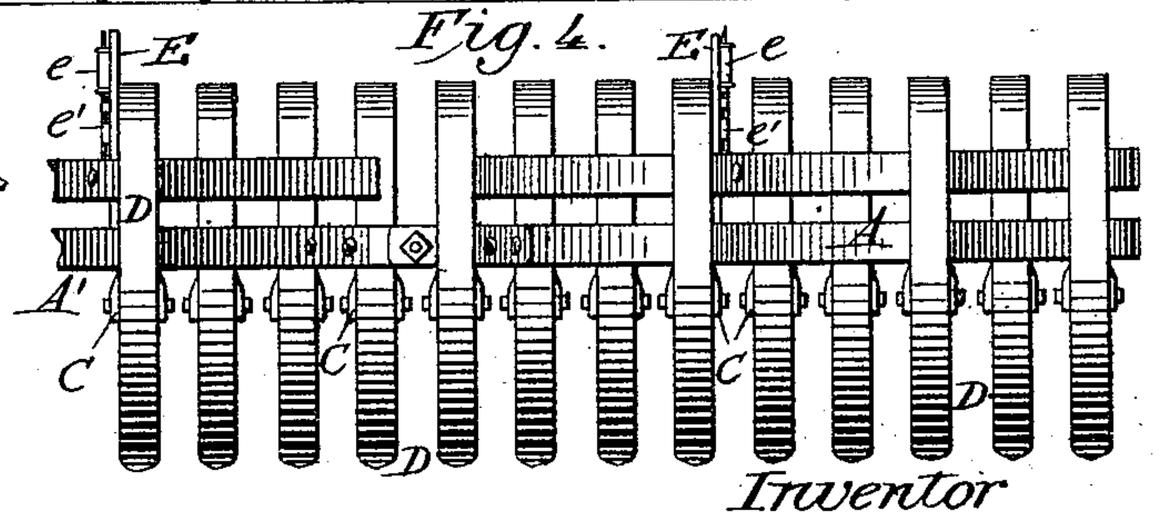


Fig. 4.



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HARROW.

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Application filed June 29, 1891. Serial No. 397,885. (No model.)

To all whom it may concern:

Be it known that I, CHARLES LA DOW, a citizen of the United States, residing at Albany, in the county of Albany and State of New York, have invented certain new and useful Improvements in Harrows, of which the following is a specification.

My invention relates to float harrows in which curved spring teeth are employed. Harrows of this class, as now usually constructed, are made in butterfly form or heart shape, of two sections hinged together in the central draft line, each having frame bars rigidly connected together. In order to vary the pitch or depth of cut of the teeth, it is necessary to adjust each tooth separately. This is both tedious and troublesome, and it is difficult to obtain a uniform adjustment.

Primarily, one object of my invention is to adjust all the teeth in each section of the harrow simultaneously, or both sections simultaneously. Another object is to organize the parts so that rubbish may be quickly dropped.

In the accompanying drawings, I have shown one way of embodying my invention; it is the simplest and best way now known to me, but I wish it understood that I do not limit myself to this one embodiment of my invention, nor to the details of construction shown in the drawings and hereinafter described.

Figure 1 is a plan view of a harrow embodying my invention with the teeth in one section removed. Fig. 2 is a side elevation thereof. Fig. 3 is a detail view of the adjusting mechanism. Fig. 4 is a rear elevation of a part of the harrow. Fig. 5 is a detail view in section showing the preferred manner of connecting the teeth to the frame.

The harrow frame is preferably made in two sections A A′, hinged together at *a*. Each section is composed of bars *a′*, rigidly connected together in the manner hereinafter described, and these bars, as shown, are of a staggered or zig-zag shape, and are arranged in the same horizontal plan. At the angles or bends of the bars, as well as at their ends, there are portions a^2, which are shown as parallel or substantially so, with the draft line, and such portions of each bar are adjacent or contiguous to similar portions of another bar, so that the different frame bars in each section may be readily secured together, and at these adjacent portions, the teeth are attached. The harrow frame bars are united together in such manner as to have contact at their points of junction, thus making the frame more rigid than if otherwise secured.

Each section of the harrow is shown as composed of three zig-zag bars, and a straighter outside bar A^2, which closes the opening which would otherwise occur at the side of the frame. The oblique front and outer side of the frame being in substantially one piece, effectually bracing the independently rocking teeth so that their movements are uniform.

