

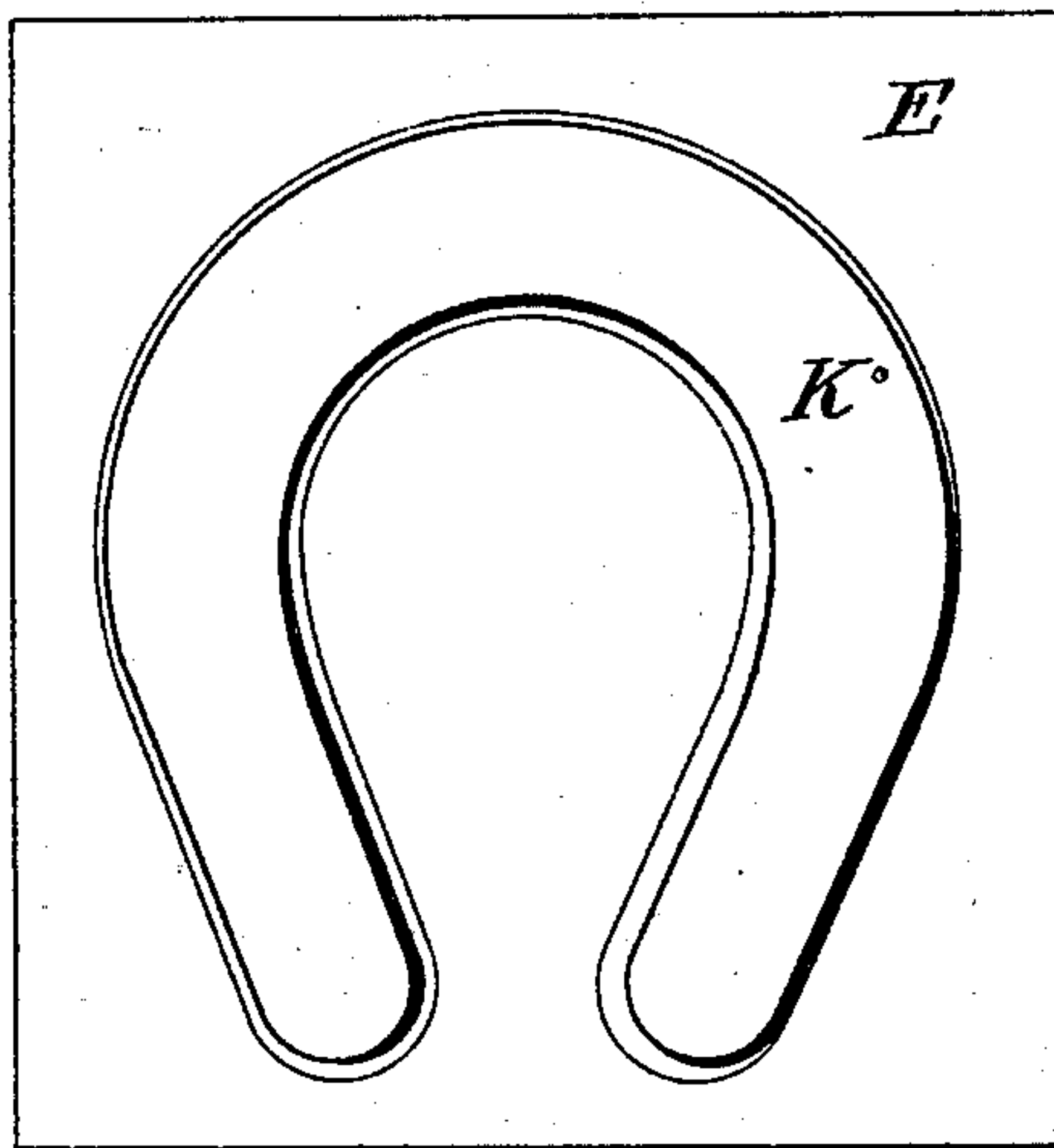
