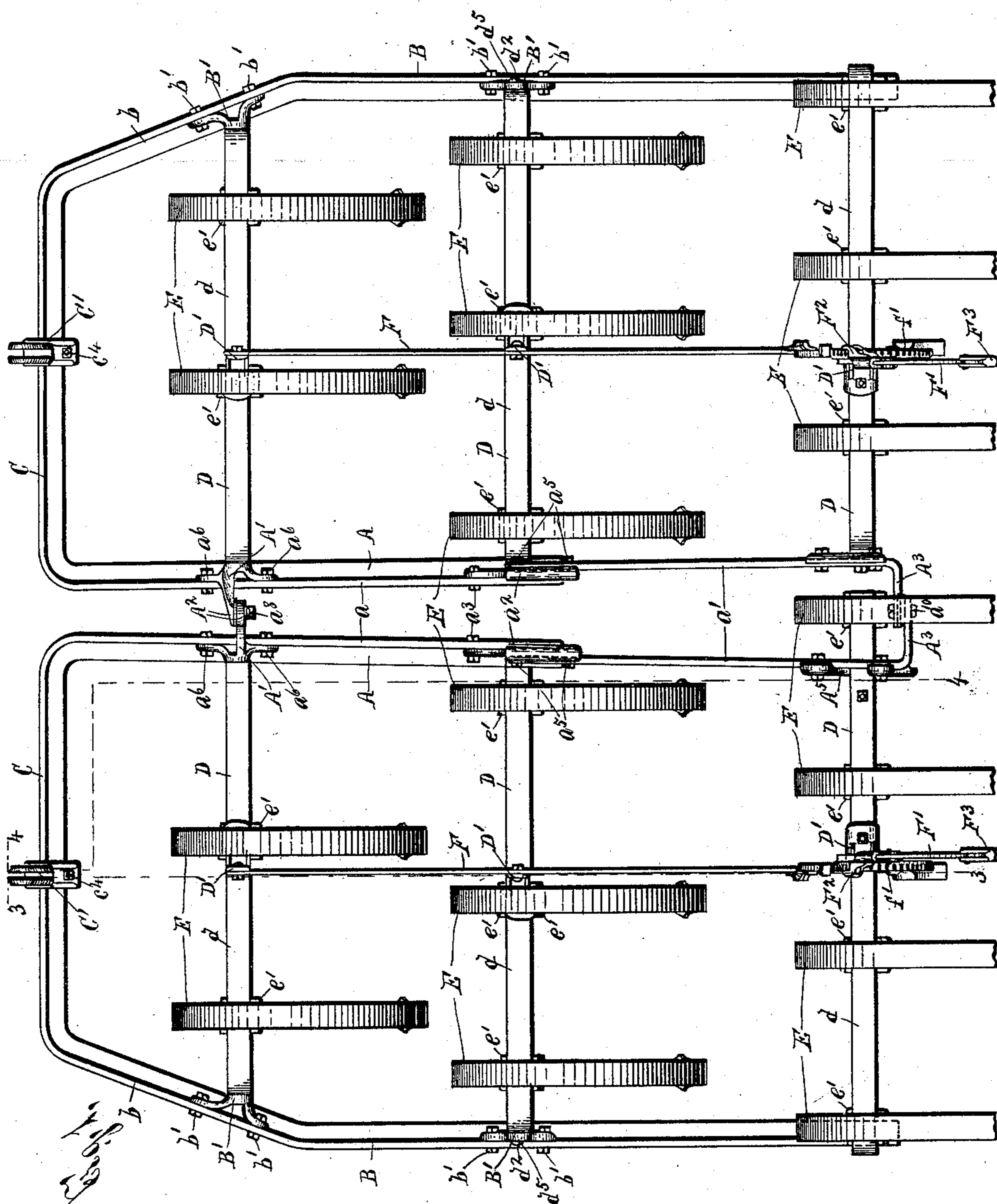


3. Sheets—Sheet 1.

No. 604,345.

Patented May 17, 1898.



