3 Sheets—Sheet.1.

G. BRYDEN.

Manufacture of Horseshoes.

No. 223,111. **Patented Dec. 30, 1879.**

Fig. 1

Fig. 2.

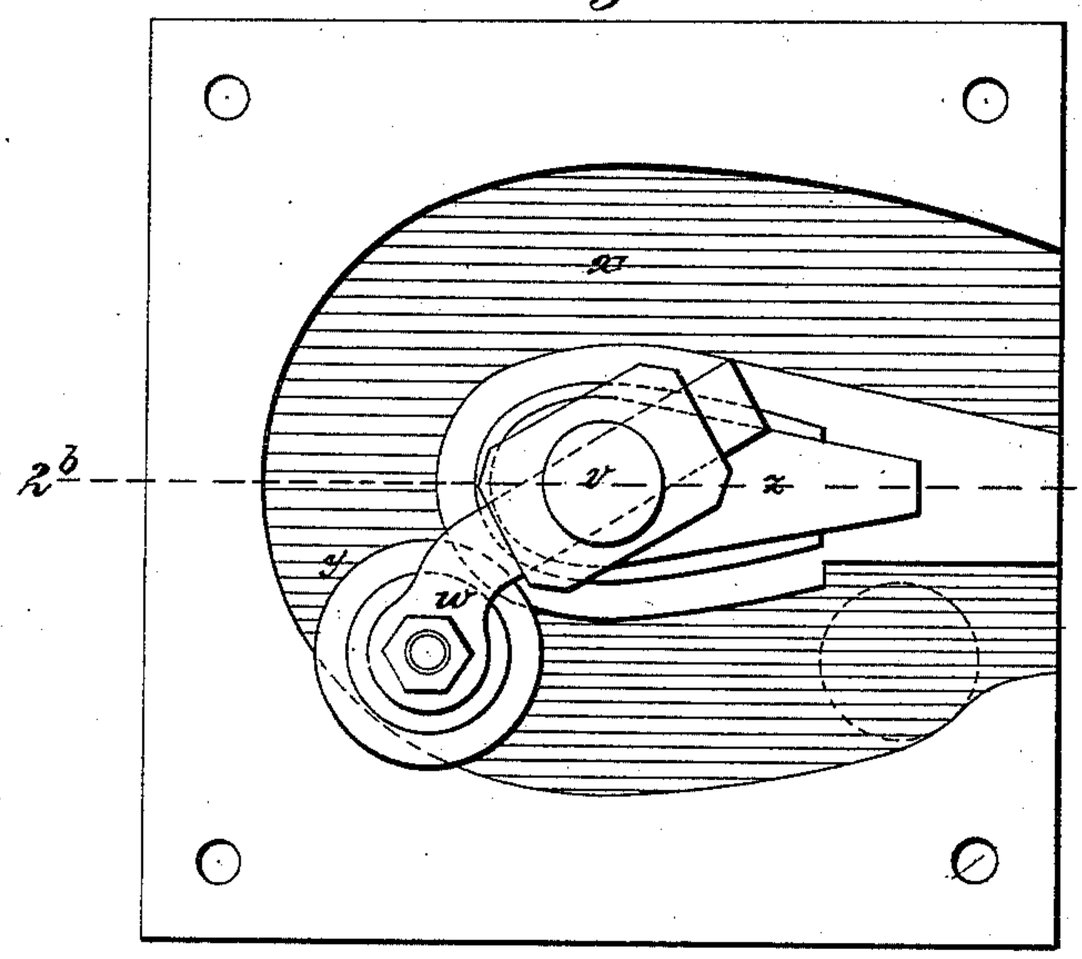

Fig. 2b

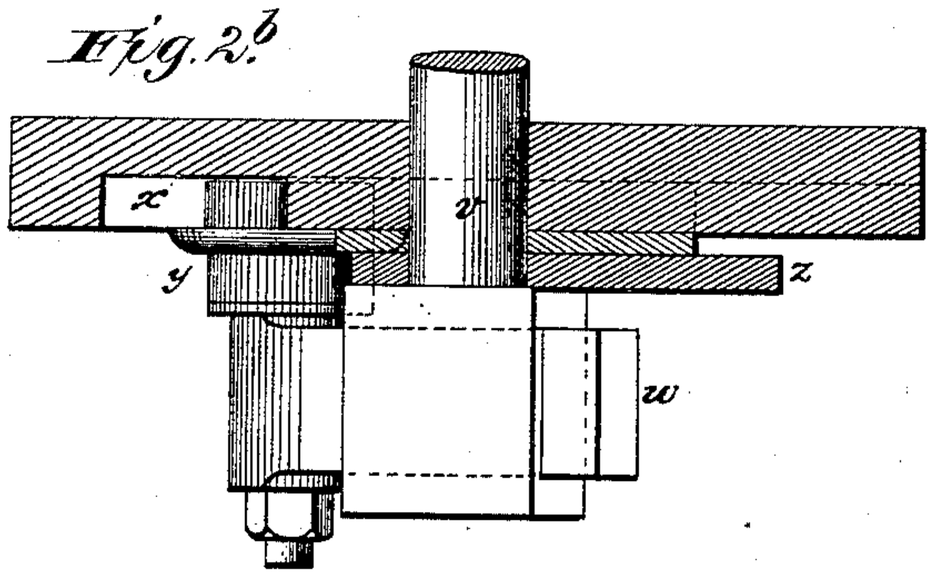

Fig. 4.

Fig. 3.

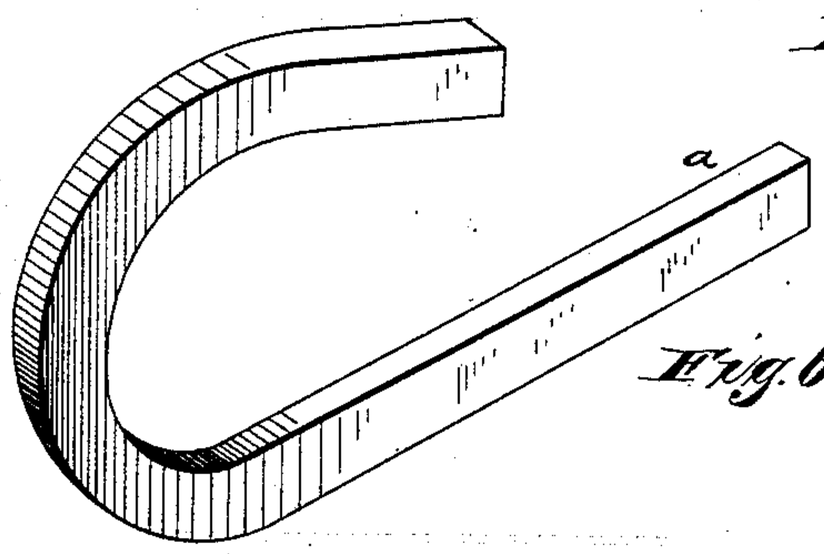