The draft devices B, may be of any desired construction, and are connected to the two sections of the frame.

As the devices for connecting the teeth to the frame also serve to connect the teeth-adjusting devices to the teeth, I will describe the mechanism which I prefer to employ for effecting this result. Over the main frame of the harrow I mount tooth operating bars or equivalent devices, and I connect them with the lower frame at each of the angles of the zig-zag bars; that is to say, at the adjacent portions a^2, by means of plates or bars, or arms C, which are connected to the longitudinal portions a^2, of the upper frame by bolts or rivets *c*, and to the longitudinal portions of the lower frame by bolts or rivets *c′*. These plates or bars or arms are of such length and their connections with the frame are such as to hold the frame and the tooth operating bars a suitable distance apart, as shown in Fig. 5, for instance. They extend up into the circle of the teeth and are extended below the lower frame, spread apart, and provided with recesses c^2, to receive the ends of the teeth D, and bolts D′, are employed for drawing the two plates together to clamp the teeth in their seats. This way of mounting the teeth on the frame is simple, and strong, and admits of the individual adjustment of the teeth, relatively to their arms, when required.

The connection between the frame and tooth setting devices is such that they may be moved relatively to each other, without varying their parallelism; that is to say, their connection as shown in the drawings, is substantially the same as that of the parallel

ruler. The tooth operating devices may be adjusted backwardly and forwardly so as to either increase or decrease the penetration of the teeth and the angle or pitch of their working ends. Any suitable means may be employed for simultaneously adjusting the teeth; I prefer a lever, as by its use the teeth may be moved quickly to drop rubbish. The front portions of the teeth are preferably cam shaped and when rocked their front bow portions have a progressive movement, relatively to adjacent portions of the frame which shifts the position of rubbish and thus causes it to drop out of the harrow as it proceeds. The frame bars form openings substantially diamond shape and the trailing digging portion of each tooth in the front and second rows operates in a separate opening so that when the teeth are simultaneously operated the frame bars surrounding the teeth form strippers therefor and push rubbish downwardly out of the bosoms of the teeth. Teeth in the rear rows are not as liable to become clogged as the advance teeth gather the rubbish before the rear teeth reach it.

Other objects of my invention are to prevent **C** shaped harrow teeth from clogging, and, should they become clogged, to simultaneously operate them in such manner relatively to their frame that they will free themselves from rubbish without the operator raising the frame from the ground in the manner necessary heretofore.

When following spring tooth harrows in the field during the past several years, in different locations, and under various conditions of soil I find that float spring tooth harrows heretofore made clog a great deal, and drag rubbish, particularly where the ground is soft or the rubbish long, such as corn stalks or potato vines. I also find that the spring teeth of a harrow when drawn over hard ground is thereby vibrated so much that rubbish usually encountered will be shaken out from the teeth, but when such ground has been harrowed over until made soft the same rubbish will be again picked up by the teeth, and the ground will not then vibrate the teeth sufficiently to shake out the rubbish and it is drawn along, but the operator may, while the harrow is in motion, step upon such rubbish as is caught in the rear teeth and thus clear first one tooth and then another of the rear teeth of the harrow without raising the frame from the ground, but, in order to clear either the forward or middle teeth from rubbish he must lift the harrow frame and pull out the rubbish from among the curved teeth the best way he can, and then drive on until other rubbish is encountered, when the same operation must be repeated or the teeth will not enter the ground, for when they are thus clogged, obviously they cannot work properly.

I have observed that in harrows heretofore made which carry circular or **C** shaped teeth the best form of frames, that is, the form which is least liable to clog and on which circular teeth are least liable to clog is a frame whose bars stand oblique to the line of draft and which are spaced into openings substantially diamond shaped between the bars, having the circular teeth attached at or near the forward ends of said openings, but even this form of frame clogs a great deal when working among the coarse rubbish which I have previously described, in fact to such an extent that such float spring tooth harrows have little or no sale in corn raising states, such as Illinois and elsewhere, arising from the fact that rubbish lodges in the teeth around their soil working portions, in one instance, and soon rises up into the bosoms of the teeth as more rubbish accumulates, and then it works forward toward their front, bow portions and lodges therein. In another instance rubbish is caught in the **V** shaped or wedge shaped openings of the frame adjacent to the front bow portion of the teeth, and, during the progress of the harrow, becomes wedged in said **V** shaped parts of the openings between the frame bars, or between the tooth and one side of its adjacent frame, and cannot readily be dislodged therefrom, and part of my invention is designed to remedy and prevent harrow teeth of the form described from clogging at either of the points mentioned, and I obtain these results, which operate advantageously either independently or all taken together, by so arranging and operating teeth, shaped substantially as described relatively to their supporting devices that the new and useful results hereinbefore specified are accomplished.