WITNESSES:

H. C. Chase.  
M. D. Lewis.

# INVENTORS

*Harry Ward and  
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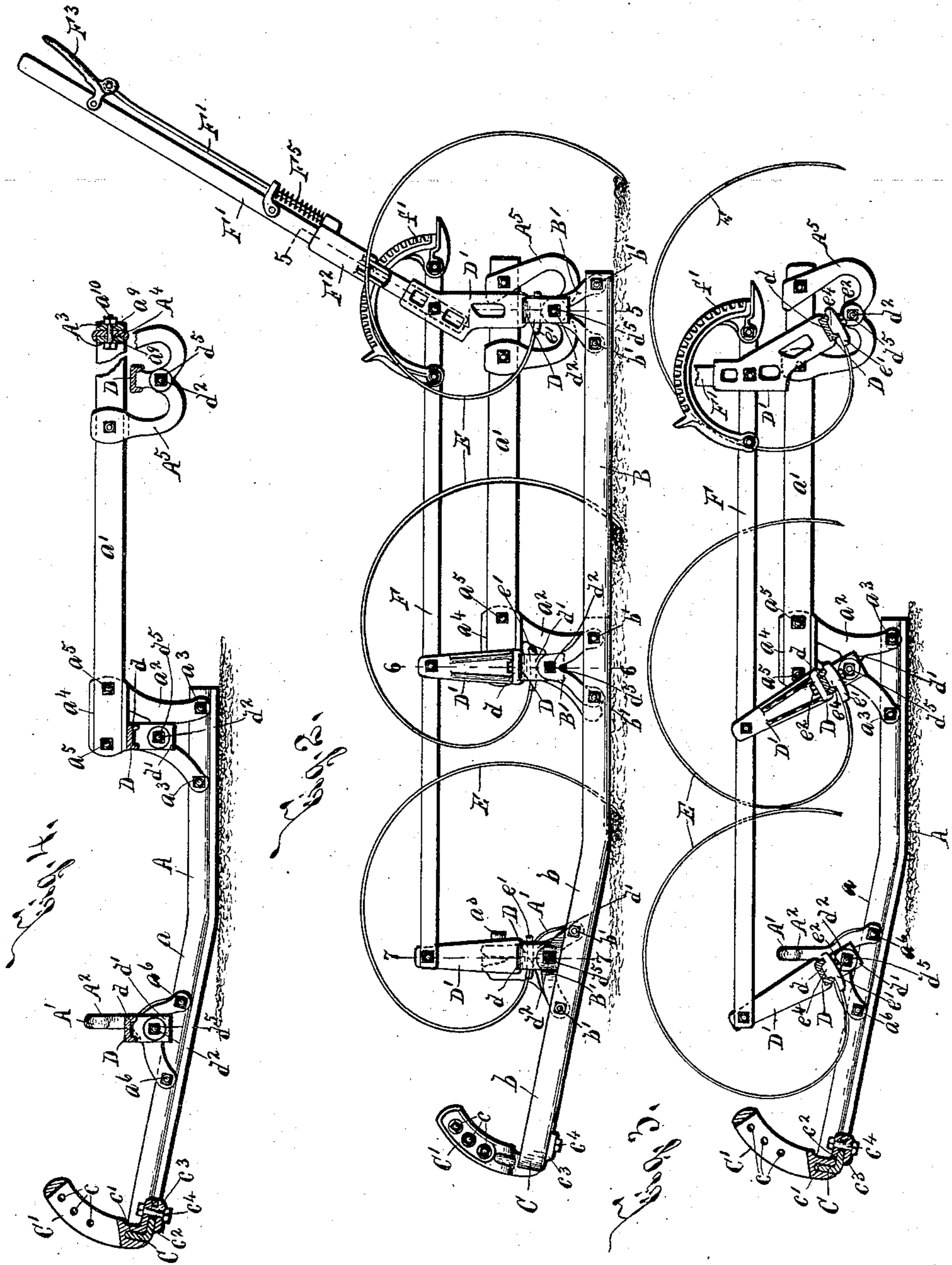
(No Model.)

3 Sheets—Sheet 2.

H. WIARD & H. M. BURDICK.  
HARROW.

No. 604,345.

Patented May 17, 1898.



