(No Model.)

4 Sheets—Sheet 1.

# C. LA DOW.

## HARROW.

No. 411,199. Patented Sept. 17, 1889.

Fig. 1.

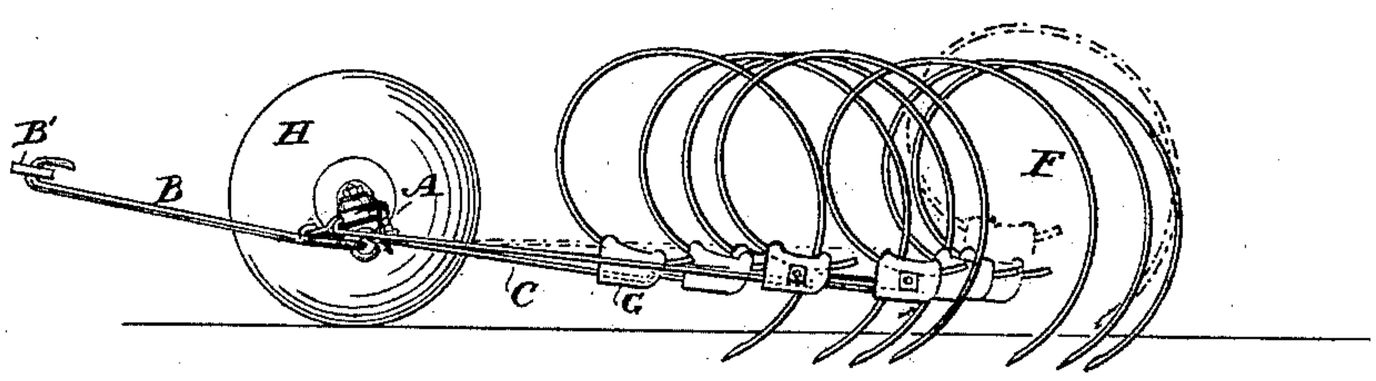
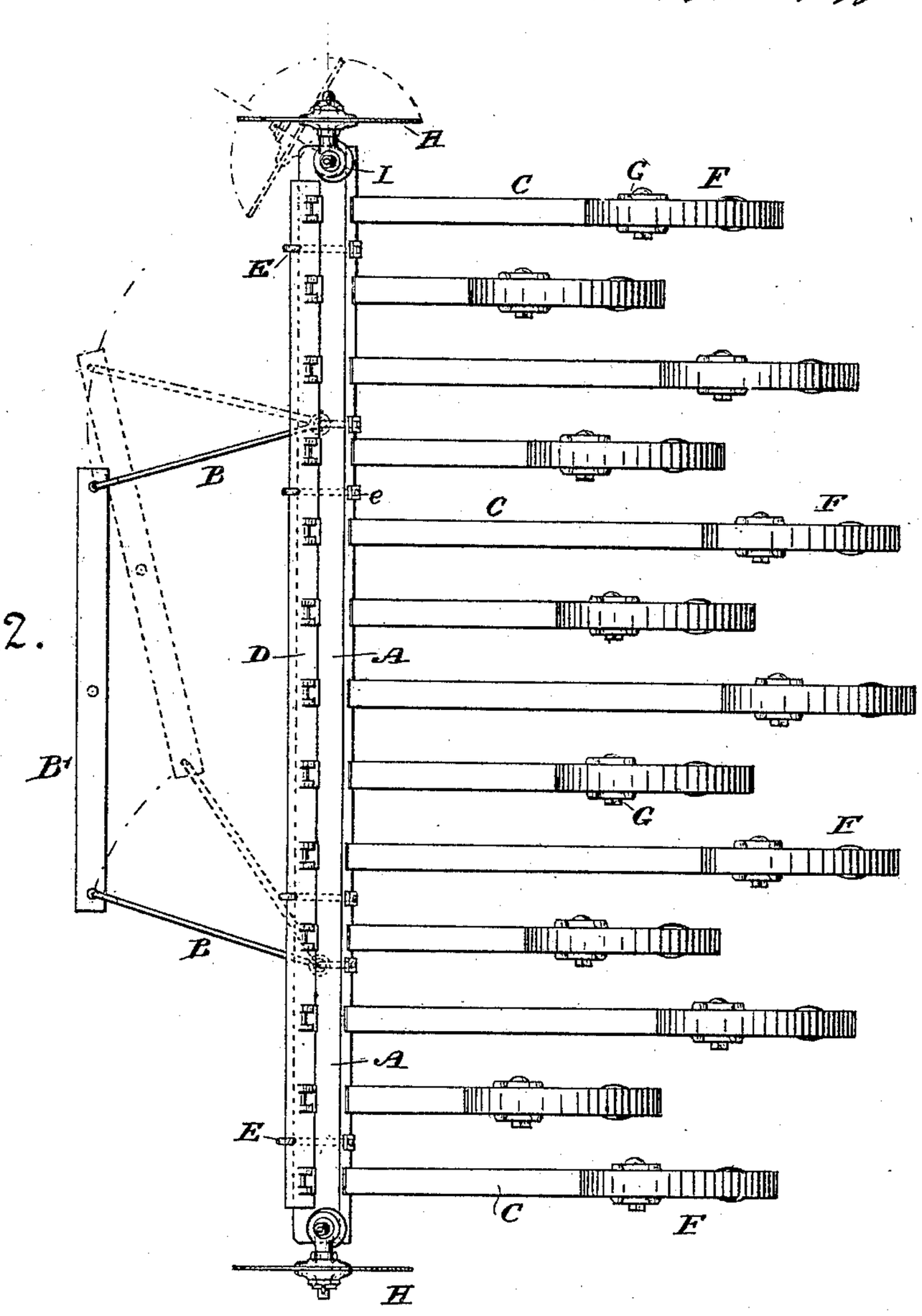



