

(No Model.)

G. W. FRENCH & W. P. BETTENDORF.
HARROW.

No. 445,444.

Patented Jan. 27, 1891.

Fig. 1.

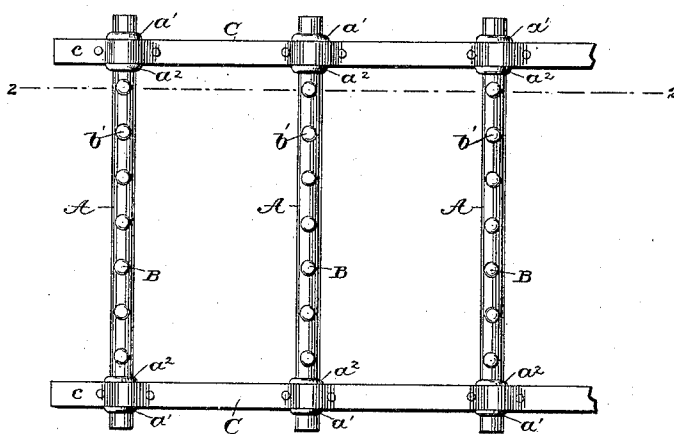


Fig. 5.

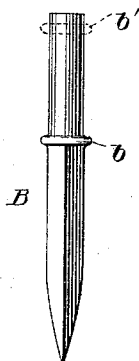


Fig. 2.
on line 2-2

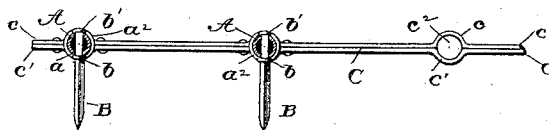


Fig. 3.

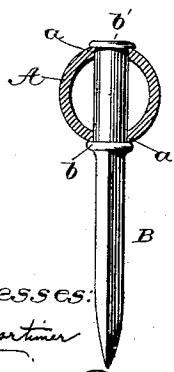
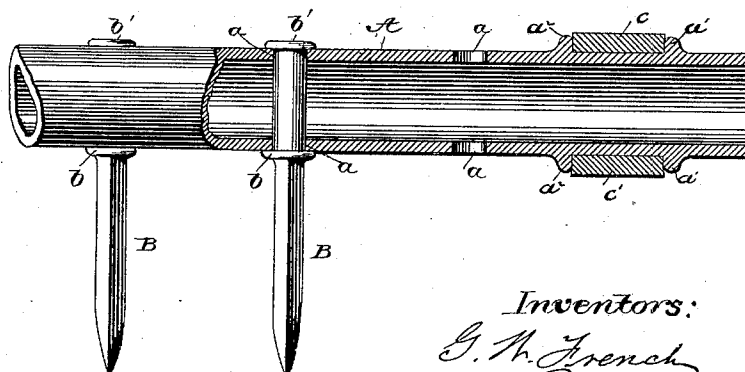


Fig. 4.



Witnesses:

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J. J. Elmore

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G. W. French
W. P. Bettendorf
By their Attys.
P. Y. Lodge

UNITED STATES PATENT OFFICE.

GEORGE WATSON FRENCH AND WILLIAM P. BETTENDORF, OF DAVENPORT,
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HARROW.

SPECIFICATION forming part of Letters Patent No. 445,444, dated January 27, 1891.

Application filed April 15, 1890. Serial No. 348,043. (No model.)

To all whom it may concern:

Be it known that we, GEORGE WATSON FRENCH and WILLIAM P. BETTENDORF, of Davenport, in the county of Scott and State of Iowa, have invented certain Improvements in Harrows, of which the following is a specification.

Our invention relates to toothed metallic harrows; and its objects are to simplify the construction, reduce the cost, and increase the strength of the structure.

Our improvements are applicable both to harrows which have the teeth fixed rigidly in the frame and to those in which the teeth are mounted in rolling bars to admit of their inclination being changed.

In carrying our invention into effect we employ hollow bars, cylindrical preferred, though square or other shaped hollow bars may be used, through which the teeth are inserted and in which they are secured by upsetting the teeth, so as to form shoulders or enlargements thereon above and below the bars. We prefer to carry this upsetting operation so far that it will not only form the enlargements of the teeth outside of the supporting-bar, but also enlarge or increase the diameter of the portion within the bar. In this manner the teeth are greatly strengthened in the part which receives the greatest strain, so that they are adapted to withstand the very severe strains and shocks encountered in practice without making them of objectionable weight. The advantage of thus forming the shoulders by enlarging the bars lies in the fact that the bars are given their maximum strength at the shoulders instead of being weakest at those points, as in the case of bars grooved to produce shoulders. Bars having the enlarged shoulders may be made very much lighter and cheaper than would otherwise be possible. It is obvious that these hollow bars, upset or compressed so as to have projections to keep them in place on the journals between the projections, the cross-bars, or beams, may be used on a variety of machines, though specially desirable on harrows. The teeth-sustaining bars, if of rolling type, are passed at their ends through a frame or frame-bars, in which they roll or turn. The rolling bars are

prevented from shifting endwise by means of shoulders or enlargements formed upon them by an upsetting operation.