WITNESSES:

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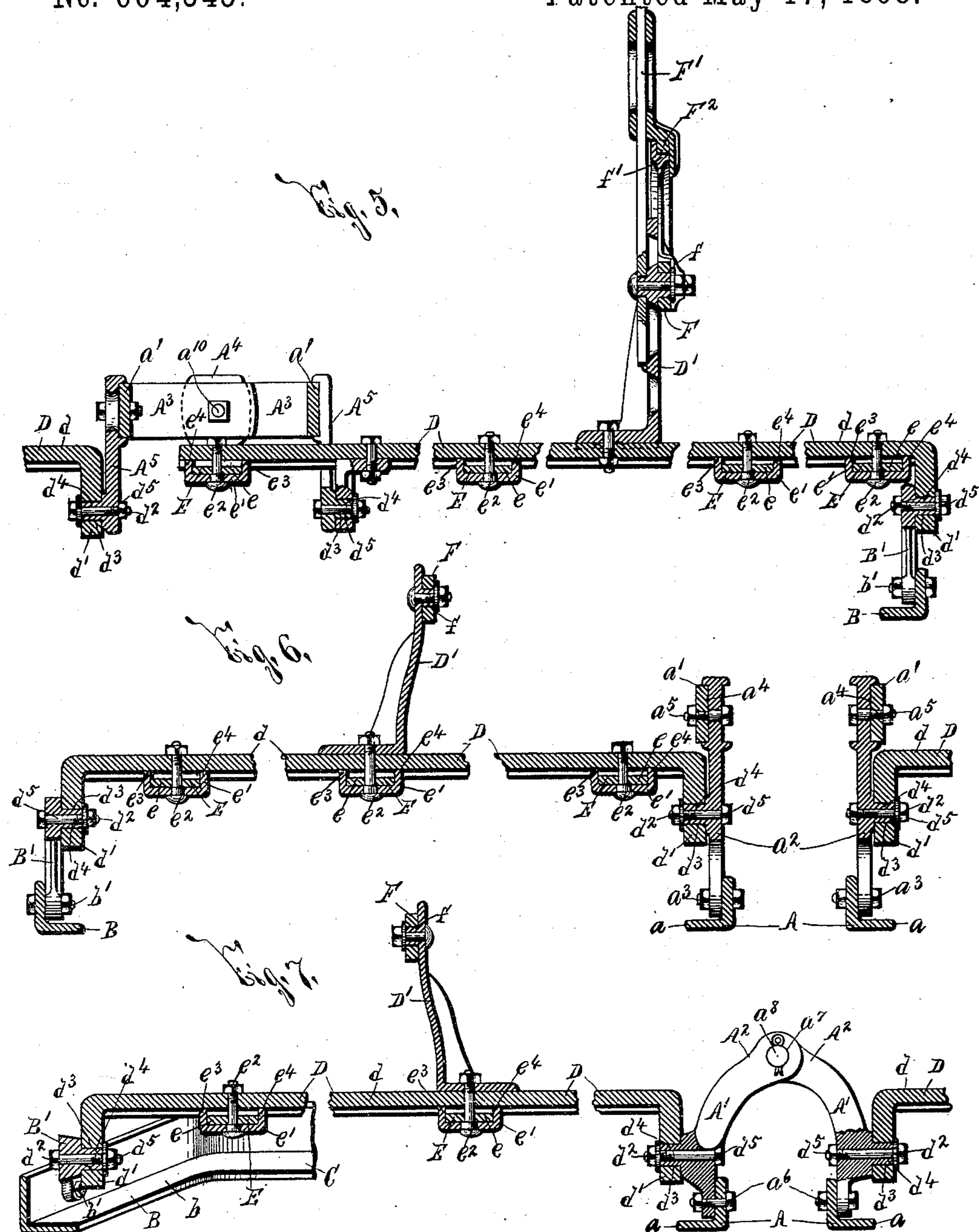
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3 Sheets—Sheet 3.

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WITNESSES:

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# UNITED STATES PATENT OFFICE.

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COMPANY, OF UTICA, NEW YORK.

## HARROW.

SPECIFICATION forming part of Letters Patent No. 604,345, dated May 17, 1898.

Application filed December 26, 1893. Serial No. 494,628. (No model.)

*To all whom it may concern:*

Be it known that we, HARRY WIARD and HIRAM M. BURDICK, of Syracuse, in the county of Onondaga, in the State of New York, have  
5 invented new and useful Improvements in Harrows, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

Our invention relates to improvements in  
10 harrows, and has for its object the production of a harrow which is simple in construction, is composed of few parts, is easily assembled, is comparatively free from clogging, is provided with a minimum amount of wearing-  
15 surface and with teeth capable of a maximum degree of adjustment, and is strong, durable, and efficient in operation; and to this end it consists, essentially, in a frame comprising tooth-carrying bars and inner and outer draft-  
20 bars having upwardly-inclining front ends, said outer draft-bars being arranged substantially parallel with each other and having their upwardly-extending ends inclined toward each other from a point in proximity to  
25 the front tooth-carrying bar and having the front extremities of said inclined ends separated from the extremities of the inner draft-bars.