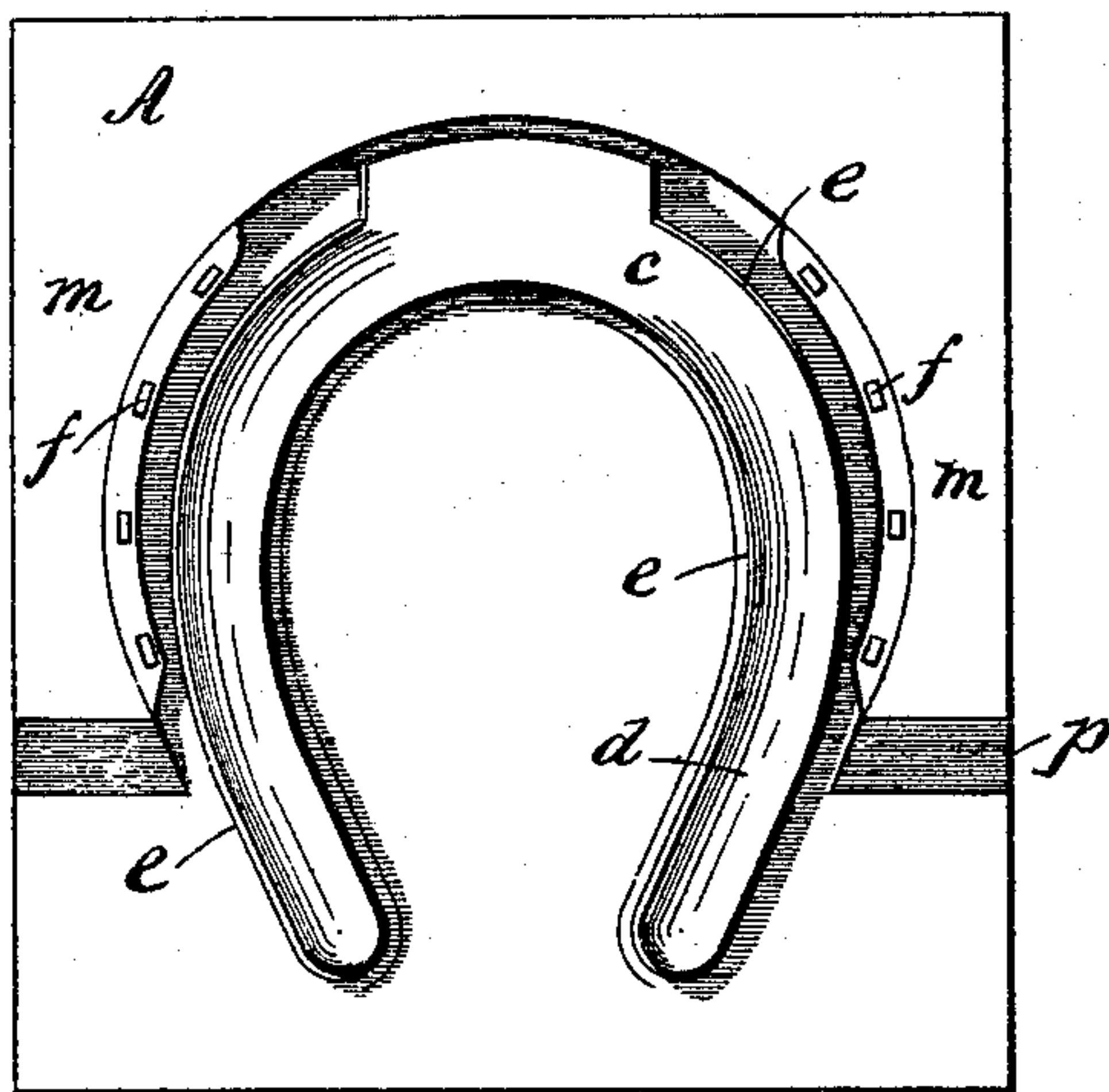
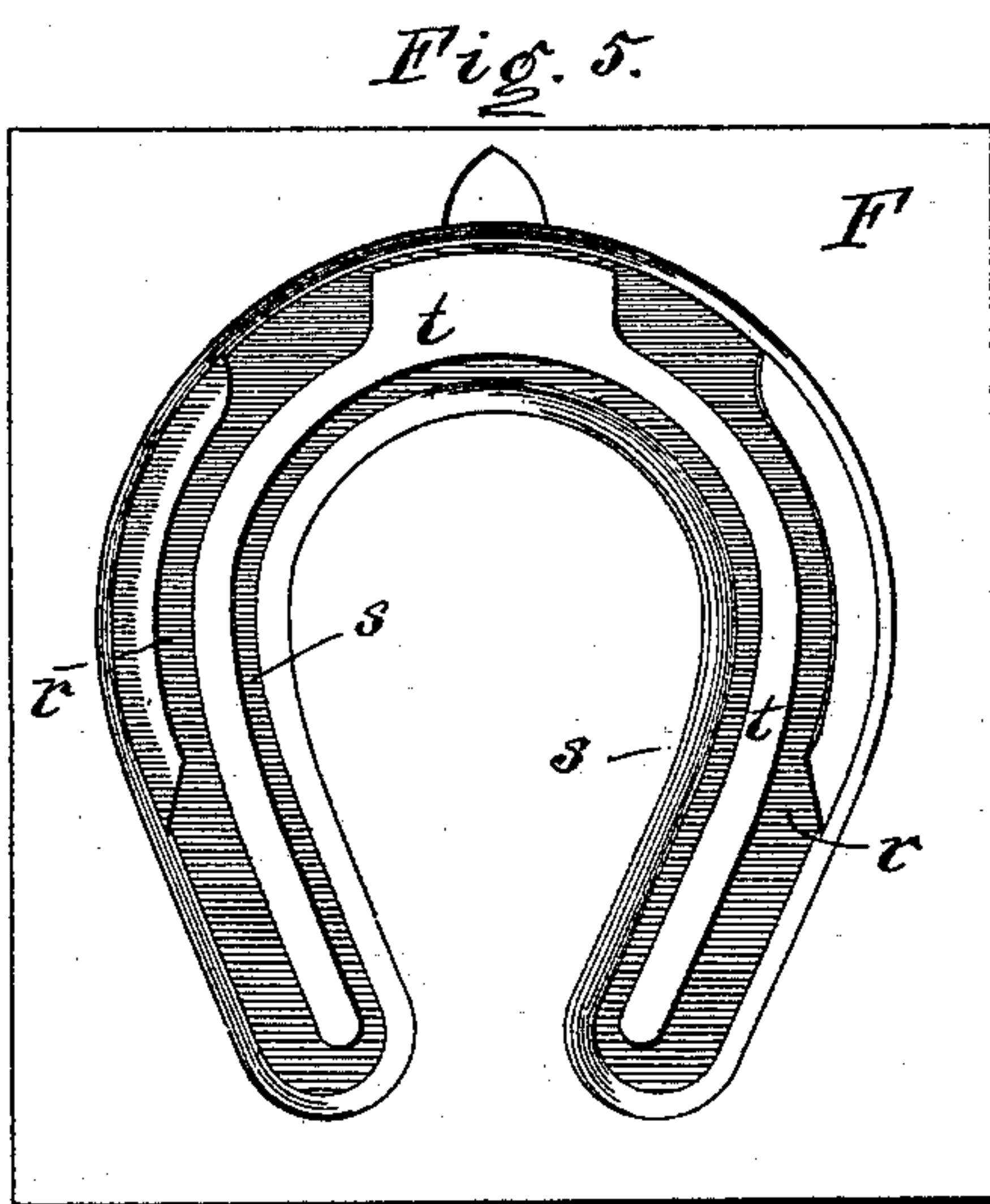