Fig. 5.

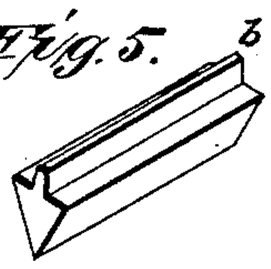

Fig. 6

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Manufacture of Horseshoes.

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Fig. 1.

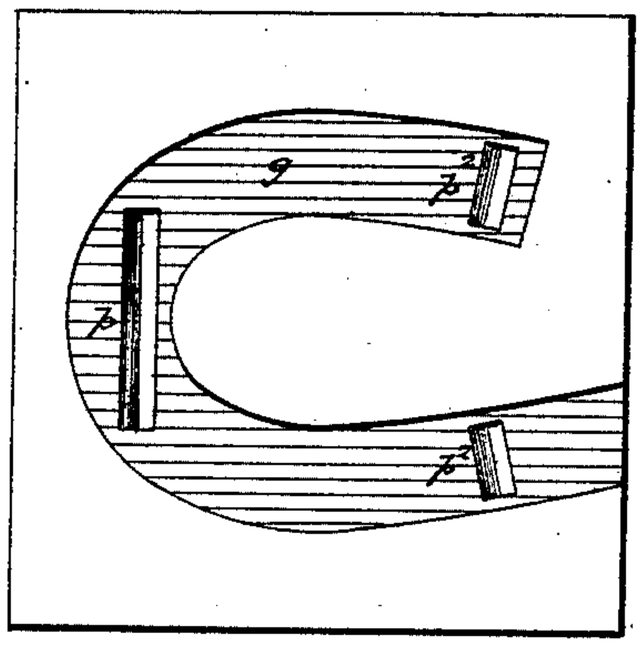


Fig. 8.