Having described the defects existing in harrows heretofore made, and the remedy proposed, I will now describe the preferred method of carrying it into effect.

In order to prevent rubbish from being dragged by the soil working portions of **C** shaped teeth I arrange them in one instance on the frame in such relative proximity one to another that the front bow portions of some teeth are brought forward to the same or about the same transverse plane occupied by the rear soil working portions of other teeth, and I connect teeth in different transverse planes in such manner that they may be rocked simultaneously (the bow portion of some teeth being rocked in a direction opposite from the soil working portions of other adjacent teeth,) whereby said front bow portions of some teeth step onto, or rock forward onto such rubbish as may be dragging from the soil working portions of adjacent teeth and thus disengage said rubbish at various places simultaneously, while the teeth are being rocked.

In order to prevent rubbish as it accumulates in front of the soil working portions of the teeth from working forward into the front bow portions thereof I place an arm in the space formed by the circle of each overhanging tooth, so that said arm projects upwardly into said space and divides it, and rubbish

which would otherwise naturally work forward is met by said arm and prevented from going forward any farther.

In order to prevent rubbish from wedging into the V shaped rear parts of the openings between the frame bars or from wedging between the front curved portions of the teeth and any adjacent part of their supporting devices, and being dragged thereby I simultaneously rock a number of the teeth (distributed over the harrow substantially as described) whereby the front bow portions of the teeth are moved relatively to said wedge shaped openings, or relatively to their supporting devices, and said movement simultaneously loosens and dislodges therefrom any rubbish that may have collected in any of the aforesaid localities throughout the frame, and this is accomplished at the will of the operator, without raising the frame from the ground by lifting it bodily as heretofore by hand. The latterly diverging or obliquely inclined portions of the frame bars which are adjacent to the front bow portions of the teeth prevent long rubbish from dropping down into said portions of the teeth when several teeth are simultaneously depressed relatively to said adjacent portions of their frame bars. It will be observed that the teeth move on separate centers, and also move relatively to their supporting frame, and that the front bow portion of one tooth is adjacent to or about in the same transverse plane across the line of draft as the rear, or soil working portions of an adjacent tooth in the same series, also that the front bow portions of the teeth are nearer the center of motion than the soil working portions, consequently said bow portions and soil working portions in the same series move at unequal speed when simultaneously operated. The frame bars brace each tooth individually and they stand edgewise vertically, thus bracing the rocking movements of the separately moving teeth, and, by reason of their thinness in a vertical direction they afford the greatest possible amount of room for the simultaneous adjustment of the circular teeth without contact therewith. The teeth are preferably arranged in oblique lines relatively to the path of the harrow, so as to avoid clogging, and the relative arrangement of the frame, teeth and adjusting devices is such that the front bow portion and the rear soil working portion of each tooth is maintained in line with the draft at all times.

It will be seen that the frame is in two sections each carrying three oblique series of teeth in different draft lines and the tooth operating bars are hinged to teeth in the front and rear series and are deflected sidewise so that they may be hinged to teeth in the middle series and said connection to teeth in the middle row prevents the bars from bending or buckling when pushed backwardly and forwardly by the lever, insuring uniform adjustment of the teeth. It will be observed that when the operating bars are drawn rearwardly to cause the ends of the teeth to dig the ground, said bars move from said ends of the teeth, thus affording room for the teeth to vibrate without striking said bars and said movement of the bars also takes them away from rubbish that accumulates around the ends of the teeth but when the bars are pushed forwardly they move over and are then adapted to cover and hold down any rubbish that might otherwise cling to the upwardly moving ends of the teeth, and this particular result can be accomplished only by zig-zag or sidewise deflected backwardly and forwardly moving bars connecting with simultaneously moving teeth which are shaped substantially as described. The plates or arms move freely backwardly and forwardly but do not have lateral or transverse movement therefore they brace the zig-zag operating bars against buckling and cause them to move endwise as directly as if they were straight.