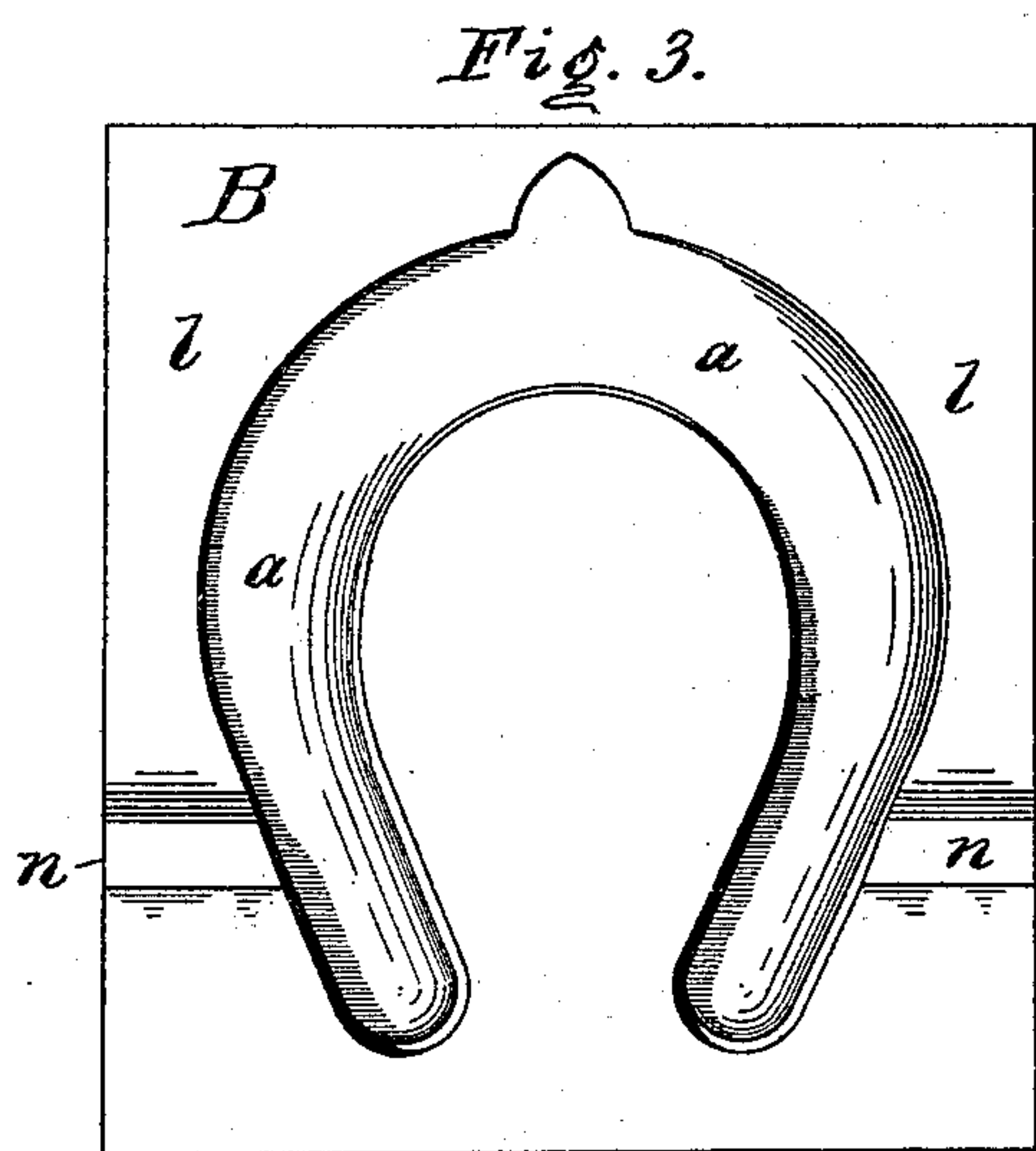