Fig. 2.




WITNESSES:
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his ATTORNEYS

(No Model.) 4 Sheets—Sheet 2.

# C. LA DOW.

## HARROW.

No. 411,199. Patented Sept. 17, 1889.

Fig. 3. Section a.b.

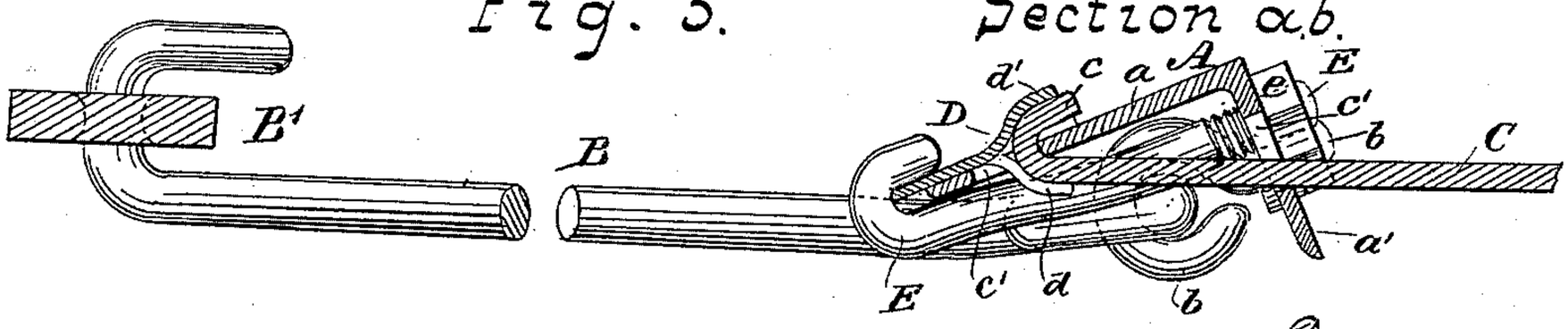


Fig. 4.