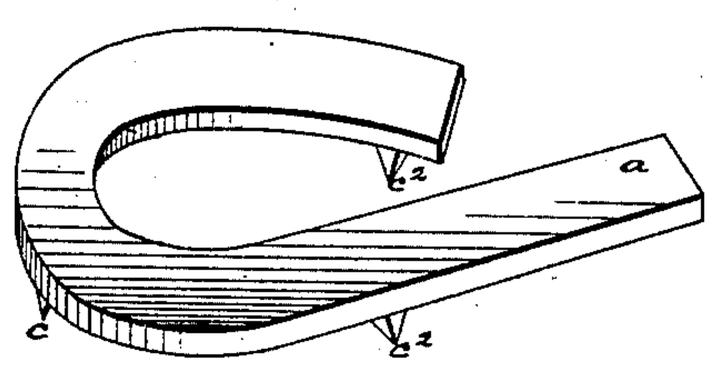


Fig. 9.

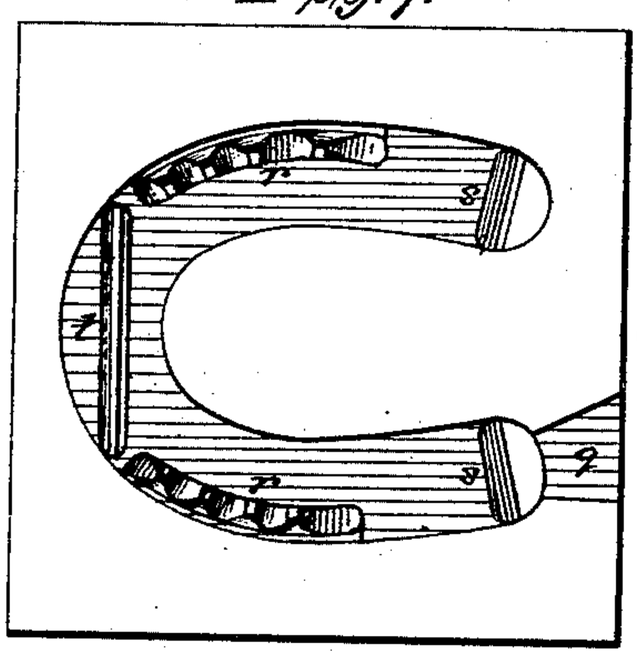


Fig. 10.

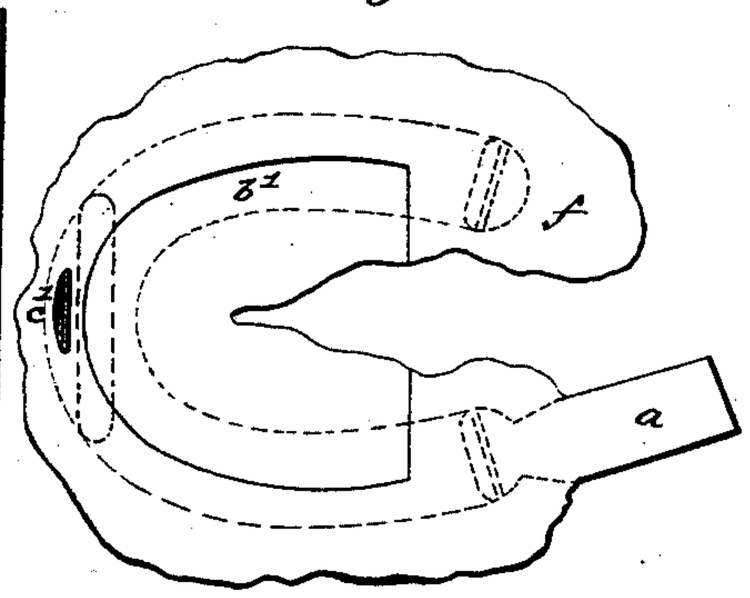


Fig. 11.