In the accompanying drawings, Figure 1 is a top plan view of a section of a portion of a harrow containing our improvements. Fig. 2 is a longitudinal vertical section of the same on the line 2 2. Fig. 3 is a vertical section through the tooth-sustaining bars on an enlarged plan, the teeth being in position therein. Fig. 4 is a side elevation of the same, one end being in section. Fig. 5 is a view of one of the teeth as it appears previous to its insertion.

Referring to the drawings, A A represent the tooth-supporting bars, which are of tubular form. We employ preferably for the purpose lap-welded steel or iron tubing, such as is commonly sold in the market. At suitable points in its length the tube has holes *a*, drilled therethrough from top to bottom, to receive the upper ends of the teeth.

B B represent the teeth, which may be of any approved form, either solid or tubular. Each of the teeth is inserted through the tubular bar A and confined rigidly in position by means of shoulders or enlargements *bb'* formed thereon, one above and the other below the sustaining-bar. These shoulders or enlargements are formed by the operation technically known as "upsetting"—that is to say, by pressing the tooth endwise, so as to reduce its length and increase its diameter at the required points. If preferred, the teeth may be formed with the lower shoulder *b* thereon, as shown in Fig. 5, previous to their introduction into the supporting-bars, after which the upper shoulder or head may be formed by a hammering action or by the application of pressure; or both shoulder and head may be formed by the same operation after the tooth is inserted in the bar.

The bars A, with the teeth fixed therein, may be mounted rigidly or movably in a draft-frame of any appropriate character. When, however, they are to be mounted to roll in the frame we form them at each end with two collars or shoulders *a'* and *a''*, produced by upsetting the metal, or in any other appropriate manner which will give the bars the increased

or abnormal diameter adjacent to the journals or points of bearing. The ends are then mounted to turn in the frame-bars C, the collars resting against opposite sides of the frame-bar, as shown in Fig. 1.

The frame-bars are each formed of two straps or bars c and c' , bent at suitable intervals, as shown at c^2 , so that they are adapted to close together around the toothed bars between the collars thereon. The two bars or straps are united by bolts or rivets. If preferred, however, the frame-bars c may be each made in one piece, suitably punched or perforated to receive the ends of the toothed bars A. When this construction is adopted, the outer shoulders or collars a' will, of course, be formed after the toothed bars are inserted through the frame-bars.

The frame constructed on our plan may be of any suitable size and form, and several such frames or sections may be jointed together, provided with braces and draft devices, or otherwise employed in the same manner as harrow frames or sections of ordinary construction.

The neck of the tooth—that is to say, the part within the bar—is usually enlarged by the upsetting action, to give the additional strength heretofore referred to. This is clearly shown in Figs. 3 and 4, in which the neck is larger than the body or point. No other parts of agricultural machines are subjected to the same strain and violence as the teeth of harrows. The result is that the teeth are frequently broken, and this generally at their

junction with the frame. The enlargements of our teeth enable them to resist the shocks and prevent them from breaking.

What we claim is—

1. In a harrow, a tubular frame-bar, in combination with a tooth inserted therethrough and upset and enlarged both above and below said bar.

2. In combination with a tubular perforated sustaining-bar, a harrow-tooth having its upper end upset to produce the enlarged collar or shoulder below the bar and the enlarged neck within the bar, as described and shown.

3. A tubular frame-bar for a harrow having perforations to receive the teeth and enlargements or collars to resist end motion of the bar in the frame.

4. In a harrow, a metal tooth-sustaining bar provided with encircling shoulders or collars a' a^2 , formed integral therewith, in combination with frame-bars encircling said toothed bars between the collars.

In testimony whereof we hereunto set our hands this 12th day of March, 1890, in the presence of two attesting witnesses.

GEO. WATSON FRENCH.

WILLIAM P. BETTENDORF.

Witnesses to signature of Geo. Watson French:

NATHL. FRENCH,

WM. EVANS.

Witnesses to signature of William P. Bettendorf:

T. B. CARSON,

NATH. FRENCH.