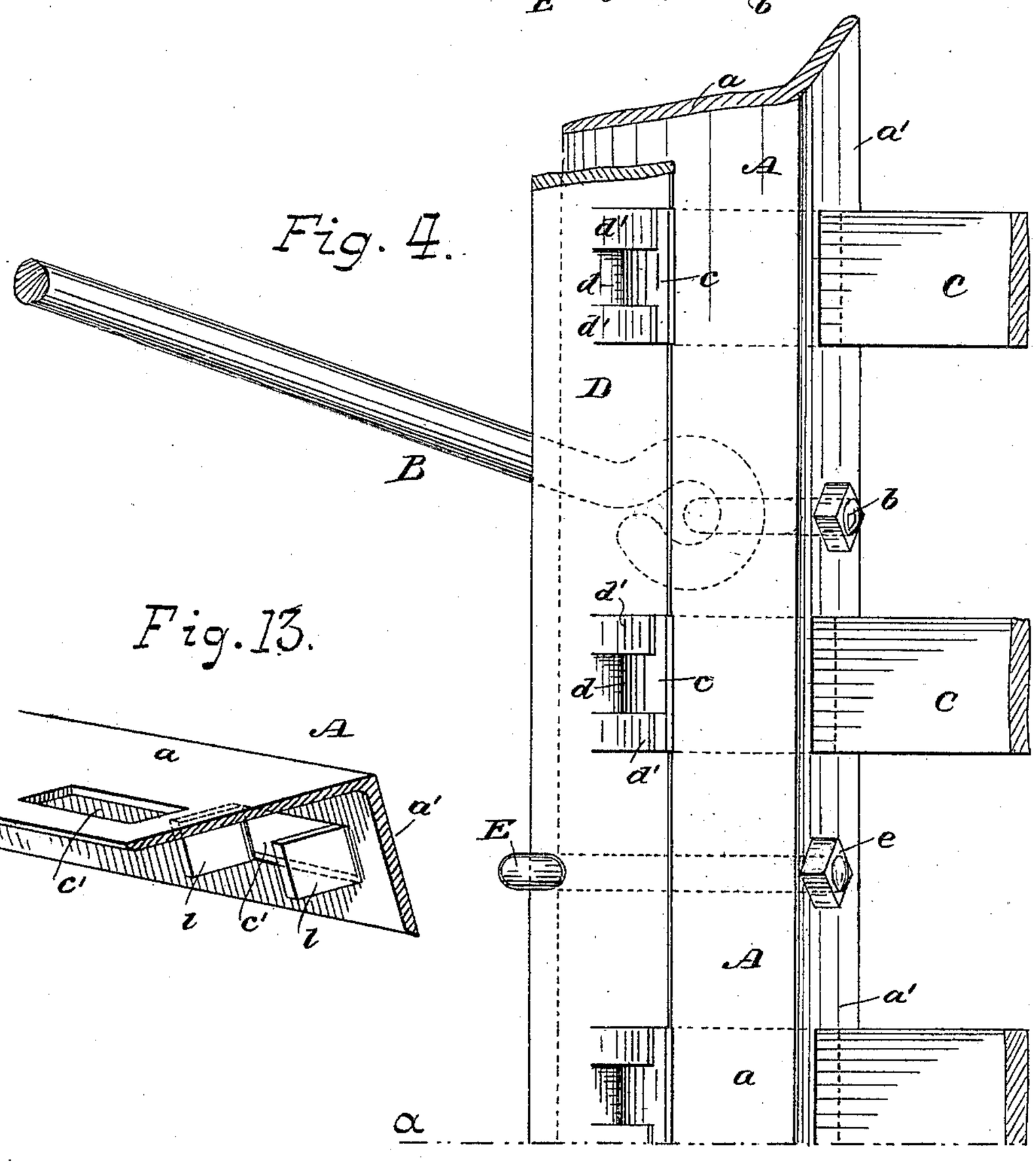


Fig. 13.




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4 Sheets—Sheet 3.

# C. LA DOW.

## HARROW.

No. 411,199. Patented Sept. 17, 1889.

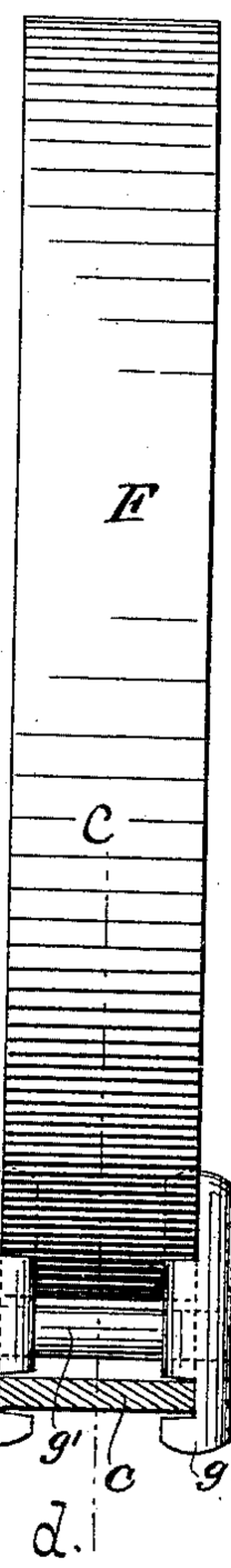



Fig. 5.