It furthermore consists in the construction  
30 and arrangement of the inner draft-bars, the tooth-carrying bars, and the detail construction and arrangement of its component parts, all as hereinafter more particularly described, and pointed out in the claims.

35 In describing this invention reference is had to the accompanying drawings, forming a part of this specification, in which like letters indicate corresponding parts in all the views.

Figure 1 is a top plan view of our improved  
40 invention, the rear extremities of the rear row of teeth being broken away. Fig. 2 is a side elevation of our harrow, the teeth being illustrated with their lower ends depressed beneath the lower faces of the draft-bars.  
45 Figs. 3 and 4 are longitudinal vertical sectional views taken, respectively, on lines 3 3 and 4 4, Fig. 1, the teeth being shown at Fig. 3 as rocked forwardly with their engaging ends elevated above the lower faces of the draft-  
50 bars; and Figs. 5, 6, and 7 are transverse ver-

tical sectional views taken, respectively, on lines 5 5, 6 6, and 7 7, Fig. 2.

The frame consists of two sections hinged together at their adjacent edges and each consisting of inner and outer draft or runner  
55 bars A B, preferably formed angular in cross-section and having their front extremities separated from each other, an elevated cross-bar C between said front extremities, and tooth-carrying bars D, supported by the draft-  
60 bars. The front ends of the inner and outer draft or runner bars of the frame are preferably inclined upwardly, as shown at Figs. 2, 3, and 4, above the central portions of said  
65 bars and the rear ends of the outer draft-bars, and consequently the frame rides readily over stones, rough surfaces, and obstructions in its path, and there is practically no tendency of its front end to enter the earth during the operation of the harrow.  
70

As best seen at Fig. 1, the inner draft or runner bars A of the frame are arranged substantially parallel with the line of draft, but are preferably inclined forwardly toward each other from their rear extremities, so that their  
75 front extremities are separated a less distance than their rear extremities, thereby reducing to a minimum the liability of brush, stones, and other articles entering between the sections of the harrow. Each inner draft-bar is  
80 preferably composed of a front section  $a$  of less length than the adjacent outer draft-bar, a rear section  $a'$ , arranged opposite to and elevated above the corresponding portion of  
85 the outer draft-bar, and an upright central arm  $a^2$ , having its lower end bifurcated and secured at  $a^3 a^3$  to the depressed rear end of the front section  $a$ , and its upper end formed with a groove  $a^4$  for receiving the front end  
90 of the rear section  $a'$ , which is secured to the arm  $a^2$  at  $a^5 a^5$ .

The free ends of the inner draft or runner bars A are provided with upwardly-extending arms  $A'$ , having their lower ends bifurcated and secured at  $a^6 a^6$  to the inner draft-  
95 bars, and having their upper ends formed with laterally-extending ears  $A^2$ . One of the ears  $A^2$  is provided with a perforation or journal-opening  $a^7$ , and the other with a rearwardly-extending spindle or trunnion  $a^8$ , jour-  
100

naled in said perforation, for hinging together the front ends of the harrow-frame sections. The rear extremities of the rear sections of the inner draft or runner bars A are formed with laterally-extending ears  $A^3$ , having their free ends lapped with each other and provided with perforations  $a^9$ . A wearing-plate  $A^4$  is interposed between the ears  $A^3$ , and any suitable clamp, as a bolt  $a^{10}$ , is passed through the perforations  $a^9$  of the ears  $A^3$ , and said ears clamp and hinge together the rear ends of the harrow-frame sections.

It will be particularly noted that the hinge-pins for the sections of our improved harrow-frame are considerably elevated above the depressed portions of the draft-bars A B and the tooth-supporting surfaces of the tooth-carrying bars, presently described. Consequently the liability of stones, brush, and similar articles engaging the hinges of the harrow-frame is reduced to a minimum, as the same are free to pass beneath said hinges, and clogging of the harrow and its hinges by the engagement of such articles is practically obviated.