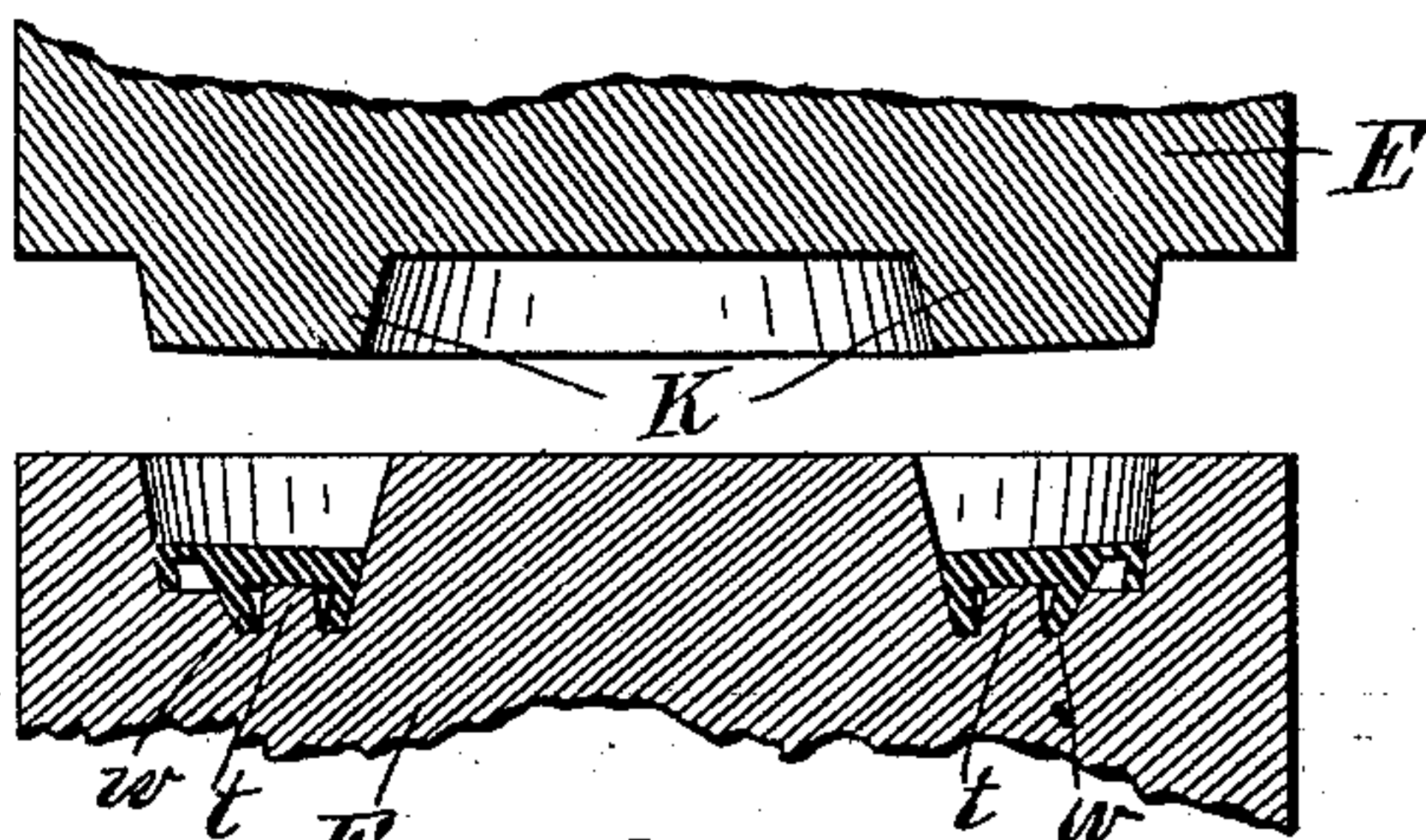