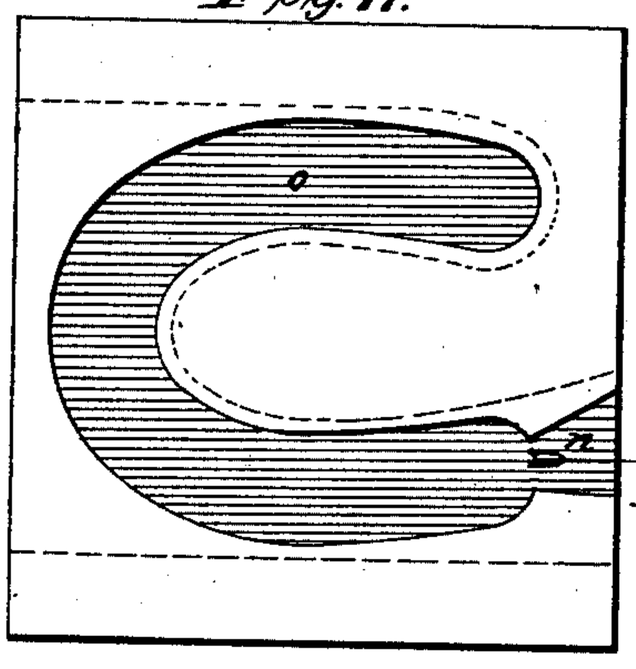
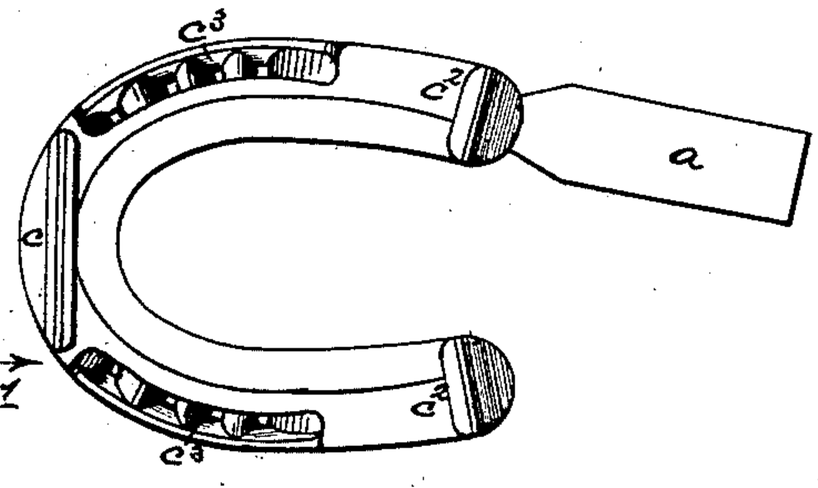


Fig. 12.



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Manufacture of Horseshoes.

No. 223,111. Patented Dec. 30, 1879.

Fig. 13.

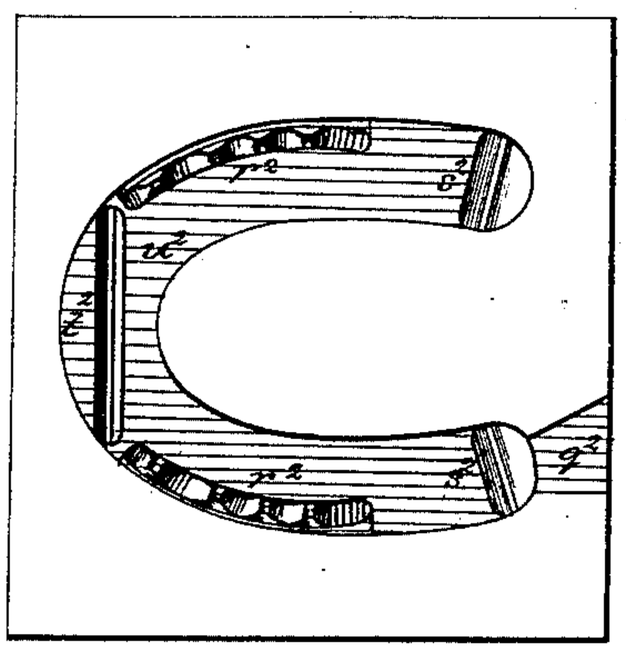


Fig. 14.

