W. W. Knowles, 2 Sheets, Sheet 1

Forming Carriage Steps

No. 104,040. Patented June 7, 1870.

Fig. 1.

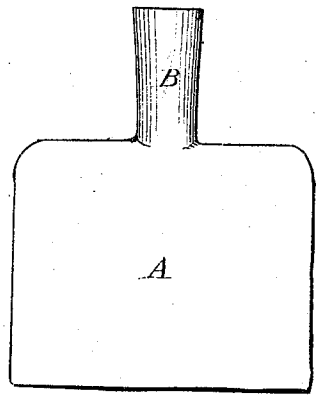


Fig. 2.

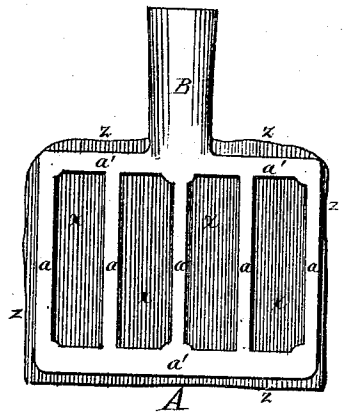


Fig. 4.

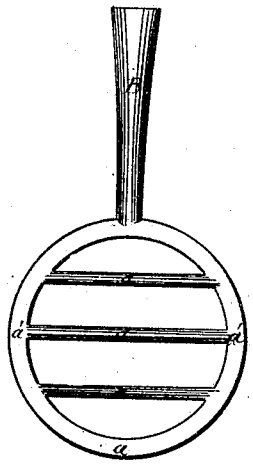


Fig. 3.

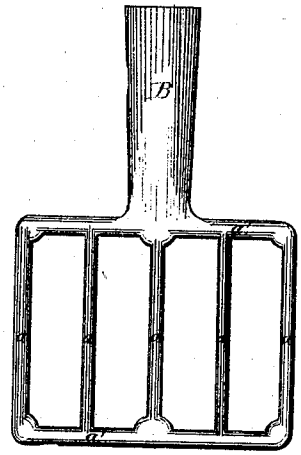
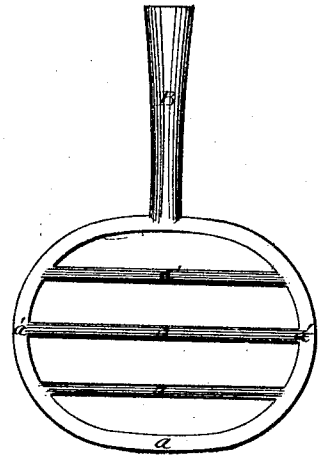


Fig. 5.



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W. W. Knowles, 2. Sheets, Sheet 2.

Forming Carriage Steps.

No. 104,040. Patented June 7, 1870.

Fig. 9.

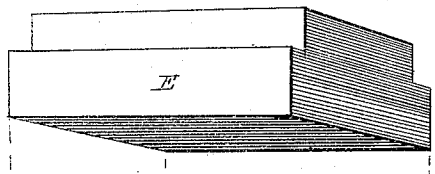


Fig. 10.

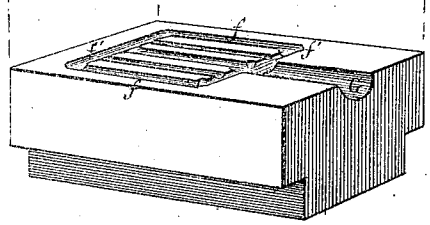


Fig. 6.

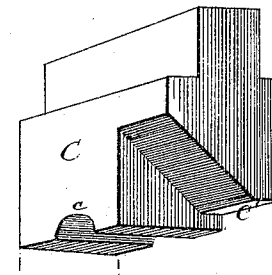


Fig. 7.

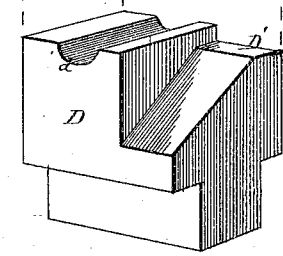


Fig. 11

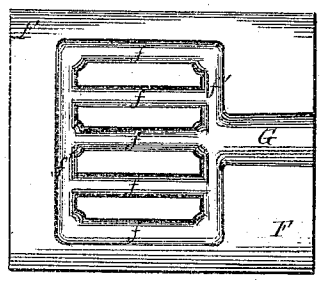
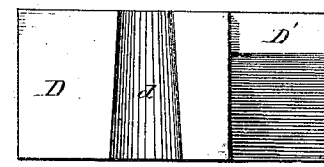


Fig. 8.



Witnesses:

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Inventor.

Wilson W. Knowles

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Att'ys.

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UNITED STATES PATENT OFFICE.

WILSON W. KNOWLES, OF PLANTSVILLE, CONNECTICUT.

IMPROVED METHOD OF FORMING CARRIAGE-STEPS.

Specification forming part of Letters Patent No. **104,040**, dated June 7, 1870.