The outer draft or runner bars B B are also arranged substantially parallel with the line of draft, and their front ends  $b$  are inclined toward each other from a point in proximity to the front tooth-carrying bar D. This inclination of the front ends of the outer draft-bars facilitates the passage to the outer sides of the harrow of stones, brush, and other articles engaged by its front end and greatly reduces liability of clogging of the harrow.

As previously stated, the front extremities of the inner and outer draft or runner bars of each frame-section are separated from each other, and these extremities are connected by front cross-bars C, arranged at substantially right angles with the line of draft and preferably formed of angular cross-section. Movable longitudinally on the cross-bars C are attaching-arms  $C'$ , to which is secured the ordinary draft-bar, (not illustrated,) connected to the traces of the horses or other animals attached to the harrow.

As is well known to those skilled in the art, there is more or less liability when using a harrow of the central portion or the outer edges of its front end becoming elevated or depressed above or below their normal positions, thus decreasing the effectiveness of the harrow and increasing its draft. By arranging the front bars C at substantially right angles with the line of draft and mounting thereon attaching-arms longitudinally movable on said bars we entirely obviate all liability of undue elevation or depression of any portion of the harrow-frame, since the attaching-arms are easily adjusted toward and away from each other until the entire front end of the harrow is supported in its normal plane when in operation.

The upper extremity of each of the attaching-arms  $C'$  is formed with a series of perforations  $c$ , arranged one above the other, for

receiving the pins or other attaching means for the draft-bar secured thereto, and the lower extremity of each of said arms is formed with bearing-faces  $c'$   $c^2$ , arranged at an angle with each other, for bearing against corresponding faces of the front bar C, provided therewith. Beneath the portions of the front bars C engaged with the attaching-arms  $C'$  are suitable clamping-plates  $c^3$ , and passed through the lower ends of said attaching-arms and the plates  $c^3$  are suitable clamps  $c^4$ , which firmly secure the attaching-arms in their adjusted position.

The tooth-carrying bars D of each frame-section are preferably formed of channel-iron and are arranged one in advance of the other in planes at substantially right angles with the line of draft with their channeled faces lowermost, and these bars are provided with teeth E, arranged in lengthwise planes out of alinement with each other and are preferably formed of spring material and of suitable shape, as the ordinary C shape commonly used. The front tooth-carrying bar D of each section is formed with an elevated central portion  $d$ , having tooth-supporting surfaces to which the attaching ends of the front teeth are secured and are provided with depending arms  $d'$ , arranged at their extremities and hinged at  $d^2$  to the arms  $A'$  previously described, and to arms  $B'$ , extending upwardly above the outer frame-bars B and having their lower ends bifurcated and secured at  $b' b'$  to the inclined front ends of said outer frame-bars.

The intermediary tooth-carrying bars D are formed with elevated central portions  $d$ , arranged in substantially the same horizontal plane as the similar portions of the front tooth-carrying bars and having supporting-surfaces for the intermediary teeth. Said intermediary bars D are provided with depending arms  $d'$ , arranged at their extremities and hinged at  $d^2$  to the central portions of the upright arms  $a^2$  of the inner draft-bars A and to upright arms  $B'$ , secured at  $b' b'$  to the central portions of the outer draft-bars B and preferably formed of substantially the same construction as the arms  $B'$  previously described. The rear tooth-carrying bars D are also provided with elevated central portions  $d$ , arranged in substantially the same horizontal plane as the corresponding portions of the front and intermediary tooth-carrying bars and having supporting-surfaces for the teeth mounted thereon. Said rear bars D are provided with depending arms  $d'$ , arranged at their extremities and hinged at  $d^2$  to arms  $A^5$ , depending from the rear elevated ends of the inner draft-bars previously described, and to arms  $B'$ , secured at  $b' b'$  to the rear ends of the outer draft-bars B and formed of substantially the same construction as the arms  $B'$  previously described.

In order to pivot the tooth-carrying bars D to the draft-bars, the depending arms  $d'$  of said bars D are provided with perforations or

journal-openings  $d^3$ , and the arms  $A'$ ,  $a^2$ ,  $A^5$ , and  $B'$  for supporting the bars  $D$  are provided with laterally-projecting nipples or trunnions  $d^4$  for entering the perforations  $d^3$ .

5 Suitable clamps, as bolts  $d^5$ , are then passed through the nipples or trunnions  $d^4$  and effectively secure the bars  $D$  in operative position.