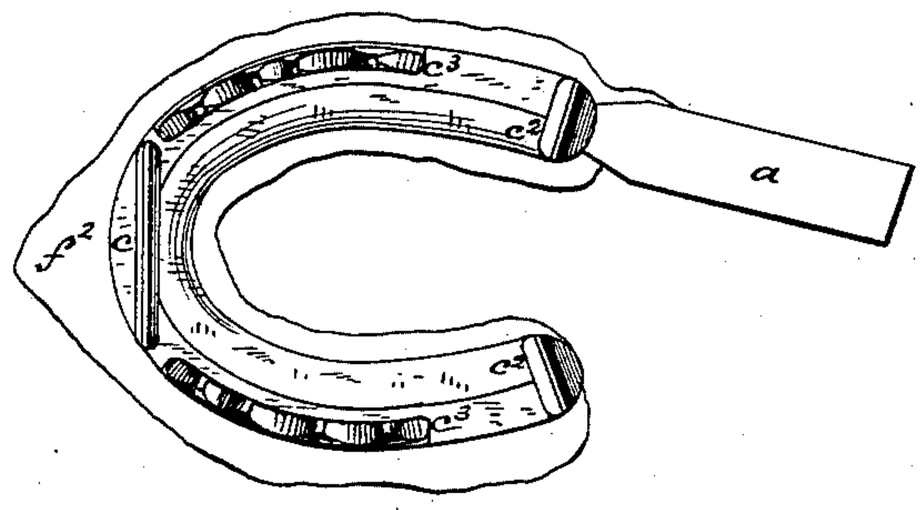


Fig. 16.

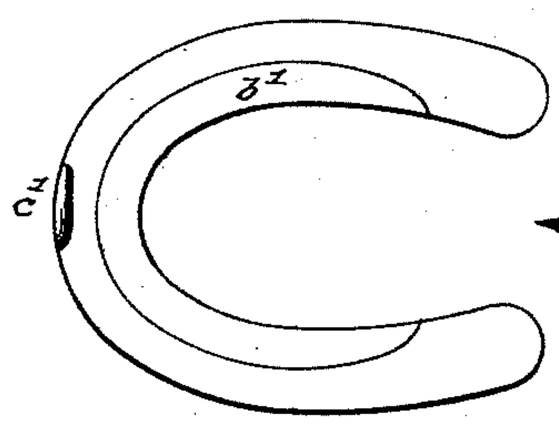


Fig. 15.

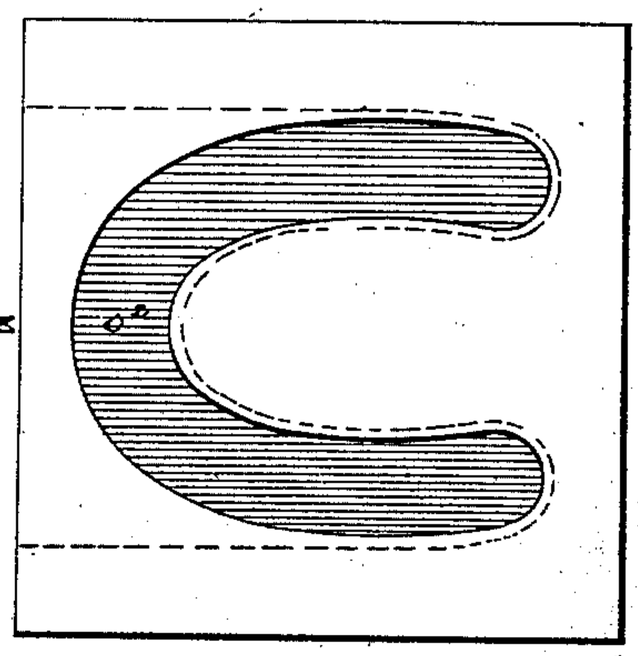
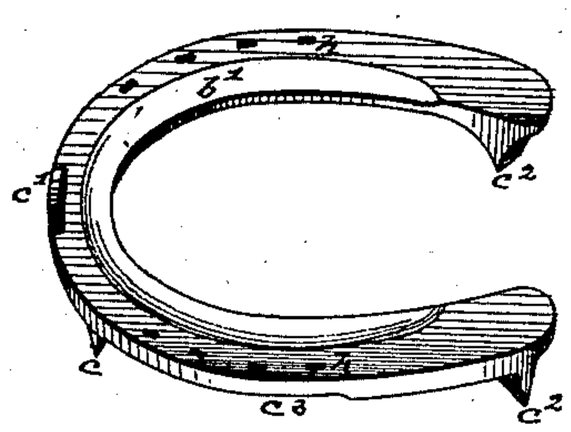


Fig. 17.



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UNITED STATES PATENT OFFICE.

GEORGE BRYDEN, OF HARTFORD, CONNECTICUT.