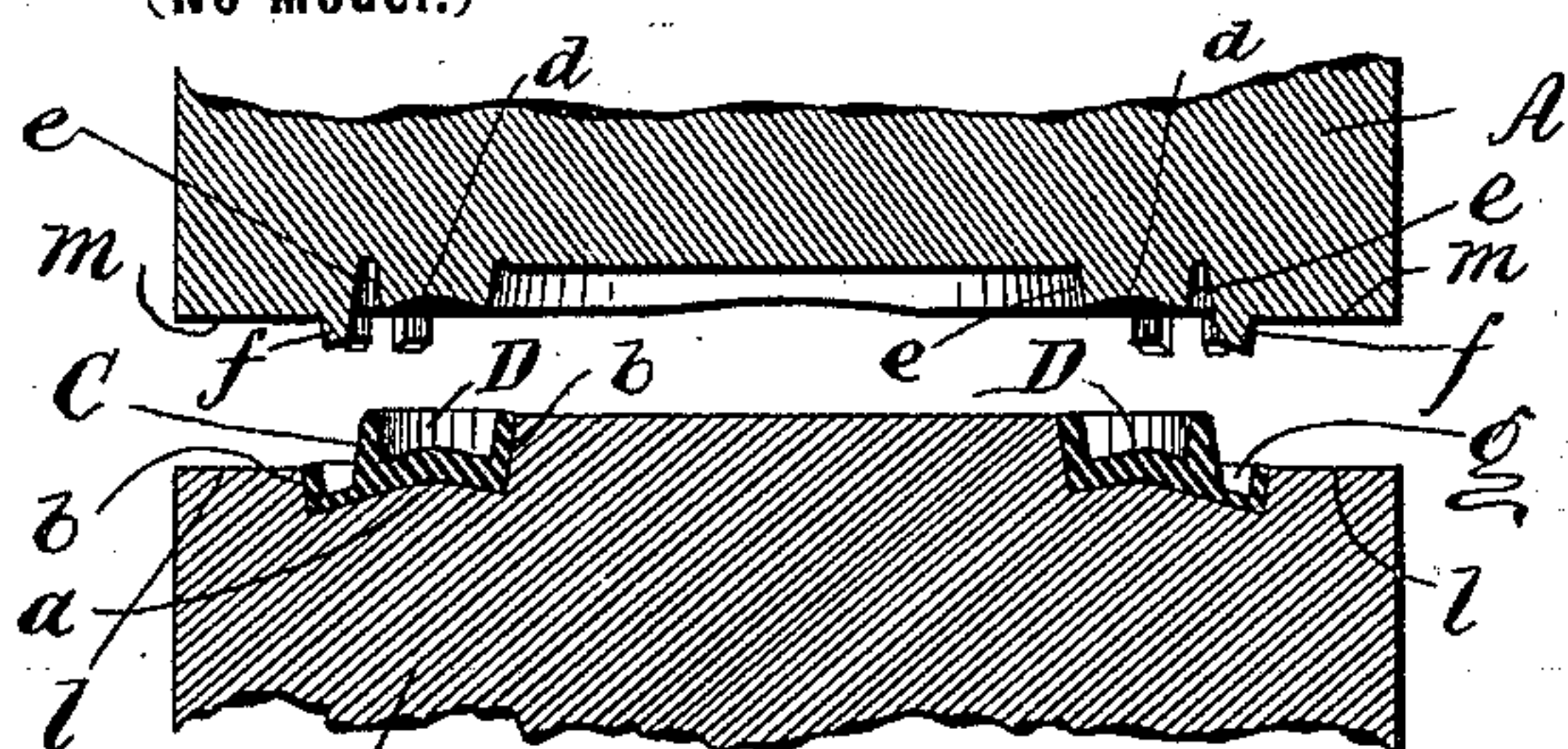
**No. 637,792.**