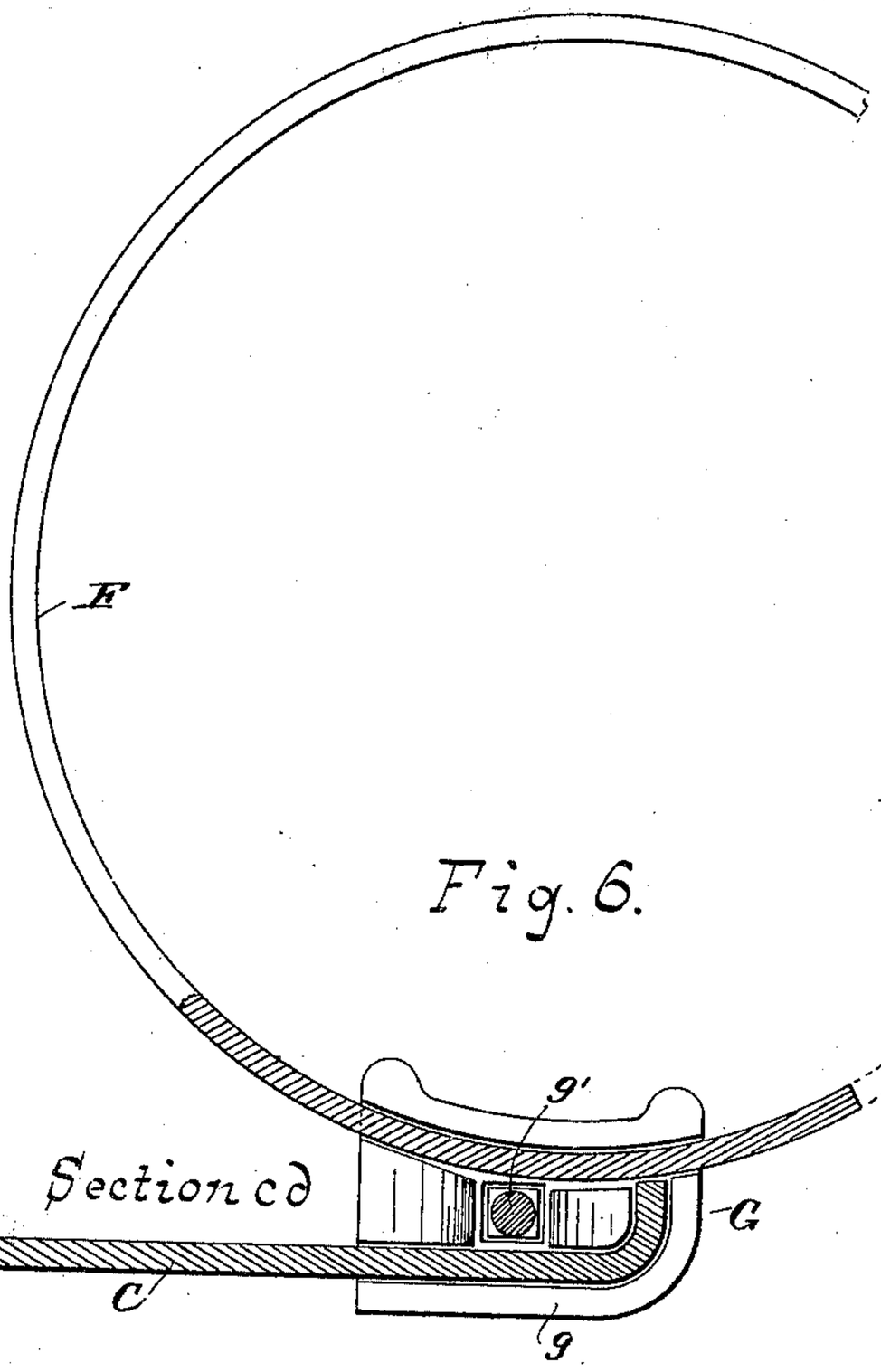
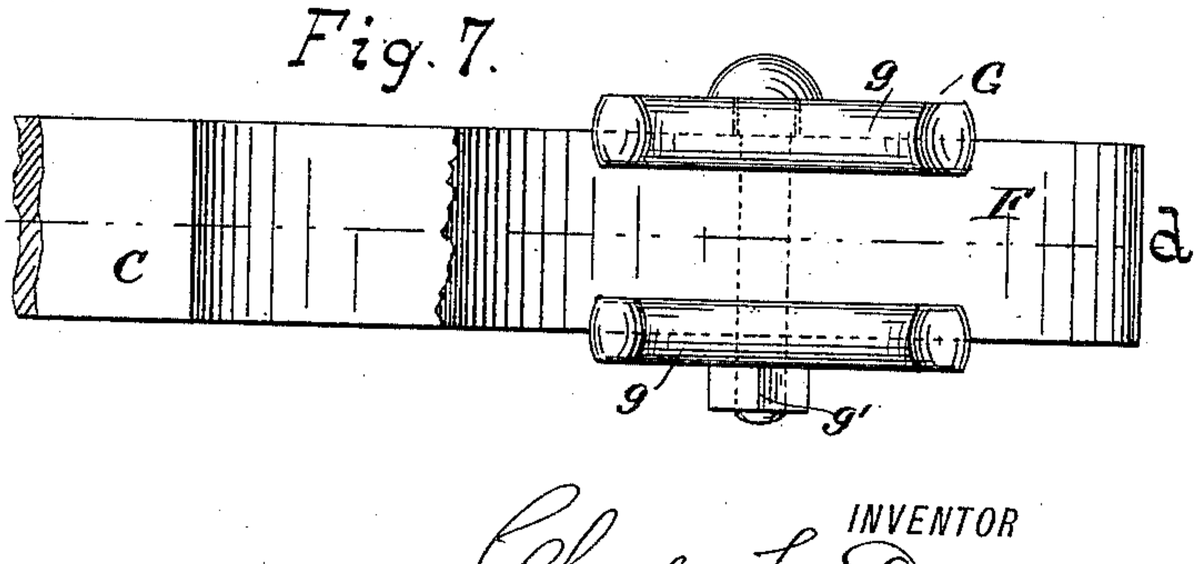



Fig. 6.

Fig. 7.

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(No Model.) 4 Sheets—Sheet 4.

# C. LA DOW.

## HARROW.

No. 411,199. Patented Sept. 17, 1889.

Fig 8.

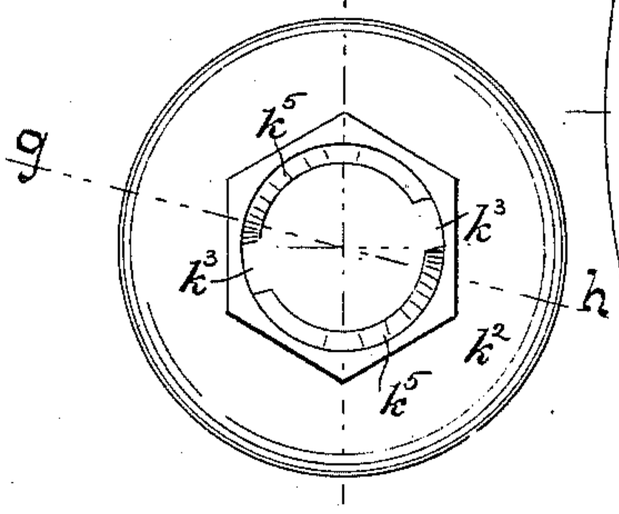



Fig 9 Section g.h.