IMPROVEMENT IN THE MANUFACTURE OF HORSESHOES.

Specification forming part of Letters Patent No. **223,111**, dated December 30, 1879; application filed February 11, 1879.

To all whom it may concern:

Be it known that I, GEORGE BRYDEN, of the city and county of Hartford, in the State of Connecticut, have invented certain new and useful Improvements in the Art of Manufacturing Horseshoes; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which my said invention appertains to practice the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to the manufacture of forged or swaged horseshoes by machinery without the use of die-rolls.

In the specification of my Patent No. 172,383, dated January 18, 1876, I describe a process for making horseshoes having no calks by means of a bending-machine, two sets of swaging-dies, and a set of trimming-dies.

In the specification of my Patent No. 206,858, dated August 13, 1878, I describe a set of dies having calk-pockets, in which steel calks are welded on a horseshoe while both are being swaged.

My present invention, which is the result of later discoveries, involves the employment of a combination of apparatus similar in part to that described in said Patent No. 172,383, with or without calk-pockets in the swaging-dies, as described in said Patent No. 206,858, and certain additional apparatus, while for stock or material I use ordinary commercial bar-iron of suitable varieties, with or without steel calk-bar or its equivalent, as hereinafter set forth.

My said present invention embraces the following method or process, to wit: hot-bending the bar-iron to impart contour, and reheating the same preliminary to swaging; then swaging the bent bar in dies which impart the final shape in rough, the surplus metal escaping in a marginal fin; then removing this fin by means of trimming-dies; then immediately reswaging in the same or similar swaging-dies, without reheating; and, finally, trimming and cold-punching the forging, said reswaging without reheating, after the removal of the first fin, serving to fill out the face of the shoe with metal from the plane of the fin, and to condense and harden the metal, rendering the products of perfect shape, stiff, and free from warp.

The preferred embodiment of said method is my process of making horseshoes with steel calks, by which a superior quality of this preferred class of horseshoes is cheaply produced.

The accompanying drawings illustrate my said steel-calk process by views of the stock or material and of the principal parts of the requisite apparatus, with views of the product at different stages, like letters of reference indicating corresponding parts in the several figures.

Figure 1 is a perspective view of a piece of flat bar-iron, which furnishes the stock for the body of the shoe. The long bars of commerce are cut into pieces of a convenient length to be handled—say, five feet long, more or less—each of which is termed a "bar." Fig. 1 represents one of these.

Fig. 2 is a face view, and Fig. 2^b a horizontal section, of the central part of a common bending-machine, whereby one end of said bar, Fig. 1, after being heated in a convenient forge, is bent to horseshoe shape. The essential parts of such a machine are a former, *z*, of the required shape and size and a bending roller or rollers, *y*, with a grooved bed-plate, *x*, or its equivalent, for supporting said parts and guiding said roller or rollers. In the illustration a single roller is carried by an oscillating arm or sweep, *w*, which is oscillated by a power-driven shaft, *v*, having a head, through which said arm slides back and forth. When the roller *y* is in the position indicated by a dotted circle in Fig. 2 the heated end of the bar is introduced between it and the former *z*, to a gage-mark or stop on the frame. The machine is then started and the roller bends the bar around the former. An automatic belt-shipper arrests the motion of the shaft at the proper point.

Fig. 3 is a perspective view of the product of the said bending-machine. In this and succeeding figures a short holding-shank, *a*, is represented. In practice, a shank of sufficient length to be handled without tongs is preserved as long as possible.

Fig. 4 is a perspective view of a steel calk-

bar such as is commonly employed for making calk-blanks; and Figs. 5 and 6 are perspective views, respectively, of a toe-calk blank and a heel-calk blank cut from said bar for use in this process. Any preferred form of calk-bar or calk-blank having an attaching-rib, *b*, or its equivalent may be employed by a proper adaptation of the calk-pockets hereinafter mentioned.