10 It will be particularly noted that the central portions of the tooth-carrying bars are considerably elevated above the upper faces of the depressed portions of the draft-bars, although said tooth-carrying bars are beneath the hinge-pins for the frame-sections, and that  
15 the hinge-pins for the tooth-carrying bars are arranged considerably beneath the elevated central portions of said bars. This particular construction and arrangement of the tooth-carrying bars and the draft-bars reduce to a  
20 minimum the liability of clogging of the frame and also permit of a maximum degree of adjustment of the digging extremities of the teeth with a minimum amount of movement of the tooth-carrying bars.

25 The attaching ends  $e$  of the teeth  $E$  are arranged beneath the channeled elevated central portions of the tooth-carrying bars  $D$  and are secured thereto by suitable fastening or clip plates  $e'$  and clamps  $e^2$ . The fastening or  
30 clip plates  $e'$  are arranged beneath the attaching ends of the teeth  $E$  and are formed at their longitudinal edges with shoulders  $e^3$  for engaging the longitudinal edges of the teeth  $E$  and are provided at their central portions with shoulders  $e^4$  for entering the channels of the tooth-carrying bars, and the clamps  
35  $e^2$  are preferably passed through perforations in the tooth-carrying bars, the attaching ends of the teeth, and the clip-plates  $e'$ . This is a very simple and effective form of tooth-securing means, which permits of independent ad-  
40 justment of each of the teeth.

We preferably connect the tooth-carrying bars of each harrow-section to a single adjusting means, presently described, and simulta-  
45 neously adjust or rock the tooth-carrying bars of each section; but it is evident that said adjusting means may be dispensed with and that the depressed ends of the tooth-carrying  
50 bars may be fixedly secured to the draft-bars instead of being pivoted thereto, and that the only adjustment of the teeth may consist of the independent adjustment thereof permitted by the clip-plates and clamps for se-  
55 curing the same to the tooth-carrying bars. This adjusting means preferably consists of a link or connection  $F$ , hinged at  $f$  to upwardly-extending arms  $D'$ , secured to the central portions of each of the tooth-carrying bars  
60 and provided at its rear end with a toothed segment  $f'$  and a lever  $F'$ , secured to the rear arm  $D'$  and provided with a dog  $F^2$ , provided upon a head movable longitudinally on the lever  $F$  and arranged to engage the toothed  
65 segment  $f'$ . A handpiece  $F^3$  is hinged to the upper end of the lever  $F'$  and is connected by a link  $F^4$  to the head carrying the dog  $F^2$ , and

a spring  $F^5$ , surrounding the lower end of the connection  $F^4$ , forces the dog  $F^2$  to operative position.

70 The operation of our improved harrow will be readily perceived from the foregoing description and upon reference to the drawings, and it will be particularly noted that the same is simple in construction, is composed of a  
75 few parts, is easily assembled, is comparatively free from clogging, is provided with a minimum amount of wearing-surface and with teeth capable of a maximum degree of  
80 adjustment, and is strong, durable, and efficient in operation. It is evident, however, that considerable change may be made in the detail construction and arrangement of the  
85 parts of our harrow without departing from the spirit of our invention, and consequently we do not herein limit ourselves to such exact detail construction and arrangement.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

90 1. In a harrow, the combination with teeth; of a frame comprising tooth-carrying bars arranged one in advance of the other, inner and outer draft-bars, said outer draft-bars extend-  
95 ing forwardly beyond the front tooth-carrying bar being arranged substantially parallel with each other and having their front ends inclined forwardly toward each other from a point in proximity to the front tooth-carrying  
100 bar and having the front extremities of said inclined ends separated from the front extremities of the inner draft-bars, and a front cross-bar connecting the front extremities of the draft-bars of a section and arranged sub-  
105 stantially parallel with the tooth-carrying bars, substantially as and for the purpose set forth.

2. In a harrow, the combination with teeth; of a frame comprising tooth-carrying bars ar-  
110 ranged one in advance of the other, inner and outer draft-bars extending forwardly beyond the front tooth-carrying bar and having upwardly-inclined front ends, said outer draft-bars being arranged substantially parallel  
115 with each other and having their upwardly-extending ends inclined forwardly toward each other from a point in proximity to the front tooth-carrying bar and having the front  
120 extremities of said inclined ends separated from the front extremities of the inner draft-bars, and an elevated front cross-bar connecting the front extremities of the draft-bars of a section and arranged substantially parallel  
125 with the tooth-carrying bars, substantially as and for the purpose described.