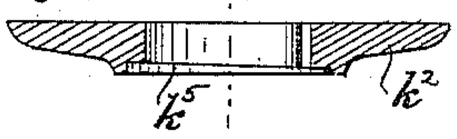



Fig 10.

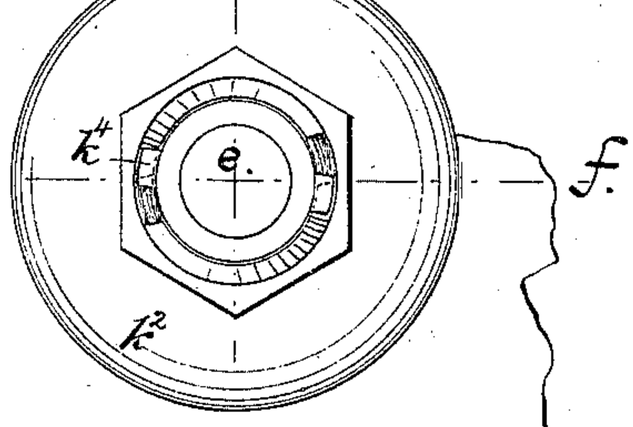



Fig 11

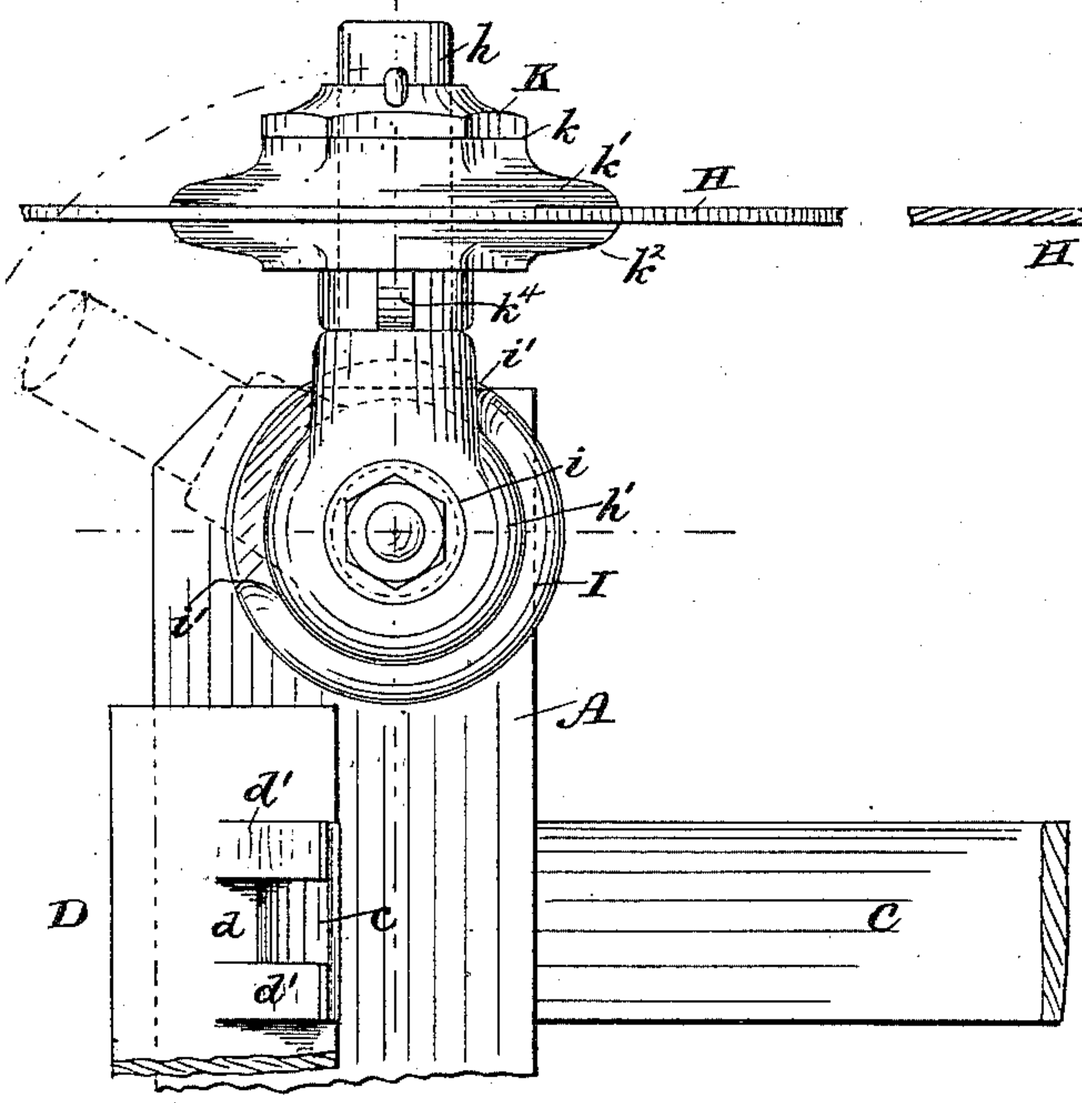
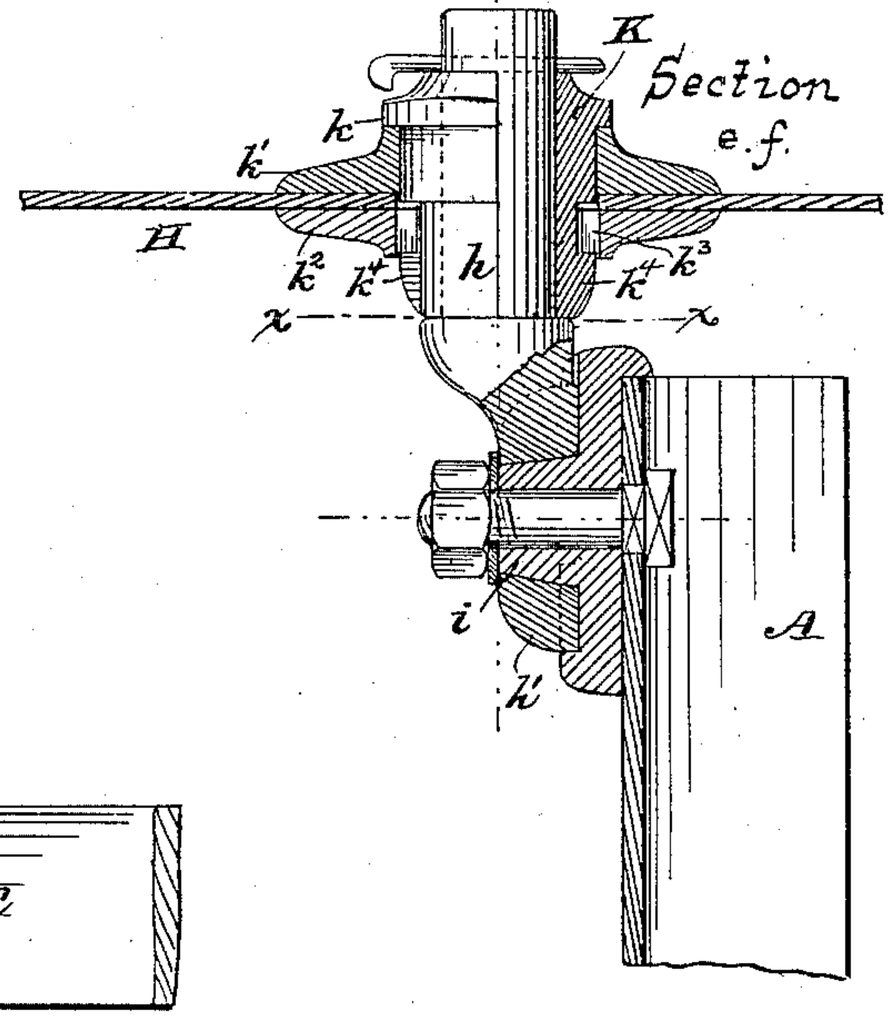



Fig. 12.

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# UNITED STATES PATENT OFFICE.

CHARLES LA DOW, OF ALBANY, NEW YORK.

## HARROW.

SPECIFICATION forming part of Letters Patent No. 411,199, dated September 17, 1889.

Application filed July 30, 1888. Serial No. 281,407. (No model.)

*To all whom it may concern:*

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

The object of my invention is to provide a new and improved spring-tooth harrow possessing many novel features, which will fully appear in the following description and accompanying drawings, in which—

Figure 1 is a side elevation with the nearest end wheel removed, showing in dotted lines the vertical hinge-motion which the drag-bars have upon their cross-bars; Fig. 2, a plan view showing by dotted lines the variable position of the flexible draft devices and end wheels when turning around; Fig. 3, a sectional view, on an enlarged scale, on the line *a b* of Fig. 4; Fig. 4, a detail plan view of a section of the cross-bar. Fig. 5 is a detail view showing the drag-bar and spring-tooth and the casting for connecting them. Fig. 6 is a section of the same on the line *c d* of Figs. 5 and 7. Fig. 7 is a plan view of the same matter, with the upper portion of the spring-tooth broken away. Fig. 8 is a detail view of the locking-disk for securing the steel-plate wheel on its hub; Fig. 9, a section of the same on the line *g h* of Fig. 8; Fig. 10, a sectional view on the line *x x* of Fig. 12; Fig. 11, a detail plan view of the end of the cross-bar with the wheel mounted thereon, showing by dotted lines the manner in which the wheel and its axle swing horizontally. Fig. 12 is a detail sectional view of the same matter, the section being in part taken on the line *e f* of Fig. 10; and Fig. 13 is a detail view of a section of the cross-bar, showing the preferred way of making the slots for the drag-bars thereon, so that wearing surface or plates for the drag-bars to work against are provided.

