2 Sheets—Sheet 1.

J. W. ELLS.

Hoe.

No. 211,502. **Patented Jan. 21, 1879.**

Fig. 1.

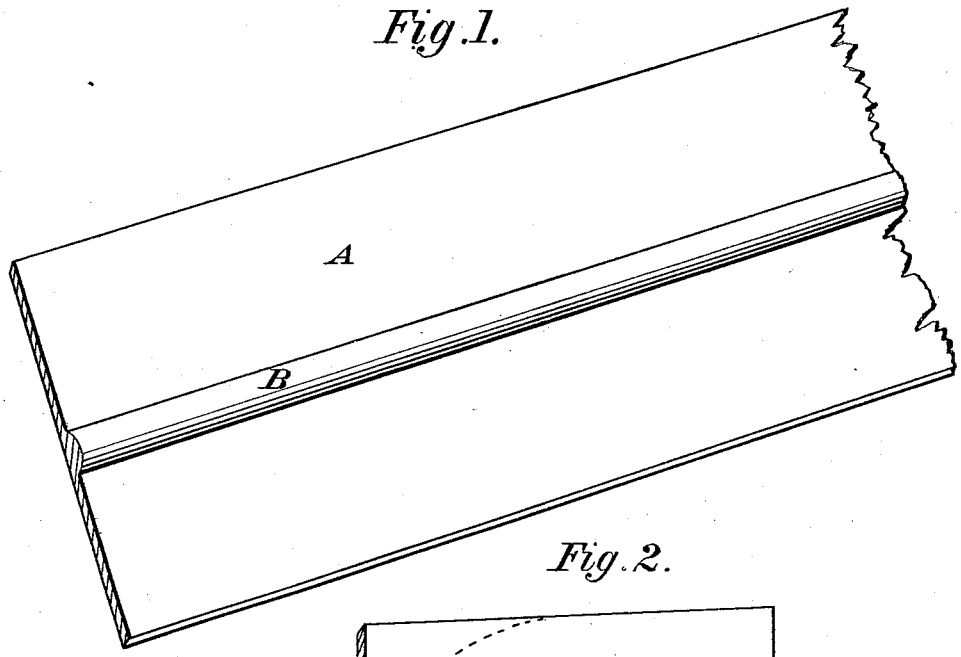
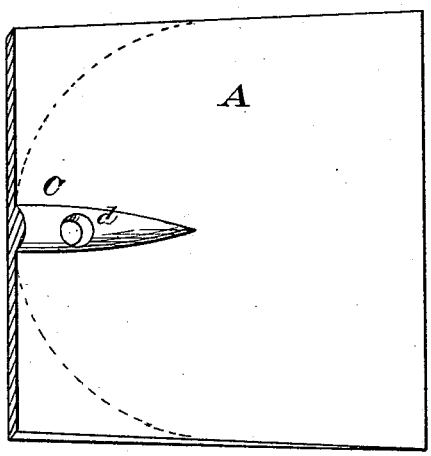


Fig. 2.



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2 Sheets—Sheet 2.

J. W. ELLS.

Hoe.

No. 211,502. **Patented Jan. 21, 1879.**

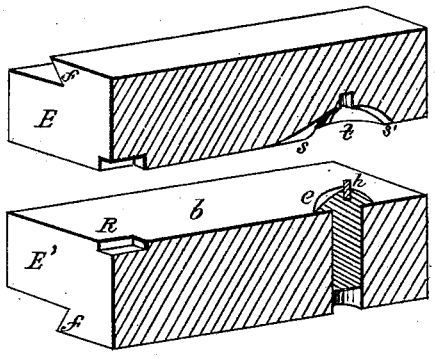

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

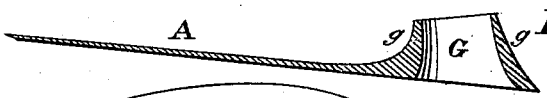

Fig. 7.

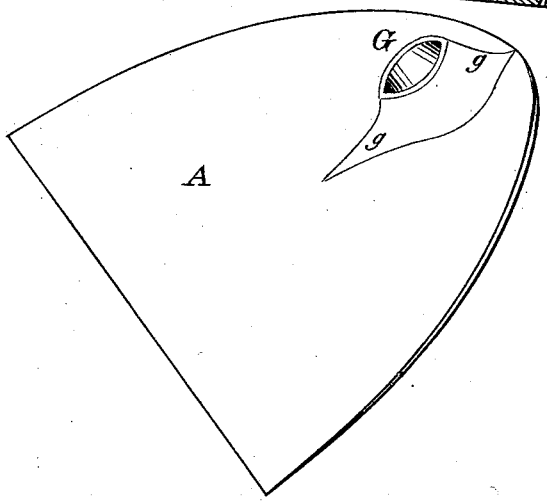

Fig. 8.

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UNITED STATES PATENT OFFICE.

JOSIAH W. ELLS, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN HOES.

Specification forming part of Letters Patent No. **211,502**, dated January 21, 1879; application filed November 23, 1878.