**Patented Nov. 28, 1899.**

**W. R. HOWE.**  
**PROCESS OF DROP FORGING.**

(Application filed Apr. 8, 1899.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## PROCESS OF DROP-FORGING.

SPECIFICATION forming part of Letters Patent No. 637,792, dated November 28, 1899.

Application filed April 8, 1899. Serial No. 712,205. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM R. HOWE, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented a certain new and useful Improvement in the Process of Drop-Forging, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My process relates to a certain novel and useful method of drop-forging, by means of which dovetailed or reëntering grooves may be formed in metal with the use of dies, and I have designed my invention particularly to enable me to produce by drop-forging horse-shoes formed with a dovetailed groove on the bottom surface thereof to receive elastic packing; but while I have shown my process of drop-forging as applied to this specific purpose I believe the process of forming the groove of dovetailed shape to be new in itself, and it will be evident that the process to be hereinafter particularly pointed out and claimed is equally applicable for forming such grooves for other purposes by means of dies, and I do not wish to be understood as limiting myself to the particular application of the process which I shall hereinafter describe in connection with the manufacture of horse-shoes.

The obvious difficulty which at once suggests itself when it is sought to drop-forge an article with a dovetailed groove is that such result cannot be accomplished, because it will be impossible to withdraw the male die if the space below is wider than at the surface. I overcome this difficulty by making two steps to the process. I first produce a blank by suitable dies, which for convenience I call the "forming-dies," in which the groove in the blank is formed with an arched or upwardly-curved base and with flanges or side walls from which the male groove-forming portion of the forming-die can be easily withdrawn. Then with another set of dies, which for convenience I call the "bending-dies," I complete the process by drawing or flattening down the curved base of the blank, the groove-

forming portion of the bending-die being sufficiently narrow to readily withdraw from the groove, while the other portions of this set of dies are of the shape in reverse of the finished article. Under these circumstances the flattening down of the arched base of the groove forces the side walls to bend toward each other, and a dovetailed groove is the result of the drop-forging.

I will now describe my process as applied to the formation of such a dovetailed groove in the under surface of a horseshoe, from which its application to the production of such grooves in any article desired can readily be understood.

In the drawings, Figure 1 is a central cross-section of the forming-dies with the blank shoe in place. Fig. 2 is a similar cross-section of the bending-dies with the finished shoe in place. Figs. 3 and 4 are plan views, respectively, of the male and female forming-dies; and Figs. 5 and 6 are similar views of the bending-dies.

A and B are the steel dies for forming the shoe-blank, of which dies A could be called the "male" and B the "female" die, between which the metal blank C is swaged.