To all whom it may concern:

Be it known that I, WILSON W. KNOWLES, of Plantsville, in the county of Hartford, and in the State of Connecticut, have invented a certain new and useful Method of and Dies for Forming Carriage-Steps; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a plan view of a rough blank used in forming a step. Fig. 2 is a like view of the lower side of said blank after having passed through the first set of forming-dies. Figs. 4 and 5 show two modifications in the form of the step. Figs. 6 and 7 are perspective views of the dies used for forming the shank of the step. Fig. 8 is a plan view of the face of the same. Fig. 9 is a perspective view of the upper die for forming the step. Fig. 10 is a like view of the corresponding lower die, and Fig. 11 is a plan view of the face of the latter.

Letters of like name and kind refer to like parts in each of the figures.

As ordinarily constructed carriage-steps are cut from sheet metal and their open-work center stamped out by means of an ordinary pair of dies, after which they are welded to the shank; but experience has proved that this method is open to serious objections on account of the inferior quality of the work, and also of the cost of its production.

To obviate these objections is the design of my invention, which consists principally in producing an open-work carriage-step from a solid bar of iron, without welding, by means of the hereinafter-described method.

It also consists in the employment of a series of peculiarly-constructed dies for forming or shaping said step, by means of which a better and more accurately-finished article is secured and time and labor economized in its production, as is hereinafter shown and described.

In the manufacture of carriage steps by my method three pairs of dies are successively used in connection with one or more drop-presses, the lower die of each pair being stationary within the bed-plate, while the upper one is attached to and carried by a ram or drop and caused to impinge upon the work placed within or upon the lower die, and thereby give to said work the desired form.

In order to form the step-blank A, a bar of iron having a suitable size is heated and its end forged under a trip or drop hammer until the required shape and dimensions are roughly obtained. The shank B is now formed by means of the primary set of dies C and D, (seen in Figs. 6 and 7,) which dies are provided at one side with corresponding peening-faces, C′ and D′, for roughly drawing out said shank, and have sunk within their contiguous horizontal and parallel faces corresponding half-round grooves, *c* and *d*, within the latter of which said shank is placed and completed by a few blows from the upper die, leaving the blank in the form shown in Fig. 1. A second set of dies (shown in Figs. 9 and 10) is now employed, the upper of which, E, has a plane horizontal face, while the lower die, F, is provided with a series of half-round grooves, *f*, arranged parallel with each other and connected together at their ends by means of two other grooves, *f′*, placed at a right angle with the former. A larger half-round groove, G, corresponding in size with the shank B, extends from the outer edge of the die into and through one of the transverse grooves, *f′*, and connects with the center one of the grooves *f*.

In order to furnish room below the surface of the die F for the increased size or swell of the shank B, the groove G is made much lower at its outer than at its inner end, and from its size, being somewhat deeper at its point of intersection than the grooves *f* and *f′*, the latter and the center of said grooves *f* are made to incline downward from their outer ends to the bottom of said groove G, by which construction the bars formed within said deepened grooves have a regularly increasing depth from their outer ends to their point of union with the shank. After reheating the blank shown in Fig. 1 is placed between the dies E and F, and receives a number of blows, which cause it to fill said lower die and assume the shape shown in Fig. 2, the metal being forced downward and sidewise, so as to raise and form the bars *a* and *a′*, leaving them connected by means of a thin diaphragm, *x*, and also leaving a fin, *z*, of corresponding thickness projecting horizontally from the edge of the step.

The blank is again heated, and the diaphragm *x* and fin *z* removed by means of suitable trimming-dies, after which it is placed beneath the finishing-dies and completed, as shown in Fig. 3, by means of a few blows.

The finishing-dies used are substantially the same as those above described, E and F, the only point of difference being in the depth of the grooves, those within the latter being made somewhat deeper than the finished bars, in order that they may contain a sufficient amount of metal to insure a perfect step.

Although I preferably construct steps in the form shown in Fig. 3, a great variety of other forms can be given to them. As an illustration of a slight change in form, Figs. 4 and 5 show two steps in which the bars *a* are placed at a right angle to instead of in a line with the shank B, while a circular or an oval shape is given to the exterior of said step. Other changes will readily suggest themselves; but as they would only be modifications of my invention, it is not thought necessary to further illustrate or describe them.

As thus formed the step and shank are composed of the same quality of metal, which, from the peculiar action of the dies forcing it downward and sidewise, has all the toughness and tenacity of hammered iron, and being without weld, no breakage can occur from a defect in the workmanship.

In addition to the above, there is a decrease in the cost of the finished article, which results from the saving in material caused by forcing a portion of the iron that would otherwise be wasted sidewise into the bars, and also from the lessened amount of time and labor required in the production of the same.

Having thus fully set forth the nature and merits of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The hereinbefore-described method of forming an open-work carriage-step from a solid bar of iron without welding, substantially as and for the purpose shown.

2. The series of dies C and D and E and F for forming a carriage-step, constructed substantially as shown and described.

In testimony that I claim the foregoing I have hereunto set my hand this 18th day of May, 1870.

WILSON W. KNOWLES.

Witnesses:
J. D. QUILL,
L. M. COMBS.