It will be perceived that in general construction the machine has an angular iron cross-bar A, its angle being at the top and rear, as shown, and its wider flange or side *a* extending toward the front of the machine. The draft-rods B, two being shown, extend under the portion *a* of the cross-bar, and are swiveled to the rear face or side *a'* thereof by hooked or eye bolts *b*. The outer ends of the draft-rods are pivotally connected with a cross-draft bar B'. These draft devices or connections are flexible, and are in action in substantially the same horizontal plane with the cross-bar. Their draft also, as will be more fully apparent after description of the drag-bars and their connections, tends to force the rear face *a'* of the angular bar downward and hold the teeth down to their work. Each drag-bar C is formed with an upwardly-turned hooked forward end *c*, and both flanges or sides of the angular cross-bar are slotted, as shown at *c'*. The drag-bar passes through the slot in the rear face *a'* and hooks in the slot in the upper face *a* of the cross-bar, as clearly seen in Figs. 3 and 4. This gives the drag-bars the capacity of rocking or hinging vertically; but they are held rigidly against lateral motion. A locking-plate D serves to hold all the drag-bars in place in the following manner: Opposite each slot *c'* four cuts are made in said plate from its rear edge inwardly, thus forming three tongues *d* and *d' d'*. The central one *d* is turned down and the other turned up, Figs. 3 and 4, so that a socket for the curved or hooked end of the drag-bar is formed. The plate D is applied on the upper face *a* of the angular cross-bar and is drawn backwardly, the middle tongues *d* entering the slots *c'* and embracing the curved ends of the drag-bars by means of hook-bolts E, which engage the forward edge of the plate and, extending under the cross-bar, pass through its rear face *a'*, and are secured by suitable nuts *e*. By screwing up these nuts the locking-plate may be adjusted to take up wear.

The spring-teeth F shown are of the class known as "arched" spring-teeth. They are adjustably secured to the drag-bar in the following manner: The rear end of each drag-bar is turned upwardly, and its edge is embraced by a two-part casting or shoe G, each section *g* of which has a socket for the reception of the edge of the drag-bar. Above the drag-bar sockets each section *g* is also formed with a curved socket for embracing the edge of the curved spring-tooth, and the transverse bolt *g'*, for clamping the sections against the edges of the drag-bar and tooth, passes between the drag-bar and tooth, Figs. 5, 6, and

7. The drag-bars are shown as made of flat bars of metal equal in width to the spring-teeth. They are arranged as shown in Figs. 1 and 2, long and short bars alternating, and each bar is capable of independent vertical vibration within limits regulated by the slots $c'$ in the cross-bar. It will now be more apparent that the draft tends to throw the rear face of the cross-bar down and hold the drag-bars and teeth down to their work. The drag-bars being of flat metal are elastic and enforce the action of the teeth with an elasticity independent of that of the teeth themselves. It will also be noted from Figs. 2 and 4 that the slots $c'$ in the rear of the cross-bar through which the shorter drag-bars pass are lower down than those through which the long bars pass. The purpose of this is to insure the teeth on the shorter bars cutting as deep as those on the longer bars.

At each end of the cross-bar I provide a steel-plate wheel H, mounted on a horizontally-vibrating stud-axle $h$. The construction is as follows: A casting I, bolted to the face $a$ of the cross-bar, has a hub $i$, which forms the bearing for the flattened end $h'$ of the axle $h$, and also stops $i'$ $i'$, which limit the range of vibration of the axle. As seen in Figs. 1 and 11, the axle is held parallel with the cross-bar as the machine advances; but in turning around the inner wheel is permitted to swing forward relatively to the cross-bar, and forms a pivot upon which the machine turns. The wheels are preferably formed of plate iron or steel, because they do not collect rubbish and they take hold of the soil and prevent lateral swerving of the machine. Each wheel is removably clamped on a hub K, which is secured upon the axle by an ordinary locking-pin. Near the outer end of the hub is an annular shoulder $k$, against which a collar $k'$ abuts, and between said collar and another collar or washer $k^2$ the wheel is clamped in the following manner: The central opening in the collar $k^2$ is formed with two notches $k^3$, which pass over corresponding lugs or projections $k^4$ on the inner end of the hub, and with oppositely-inclined wedging segmental surfaces $k^5$ $k^5$, upon which said lugs $k^4$ run, and when the collar $k^2$ is in place, as in Fig. 12, by turning the collar the parts are firmly wedged or clamped together. The hub and wheel may readily be removed from the axle and the hub and wheel separated whenever desired.

In order to prevent wear between the edges of the drag-bar and the slots in the cross-bar, I provide wearing-plates $l$ at the sides of the slots $c'$ in the rear face $a'$ of the cross-bar. They are preferably formed in the following manner: In cutting the slots two parallel cuts are made lengthwise of the bar and one transverse cut midway of the slot, and the ears $l$ thus formed are turned in at right angles to the face of the cross-bar and form wearing-plates. This feature is shown in Fig. 13.