What I claim is—

1. In a harrow, a frame having openings substantially wedge shaped at their rear portions, in combination with devices moving simultaneously at the will of the operator relatively to the wedge shaped openings whereby rubbish may be dislodged from several of said openings simultaneously.

2. In a harrow, a frame whose bars form openings substantially diamond shaped between them, C shaped teeth distributed over the frame substantially as described, and hinged at or near the forward ends of said openings, and having their front bow portions located in advance of the points of juncture of the frame bars and operatively connected together so that several teeth may be moved simultaneously, in combination with means for adjusting the pitch of the teeth.

3. A harrow frame having bars arranged to form openings substantially such as described, teeth shaped substantially as described and having their front bow portions arranged in advance of the rearward parts of said openings, and devices operatively connecting several of the teeth whereby their front bow portions may be simultaneously varied relatively to the obliquely inclined sides of said openings so that said movement of the teeth may act on and dislodge rubbish that may be centralized at or near said bow portions of the teeth by said obliquely inclined bars, during the progress of the harrow.

4. In a float harrow, a frame and C shaped teeth hinged thereto so as to be simultaneously adjustable and arranged in such relative proximity to each other that when the front portions of some teeth are moved by their operating devices in opposite direction from the rear portions of adjacent teeth, said front portions assist in disengaging rubbish from the rear portions of other teeth.

5. In a float harrow, a frame and C shaped teeth independently hinged thereto and arranged in stepped series across the line of draft with the front bow portions of teeth in

one series arranged adjacent to the rear soil working portions of teeth in another series, in combination with devices operatively connected with the teeth whereby the front bow portions of one series may be moved downwardly at the same time that the rear soil working portions of its adjacent series are moved upwardly, adapting the front bows of one series to disengage rubbish from the rear portion of its fellow series when simultaneously operated.

6. In a float harrow, a frame and C shaped teeth hinged thereto and so arranged relatively to each other that when the front bow portions of some teeth are rocked simultaneously with the rear soil working portions of adjacent teeth (but in opposite direction therefrom,) said bow portions step on or rock on rubbish clinging to said soil working portions and thus assist in disengaging said rubbish.

7. In a harrow a frame and C shaped teeth hinged thereto, and so arranged relatively to each other that the front bow portions of some teeth may be rocked simultaneously with but in an opposite direction from the rear portions of other teeth in the same series and that said front and rear portions of different teeth may when rocked intersect a line transverse to the path of the harrow, thus adapting teeth in the same series to assist in disengaging rubbish from each other when operated in concert.

8. In a harrow a frame and C shaped teeth adapted to be simultaneously rocked relatively thereto and arranged in obliquely inclined stepped series across the line of draft substantially as shown, the teeth in each series being so arranged relatively to each other that the rear soil working portion of one tooth may, when rocked, move at a different speed than the front bow portion of an adjacent tooth in the same series, the unequal speed of said adjacent moving parts adapting them to assist in loosening or disengaging rubbish from each other when simultaneously operated.

9. In a harrow a draft frame and C shaped teeth adapted to be simultaneously rocked relatively thereto, the teeth being so arranged relatively to each other that the rear soil working portion of one tooth may operate in a plane substantially transversely opposite to the front bow portion of another tooth in the same obliquely inclined series, whereby the front portion of said tooth is adapted to be moved forwardly and downwardly while the rear portion of its adjacent fellow is being moved upwardly, the unequal movement of said teeth facilitating the discharge of rubbish therefrom.

10. A harrow having its frame, or a section thereof, made up of series of bars rigidly connected together with openings substantially diamond-shaped between the bars, and with teeth moving on separate centers and mounted at or near the angles of the bars and simultaneously adjustable as to pitch, whereby teeth in different series may be adjusted at one time.

11. A harrow having its frame, or a section thereof, made up of zig-zag bars united at their contiguous portions, and simultaneously adjustable harrow teeth mounted at the contiguous portions and braced by the diagonal parts of the frame.

12. In a harrow, two sections, each composed of zig-zag bars rigidly secured together at their contiguous portions and a series of simultaneously adjustable harrow teeth carried by each section.

13. A main harrow frame having curved teeth secured thereto in zig-zag lines, each rocking on a separate center, a lever for simultaneously adjusting the pitch of the teeth, and bars shaped substantially the same as the main frame for connecting the lever and teeth.