Fig. 7 is a plan view of the anvil of a calk-attaching machine, which machine is formed by inserting such an anvil in an ordinary drop-press beneath a plain follower or hammer. A groove, *g*, in the flat top of the said anvil, Fig. 7, is adapted to receive the bent bar, Fig. 3, loosely within it, and in the bottom of said groove depressions or pockets $p\ p^2$ are formed to receive, respectively, in like manner, toe and heel calk blanks, Figs. 5 and 6. The latter, in cold condition, are inserted in the pockets $p\ p^2$ by a boy, their ribs *b* projecting upward within the groove *g*. The bent bar, Fig. 3, is taken hot from the bending-machine and laid in the groove *g* upon said ribs. The drop of the calk-attaching machine is then started. A single blow embeds the ribs *b* sufficiently, leaving the calk-blanks $c\ c^2$ securely attached to the bar in proper positions, respectively, as represented by Fig. 8, which is a perspective view of the product at this stage. The calked bar, Fig. 8, is now returned to the forge until its parts reach a good welding-heat, which will also answer for swaging, and a suitable flux is applied to the joints between the calk-blanks and bar to assist the welding operation.

Fig. 9 is a plan view of a bed-die, illustrating a set of welding and rough-swaging dies in a drop-press or its equivalent, to which the hot calked bar, Fig. 8, is next subjected. The matrical cavity *u* of said bed-die contains depressions or pockets *t s*, to receive and swage the toe and heel calks, and creasers *r r*, for forming indented nail grooves or creases, said creasers being preferably removable, so that they can be readily renewed. This is accomplished by forming vertical pockets in the bed-die to receive separately-formed creasers, said pockets extending partially through the die, with holes to admit a removing-punch at bottom. A notch, *q*, at one end of the matrical cavity *u* accommodates the shank *a*. The upper die, for making flat-topped shoes, would have a perfectly plain flat face, excepting, preferably, a small recess to raise a toe-clip on the top of the shoe. The upper die, for making the product represented in the drawings, requires, in addition to such toe-clip recess, a projection to render the top of the shoe concave or beveled. As regards details of shape, the closed matrical cavity between the dies is simply the counterpart of the desired pattern of shoe, which will vary, and is not a part of the present invention. In these dies, Fig. 9, the steel calks are welded on, and the shoe, as a whole, is rough-swaged at one operation, every detail of shape being imparted (in rough) to the iron and steel at this operation, so as to accomplish this result while the metal is in its most plastic condition.

Fig. 10 is a top view of the product as taken from the said welding and swaging dies, with its fin *f* projecting on all sides. This figure shows a toe-clip, c', and top bevel, b', which are formed by the upper swaging-die, (not shown,) together with dotted outlines of the face of the shoe, which is the counterpart of the said die-cavity *u*, Fig. 9.

Fig. 11 is a face view of a bed die, illustrating a first pair of trimming-dies, said bed-die having an opening, *o n*, in its steel top plate or cutter, of the same outline as the said die-cavity *u*, Fig. 9, with its shank-notch *q*, while the upper die or punch has a counterpart projection, the office of these dies being to remove at one operation the fin *f*, Fig. 10, of the said product of the welding and swaging dies, but not its shank *a*, as this is required for use in succeeding operations. The upper trimming-die (not shown) may be reciprocated by a pitman from a slow-motion crank. The product, as indicated by arrow 1, is withdrawn through the space beneath the shank-notch *n* of the bed-die, Fig. 11, after being pushed back a little and turned on edge.

Fig. 12 is a face view of the inverted product of the said first trimming-dies, showing its calks $c\ c^2$ and indented nail-creases c^3, as well as its clean edges.

Fig. 13 is a face view of a bed-die, representing a second set of swaging-dies, which are duplicates or fac-similes of the said welding and rough-swaging dies, Fig. 9, except that said second set are perfectly smooth finished, while the first set are not. The said product of the first-trimming dies is introduced into these dies, Fig. 13, for reswaging without being reheated, the object and effect of the second swaging being to condense and harden the iron and render the shoe stiff and true, as well as to perfect its shape and finish. If the shoe were reheated before the second swaging there could obviously be little if any hardening or truing effect, the shoe in such case being nearly as soft and quite as liable to warp after removal from the second dies as after removal from the first. The cool metal also takes a better surface in the dies, while it is sufficiently soft to yield to the dies, as shown by the fin f^2, Fig. 14.

In an inferior modification both swagings may be done in one set of dies, provided the same be properly finished; but the amount saved by rough-finishing the first set, together with greater convenience, renders the use of two sets of swaging-dies, as above described, preferable.