The female die B provides a horseshoe-shaped recess with an arched or raised middle portion *a* and slightly-flaring side walls *b b*, while the male die provides a circular projection *c* to form the main groove D in the blank, the projecting portion having a central depression *d* to form the arched base of the groove in the blank C, with sloping walls *e e* to form the inside slightly-flaring walls of the groove, while *f f* are projections to form the nail-holes *g g* in the blank. The metal for the shoes is presented to the forming-dies as a rectangular bar, which has been previously curved into horseshoe shape. It is placed between the forming-dies and the dies struck with the hammer in the usual way, and the blank C is thus formed with the groove D, having slightly-flaring side walls and an arched base, as shown. Under the hammer the surplus metal forms a fin on the side edges of the blank, and in order that these fins may come at the edge of the blank



all the way around and inasmuch as the portion of the shoe containing the nail-holes is considerably lower than the tread-surface of the shoe the entire outside face *l* of the female die is depressed and the outside surface *m* of the male die is raised to correspond with the difference in height of the tread and nail-hole portion of the blank, the change of surface being a graduated slope shown at *n* in die B and at *p* in die A. The fin thus formed on the inner and outer side edges of the blank is then cut or trimmed off by an ordinary cutting punch or die of suitable shape for the purpose and the blank C is ready for the bending-dies, in which it takes its ultimate shape. E and F represent these bending-dies, E being the male and F the female die. The female die is provided with concentric grooves *r s*, the outside walls of which flare outwardly, leaving a projection *t* between them, which is slightly narrower at the top than at the base, while the male die E is simply a horseshoe-shaped punch K, gaged to fit within the die F. The blank formed by the forming-dies is then placed within the recess in the female bending-die in reverse position and the blank is driven to place by the hammer. The punch K and the projection *t* draw down and flatten out the arch at the base of the blank, which causes the flanges of the blank to bend inward, forming the dovetailed groove *w*, while at the same time the walls of the grooves in the die F assist in this bending operation, so that a perfectly even dovetailed groove is formed in the horseshoe, running from heel to heel, if desired. The nail depression and the nail-holes being already formed in the forming-dies, the last operation above described practically consists in merely bending up the blank into the form desired. Hence the second set of dies are called the "bending-dies."

It will be noticed that the blank is reversed in transferring it from the forming to the bending dies, so that when the bending-dies are placed under the hammer there is no danger of the metal of the blank upsetting, and the flanges of the groove of the blank will always take the path of least resistance, forming the dovetailed groove uniformly, as desired.

It will be evident from the above description that my process is equally applicable to the formation of reëntering grooves in other articles, and, as hereinbefore stated, I do not wish to limit myself to the particular application of my process in the forming of a horseshoe.

Having thus described my invention, what

I claim, and desire to secure by Letters Patent, is—

1. The process of forming a dovetailed groove in metal by forging, which consists, in first forming the groove with arched base and open flanges by swaging with suitable dies, and then simultaneously swaging the base and bending the flanges with suitable dies to form the groove, substantially as described.

2. The process of forming a longitudinally-curved dovetailed groove in metal by forging, which consists, in first forming the groove of the desired curve with an arched base and open flanges, by swaging with suitable dies, and then swaging the base and bending the flanges with suitable dies to form the groove, substantially as described.

3. The process of forming a longitudinally-curved dovetailed groove in metal with closed ends by forging, which consists in first forming the groove with the longitudinally-curved and closed ends, but with arched base and open flanges, by swaging with suitable dies, and then swaging the base and bending the flanges with suitable dies to form the groove, substantially as described.

4. The process of forming a horseshoe, provided with a longitudinally-curved dovetailed groove, by forging, which consists in first forming the longitudinally-curved groove with arched base and open flanges by suitable dies, and then simultaneously swaging the base and bending the flanges with suitable dies to form the groove, substantially as described.

5. The process of forming a horseshoe, provided with a longitudinally-curved dovetailed groove closed at the ends by forging, which consists, in first forming the longitudinally-curved closed groove with an arched base and open flanges by suitable dies, and then simultaneously swaging the base and bending the flanges with suitable dies, to form the groove, substantially as described.

6. The process of forming a horseshoe, provided with a longitudinally-curved dovetailed groove closed at the ends by forging, which consists, in first forming a longitudinally-curved closed groove with arched base and open flanges by suitable dies, then reversing the blank and simultaneously swaging the base and bending the flanges with suitable dies to form the groove, substantially as described.

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