14. In a harrow, zig-zag frame bars having longitudinal portions, plates or bars pivoted thereto, and teeth supported by these plates, in combination with means for rocking the plates, whereby the pitch of several teeth is simultaneously adjusted.

15. A harrow having zig-zag frame bars with their longitudinal portions bolted or riveted in direct contact, in combination with teeth mounted on said longitudinal portions.

16. The combination of a harrow frame, or a section thereof, individually adjustable harrow teeth secured thereto in zig-zag lines and moving about separate centers and means for simultaneously adjusting the pitch of several teeth on a section.

17. In a harrow a frame whose bars form openings between them, and a circular tooth adapted to dig the ground in each of said openings, in combination with means adapted to simultaneously move two or more of said teeth upwardly and downwardly within said openings whereby the frame around each tooth acts as a stripper therefor.

18. In a harrow circular teeth and a frame having openings substantially diamond-shaped in which teeth operate, in combination with mechanism for simultaneously adjusting the pitch of the teeth, said mechanism occupying substantially parallel planes with the frame, so as not to obstruct the diamond shaped openings, nor to prevent the backward and forward or upward and downward movement of the working ends of the teeth within said openings.

19. In a harrow upper and lower bars, circular teeth hinged thereto by an upper and a lower pivot for each tooth, in combination with a ratchet and lever by which said circles of the teeth may be simultaneously set more or less in advance of their hinges and adapted to shield the hinges from rubbish.

20. In a harrow frame zig-zag or wavy bars set up edgewise vertically and joined into a rigid section, and circular teeth attached at various points to said section and individually braced thereby, in combination with means for simultaneously rocking several of

the teeth upwardly and downwardly relatively to the frame bars the vertical thinness of said bars affording the greatest possible space in which to simultaneously adjust circular teeth which are individually braced during their rocking movements.

21. As a new article of manufacture, a harrow frame having obliquely inclined bars, curved teeth having trailing ends, and means for rocking the teeth simultaneously and for holding the front and rear portions of each tooth squarely in line with the draft during their rocking movements.

22. In a harrow a frame, curved teeth hinged thereto by two hinges for each tooth, in combination with means whereby the front bow portion of two or more teeth can be simultaneously rocked forward below their hinge connections, and the points of said teeth elevated above said hinge connections.

23. In a harrow non-revolving bars, circular teeth thereon, and mechanism located within the circle formed by each ovehanging tooth for adjusting the pitch thereof, in combination with devices for connecting said mechanism with a lever whereby several teeth may be simultaneously adjusted.

24. In a harrow a frame and C shaped teeth, each separately pivoted at a point between its front and rear portions so as to have the weight of its front part balance against the weight of its rear part (so as to be easily moved backwardly and forwardly), in combination with means for simultaneously adjusting several of said teeth.

25. The combination of a C shaped tooth with a swinging arm dividing the space between the soil working end and the front bow portion of the tooth, whereby rubbish is prevented from working forward into said front bow portion and the tooth is adjusted as to pitch.

26. In a harrow a frame having two sections, circular teeth hinged loosely relatively to the frame and arranged in three diagonal series on each section, upper bars hinged to the front and rear teeth and deflected sidewise so as to be hinged to teeth located between the front and rear series, but in a different draft line, the said intermediate hinge being adapted to prevent the deflected bars from buckling, in combination with means operatively connected with the bars, adapted to impart a backward and forward movement to the teeth.

27. In a harrow circular spring teeth, a frame attached thereto and then diverging therefrom, in combination with backwardly and forwardly moving rods, links, or other bars also attached to the teeth or to devices moving with the teeth and then diverging therefrom for the purpose of simultaneously varying their pitch without contact therewith except at the points of attachment thereto.

28. A float harrow frame having separately hinged teeth in combination with devices operatively connected to and moving with the teeth in such manner that the pitch of several teeth may be simultaneously adjusted; said devices, at their junction with the teeth, being encircled thereby to such extent that they are guarded by the encircling teeth.

29. In a harrow a draft frame, two or more series of teeth hinged thereto, arms supporting the teeth, and a lever for moving teeth in different series simultaneously, in combination with zig-zag bars operatively connecting the lever with arms of different draft lines, and braced at their deflected portion by said arms.

In testimony whereof I have hereunto subscribed my name.

CHARLES LA DOW.

Witnesses:
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