3. In a harrow, the combination of draft-bars, a tooth-carrying bar having depending arms hinged to the draft-bars and provided with a tooth-supporting surface elevated  
130 above the hinge-pin of said tooth-carrying bars, and a tooth secured to said supporting-surface, substantially as described.

4. In a harrow, the combination with spring-teeth; of a frame comprising inner and outer

draft-bars disposed in planes substantially parallel with the line of draft, and tooth-carrying bars disposed in planes arranged at substantially right angles with the line of draft and having tooth-supporting surfaces elevated above the top faces of the adjacent portions of the outer draft-bars and having their opposite ends provided with depending arms hinged to the inner and outer draft-bars, and adjusting means for simultaneously adjusting said tooth-carrying bars, substantially as set forth.

5. In a harrow, the combination with spring-teeth; of inner and outer draft-bars, arms projecting upwardly above adjacent portions of said draft-bars and provided at their upper ends with laterally-projecting trunnions or spindles, and tooth-carrying bars having projecting arms provided with journal-openings for receiving said trunnions or spindles, substantially as described.

6. In a harrow, the combination of spring-teeth; with the opposite sections of a frame hinged together and each consisting of draft-bars, and tooth-carrying bars having elevated tooth-supporting surfaces arranged beneath the hinge-pins of said sections and having depending arms secured to said draft-bars, substantially as specified.

7. In a harrow, the combination of draft-bars and tooth-carrying bars having channeled under faces arranged above the adjacent portions of the draft-bars, spring-teeth having their attaching ends bearing against said faces of the tooth-carrying bars, fastening-plates arranged beneath said attaching ends above the adjacent portions of the draft-bars and provided with shoulders for entering the channels of the tooth-carrying bars, and clamps for holding said fastening-plates in operative position, substantially as and for the purpose specified.

8. The following elements in combination in a harrow: parallel draft-bars having their front ends deflected upwardly formed in one piece; turnable tooth-bars having perforated angle bends at their ends, perforated brackets secured rigidly to the draft-bars with their free ends extending upwardly, and means for pivotally connecting the angle perforated ends of the tooth-bars and the free ends of the brackets, and means for operating the turnable tooth-bars, substantially as set forth.

9. The following elements in combination in a harrow: draft-bars parallel in portions of their length, tooth-supporting bars at an angle to the line of draft having perforated angle bends at their ends; upwardly-extending brackets rigidly secured to the draft-bars provided with inwardly-extending perforated

trunnions to receive the perforated ends of the tooth-bars, means for securing the ends of the tooth-bars and the free end of the bracket together, and mechanism for operating the turnable tooth-bars, substantially as set forth.

10. In a turnable tooth-bar harrow the combination therewith of the bracket having a perforated journal extending from its side, a perforated turnable bar mounted to turn on the journal, and mechanism for securing the parts together, substantially as set forth.

11. In a sectional turnable tooth-bar harrow, the combination therewith of an outer and a short inner draft-bar, parallel in portions of their length, a supplementary bar supported at its front end in an elevated plane above the short bar and at its rear end by a depending support extending into engagement with the soil, substantially as set forth.

12. In a sectional tooth-bar harrow, the combination therewith of an outer draft-bar and a short inner draft-bar parallel in portions of their length, a supplementary short bar supported at its front in an elevated plane above the short draft-bar and at its rear end by a depending support extending into engagement with the soil and the depending support provided with means for supporting and carrying one end of one of the rocking tooth-bars, substantially as set forth.

13. In a harrow of the character described, the combination of the clips provided with projecting journals to receive and support the turnable tooth-bars in a different plane from the plane of the runners, and the turnable tooth-bars supported by the projecting journals in a different horizontal plane from the runners, substantially as set forth.

14. In a sectional harrow, the combination of the following elements: an outside runner and an inside short runner in each section, two elevated short supplemental sections supported in a plane above the plane of the short runners of the harrow-sections, intermediate supports between the rear ends of the short runners and the front ends of the elevated supplemental sections, and a supporting-hinge between the rear ends of the elevated supplemental sections, substantially as set forth.

In testimony whereof we have hereunto signed our names, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 22d day of December, 1893.

HARRY WIARD.  
HIRAM M. BURDICK.

Witnesses:

W. W. WIARD,  
L. B. THURLOW.