The intermediate trimming or removal of the first fin, accomplished by the said first trimming-dies, Fig. 11, is an important element in the successful process. With it the shoe is finished in shape, hardened, and trued, as aforesaid, by a second swaging in what may be one and the same matrical cavity, as above

stated. Otherwise this would be impracticable, as, without reheating, the force of the second dropping or pressing would be met and resisted by the chilled fin between the lands of the dies. The removal of said fin permits the faces of the same or similar dies to approach nearer each other the distance represented by the thickness of said fin, or a sufficient distance to fill the lower die-cavity perfectly with metal from the plane of said fin at the second swaging, and to bring the full force of the blow or pressure upon the forging proper, with the effects before stated.

Fig. 14 is a face view of the inverted product of the said second swaging-dies, Fig. 13, showing its fin f^2 and its perfected calks and nail-creases c c^2 c^3.

Fig. 15 is a face view of a bed-die, illustrating a second set of trimming-dies, which are fac-similes of the first set, Fig. 11, except that the shank-notch n and its counterpart and the space beneath said notch in the first set are omitted in the second. Said bed-die, Fig. 15, has consequently an opening, o^2, of the exact outline of the shoe proper, and, being solid beneath both ends of said opening, it is adapted to sever the shoe from the bar or shank a, in the act of removing the second fin, f^2, without undue strain. The trimmed shoe is withdrawn from the back of this die, as indicated by arrow 2.

Fig. 16 is a top view of the product at this stage. After the said second trimming the shoe is cold-punched to form the nail-holes without danger of warping the shoe. Any ordinary power-punch may be employed for this purpose, the holes being preferably punched singly. The shoe is next, in practice, taken to a grinding-wheel, against which the top of the shoe is held for an instant to remove the burr left by the last trimming-dies and punch. The shoe is then ready for the keg or for the hoof.

Fig. 17 is a top view of the said finished shoe, showing the nail-holes h as formed by cold-punching, together with the toe-clip c' and top bevel, b', the same being a forward shoe. Hind shoes of the same style would have flat tops and would differ otherwise slightly in shape from such forward shoes, according to well-known rules.

To produce solid iron-calked shoes according to my invention heavier stock is used, square or nearly square bar-iron being preferred, while round bar-iron of an equivalent size may be employed. The bar is heated and bent, as above described, then immediately reheated, swaged, trimmed, reswaged without reheating, and finally trimmed and cold-punched, the nature and effect of each step being precisely the same as those of the corresponding steps of the said steel-calk process, except as regards the calks, portions of the body-metal being forced by the first swaging into the calk-pockets to form the iron calks, while the reswaging without reheating serves to fill out and harden them.

The same apparatus produces a given pattern of horseshoes of iron and steel combined, or of solid iron, as preferred, the use of the said calking-machine, Fig. 7, being simply omitted in the production of solid iron shoes. By using all the apparatus with toe-calk blanks alone and suitable bar-iron the same pattern of shoe is made with a steel toe-calk and iron heel-calk.

Other patterns and styles of shoes, together with the various sizes and hind and forward shoes of each, are produced by employing appropriate stock with substitute formers and dies of the required patterns and sizes.

The bar-iron may, if preferred, be cut up into short pieces, each of the proper length for a shoe, before the bending operation. In this case the shank-notches in the dies will be omitted, and the blank and shoe will be handled by means of tongs or their equivalent.

The quantity of stock driven into the fins may be reduced by drawing out the bar-iron between given calk-points, which may be accomplished in the well-known way, beneath an ordinary light power-hammer.

I do not claim herein anything shown or described in any of my previous United States Patents Nos. 155,362, 172,383, 206,858, and 206,859, nor any of the within-described apparatus in itself considered. Neither do I claim the broad idea of attaching steel calk-blanks preliminarily by means of projections thereon, this being very old.

I claim as new and of my own invention, and desire to protect by Letters Patent—

1. The process of hot-bending bar-iron to horseshoe shape, and reheating the same, then swaging the same in dies, which impart the final shape in rough, the surplus metal escaping in a marginal fin, then removing said fin by means of trimming-dies, then immediately reswaging in the same or similar swaging-dies without reheating, and finally trimming and cold-punching the forging, substantially as herein illustrated and described.

2. The process of hot-bending bar-iron to horseshoe shape, and attaching steel calk-blanks thereto, to be welded on at the swaging operation, then reheating the same, then swaging the same in dies which impart the final shape in rough, the surplus metal escaping in a marginal fin, then removing said fin by means of trimming-dies, then immediately reswaging in the same or similar swaging-dies without reheating, and finally trimming and cold-punching the forging, substantially as herein specified, for the purposes set forth.

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