To all whom it may concern:

Be it known that I, JOSIAH W. ELLS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and Improved Hoe, the construction of which will be readily understood from the following description, taken in connection with the accompanying drawings, wherein—

Figure 1 represents a thin sheet of steel upon which is formed a central longitudinal rib; Fig. 2, a transverse section of said sheet rolled or hammered, so as to remove a greater part of its rib, and at the same time lengthen, taper, and widen the blank. Fig. 3 represents a longitudinal vertical section of a pair of a series of such dies I use in the formation of the eye of the hoe; Fig. 4, a longitudinal central section of a blank after having been subjected to the joint action of the first pair of dies; Fig. 5, the same after having been acted on by the second pair of dies; Fig. 6, the same when acted on by the third pair of dies; Fig. 7, the same when given the final and finishing shape by the fourth pair of dies. Fig. 8 represents a perspective view of my improved hoe.

To make hoes in accordance with my invention, I use a long thin plate, A, of steel, of a size equal to the thickest portion of the intended blade, and of nearly the same width, and with a longitudinal central rib, B, on one side, integral therewith. From this plate I sever the blank by a transverse cut, so that each disconnected blank shall be somewhat shorter than the prospective finished blade. A blank is then made red-hot and subjected to the action of such hammers or rolls as will quickly and effectually taper and lengthen the plate by thinning it regularly from one end down to the other, and at the same time flatten or depress a greater portion of the rib B by forcing it completely into the surface of the plate A, widening it gradually toward the thinnest part, after the manner represented in Fig. 2, which shows the widened tapered blank and the shape of the reserved rib C, terminating in a point near the middle of the blade. The thickest end of the plate may be sheared to give it a circular form, or such other shape as will be most pleasing or suited to the requirements of trade. A small hole, *d*, is then punched through the rib C about midway of its length, and the blank thus prepared for the formation of the eye by the operation of a series of dies, the first pair of which is delineated in Fig. 3, and consists, essentially, of two rectangular blocks, E E′, of hard metal, each constructed with a dovetailed piece, *f*, by which they may be secured, the one to an anvil or solid support, and the other to a drop-hammer or moving part of a powerful press. The face *b* of each of these several dies is perfectly plain, except that part designed for the formation of the eye, and on that part in the lower die of the first pair rises a circular protuberance, *e*, in the top of which is a vertically-arranged projecting pin, *h*. This protuberance and pin may be made detachable, permitting the face of the die to be ground, or otherwise made straight and smooth. The upper die, E, of this pair is an introverted counterpart of the one just described, except that two grooves, *s s′*, are cut in the sides of the cavity *t*, opposite each other, corresponding in position to the braces on the eye of my improved hoe.

To form the eye, the entire blank must be made red-hot, and while in that condition subjected to the joint action of the first pair of dies, by placing the plate rib side uppermost between them, and so that the thinnest edge of the blank shall be toward the recess R in the front of the dies, which recess is merely for convenience in handling the blade by means of a pair of tongs. The pin on the knob *e* having properly entered the hole *d* in the plate, the descending upper die will cause the plate A to be raised hemispherically about the height of a finished eye, but of much greater diameter, bending the rib with it to a similar degree of curvature, and at the same instant the peculiar shape of the grooves *s s′* in the cavity *t* of the upper die will depress, spread, and force that portion of the rib nearest the center of the swell into the surface of the plate immediately around the hole *d*, thickening it sufficiently to supply any deficiency that may take place in the stretching process necessary in the enlargement of the hole for the complete formation of the eye, and whereby the original consistency of the plate around the hole will be maintained and preserved. The blank is then reheated and subjected to the next dies of the series, in which the protuberant portion is

higher and coniform, so as to gradually open the eye at the top and contract it at the base.

The succeeding pair of dies to which the blank is subjected are in all respects like those just mentioned, and act on the blank in a similar manner, only that the parts for forming the eye are smaller in diameter, and the grooves in the upper die are better calculated to bring the rib to a shape triangular in transverse section. The rib, having been divided by the punching and stretching process, and brought to proper shape by the dies, constitutes the braces *g g* to the eye, the one on top and the other underneath, each thickest at that part next the base of the eye, and gradually tapering toward its projecting smallest open end. The eye, at this stage, represents a short open-ended tube, the axis of which is at right angles to the face of the blade; and in order to give it suitable and final shape, another pair of dies is necessary, which dies are so constructed that their joint action not only brings the eye G to an oviform shape, but gives it the proper "set" or angle to the plane of the plate A. Thus, from a thin sheet of metal a complete broad-bladed hoe is formed, without rivets or welding, perfectly smooth on the back, and without any corrugations, recesses, or indentations therein, and with a rib or brace, *g*, thicker than the blade A, stiffening and supporting the projecting portion of the eye G above and below its axis.

I claim—

1. A thin broad-bladed hoe having a single cutting-edge, and constructed entirely of one piece of metal, and so that the circumference of its eye shall be wholly within the margin or border of the blade, in combination with a thick solid rib or tapering brace along and underneath the eye, or that part nearest the cutting-edge.

2. A hoe having a single cutting-edge, and constructed entirely of one piece of metal, and so that the circumference of its eye shall be wholly within the margin or border of the blade, in combination with a thick solid rib or tapering brace extending along that part of the projecting eye most remote from the cutting-edge of the hoe.

3. A hoe constructed entirely of one piece of metal, with a single cutting-edge, and so that the circumference of its eye shall be wholly within the margin or border of the blade, in combination with a thick solid tapering rib or brace extending along the projecting portion of the eye above and below its axis.

JOSIAH W. ELLS.

Witnesses:
AL. PRICE,
GEO. C. STEWART.