This harrow may be constructed entirely of metal, and is strong and light. The draft of the team holds the teeth down to their work. The machine will not swerve in traversing the field and no pole is necessary. In turning, the machine pivots upon the inner wheel while the outer wheel runs freely through the soil. The drag-bars within limits freely vibrate independently. The teeth may readily be adjusted by loosening the casting or shoe. All the drag-bars are secured in a simple and cheap way by a common locking-plate. All these as well as other advantages are apparent from the foregoing description.

In this machine the cross-bar runs close to the ground and serves as a crusher to break up clods, and the vibratory action of the drag-bars prevents the under face of the cross-bar from clogging, while the rearwardly-trailing drag-bars permit rubbish to readily pass to the rear of the machine.

I claim as my invention—

1. The combination of the flat-faced cross-bar and the flat drag-bar having a hook at its front end which engages with a straight edge of the cross-bar and forms a hinge-connection with the cross-bar.

2. An angle-iron cross-bar having slots $c'$, in combination with the drag-bars passing through said slots, and teeth on the drag-bars.

3. An angle-iron cross-bar having slots $c'$ in its front and rear faces, in combination with drag-bars passing through the slots in the rear face and hinged in the slots in the front face.

4. An angle-iron cross-bar having slots $c'$ in its rear side or face, in combination with drag-bars passing through said slots and hinged to the front side of the cross-bar.

5. The combination of the drag-bars and the cross-bar having rectangular slots, in which the hooked ends of the drag-bars engage.

6. The combination of the hooked drag-bars, the cross-bar having slots in which the hooked drag-bars engage, and a locking-plate common to all the drag-bars for securing them in place.

7. The combination of the slotted cross-bar, a drag-bar whose hooked end engages in said slot, and a locking-plate having tongues $d$ $d'$ $d'$, as described, for holding the hooked end of the drag-bar in place.

8. The combination of the slotted cross-bar, the hooked drag-bars, the locking-plate, and adjustable securing devices for holding the locking-plates.

9. A cross-bar having a side or face $a$, to which the drag-bars are hinged, and a draft-connection in rear of the hinges and applied to the cross-bar below the plane of the face $a$, for the purpose set forth.

10. The combination of the cross-bar, the drag-bars flexibly connected or hinged thereto at their inner ends, the teeth on the outer ends of the drag-bars, and flexible draft devices located in substantially the same horizontal plane as the cross-bar.

11. The combination of the cross-bar, the

drag-bars hinged thereto, the teeth on the outer ends of the drag-bars, the swiveled draft-rods of the cross-bar, and a cross-rod B′.

12. The combination, with the cross-bar, of the narrow plate-metal low wheels, supporting the cross-bar at each end close to the ground and adapted to permit rubbish to pass backward, and the drag-bars connected with the cross-bar, as set forth.

13. The combination, with the drag-bar and tooth, of a holder or casting which clamps the drag-bar by its outer side edges and also carries the tooth.

14. The combination, with the drag-bar and tooth, of an interposed tooth holder or casting which clamps both the drag-bar and tooth by their outer side edges.

15. The combination, with the drag-bar and tooth, of the clamping device or tooth-holder made in sections and clamped upon the tooth and bar by a bolt located between the tooth and bar.

16. The drag-bar having a hooked rear end, in combination with the sectional tooth-holder having sockets for embracing the end of the bar, and clamping devices to clamp the holder to the edges of the bar.

17. The combination of the drag-bar, a sectional tooth-holder having a seat or socket for the outer end of the drag-bar, and a separate curved socket for the curved spring-tooth, and adjustable clamping devices for securing the drag-bar and the tooth in their sockets between the sections of the holder.

18. The combination, with the cross-bar, of wheels at each end of the cross-bar having horizontal axles pivoted directly upon the cross-bar and projecting therefrom and capable of vibrating horizontally upon their pivots, for the purpose set forth.

19. The combination, with the cross-bar, of the wheels at each end of the cross-bar, their horizontally vibrating or swinging axles mounted on the cross-bar, and stops for limiting the vibration of the wheels.

20. The combination, with the axle, of a removable hub carrying the wheel and having flange $k$, and collars $k'$ $k^2$, between which the wheel is removably clamped.

21. The combination of the hub having the shoulder $k$ and lugs $k^4$, of the opposing collars $k'$ $k^2$, between which the wheel is clamped, one of said collars having interior notches, through which said lugs pass, and oppositely-inclined segmental surfaces upon which said lugs travel to clamp the hub, collars, and wheel together.

22. The cross-bar having slots $c'$, through which the vibratory drag-bars pass, said slots being provided with side wearing-plates $l$.

23. The combination of the slotted cross-bar and long and short drag-bars passing through said slots, the slots for the shorter bars being on a lower level than those for the others, for the purpose set forth.

In testimony whereof I have hereunto subscribed my name.

CHARLES LA DOW.

Witnesses:
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M. J. KELLEY.