

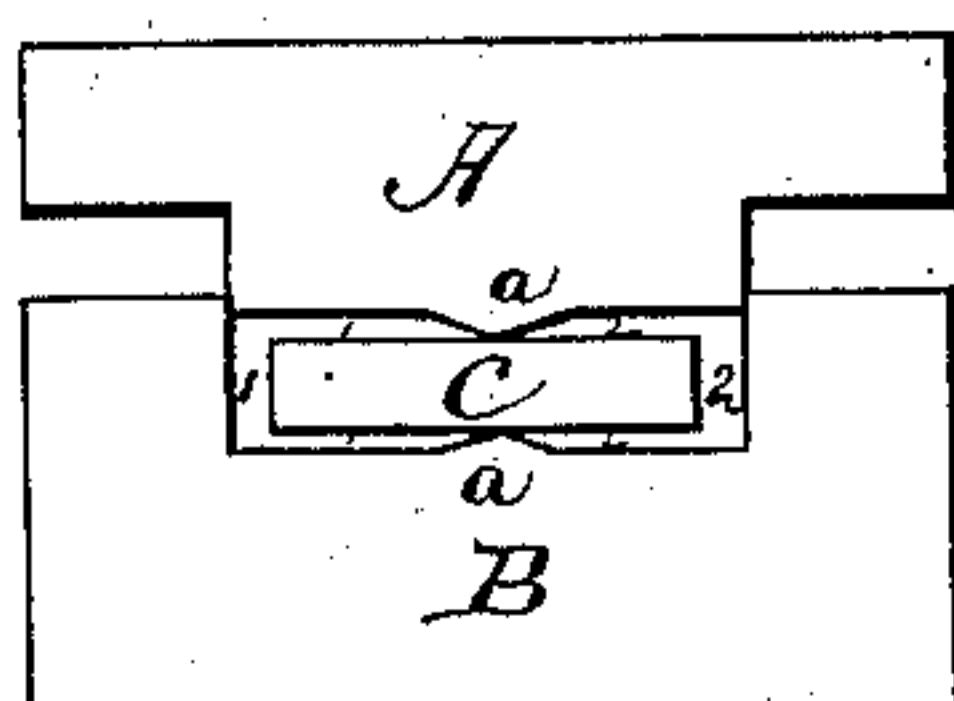
(No Model.)

W. R. WEBSTER.

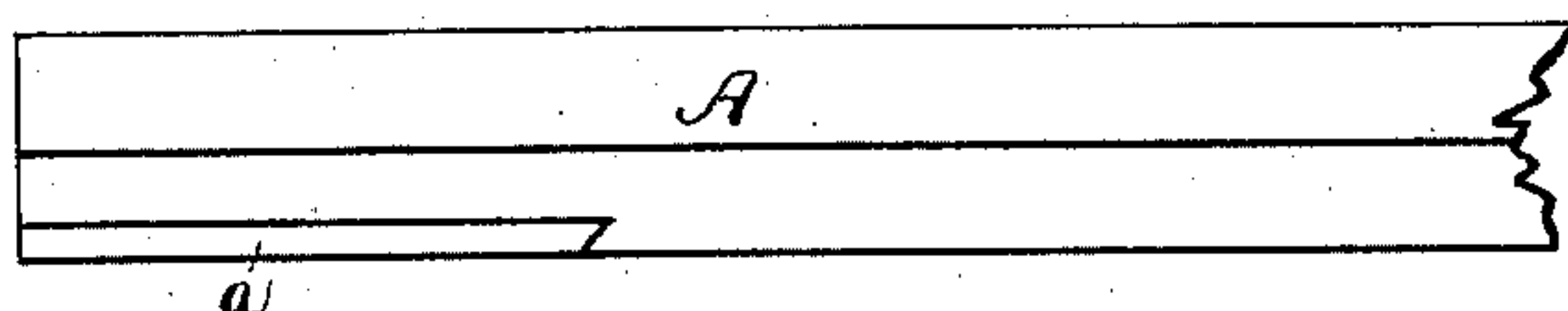
METHOD OF SPREADING THE ENDS OF EYE BARS.

No. 383,508.

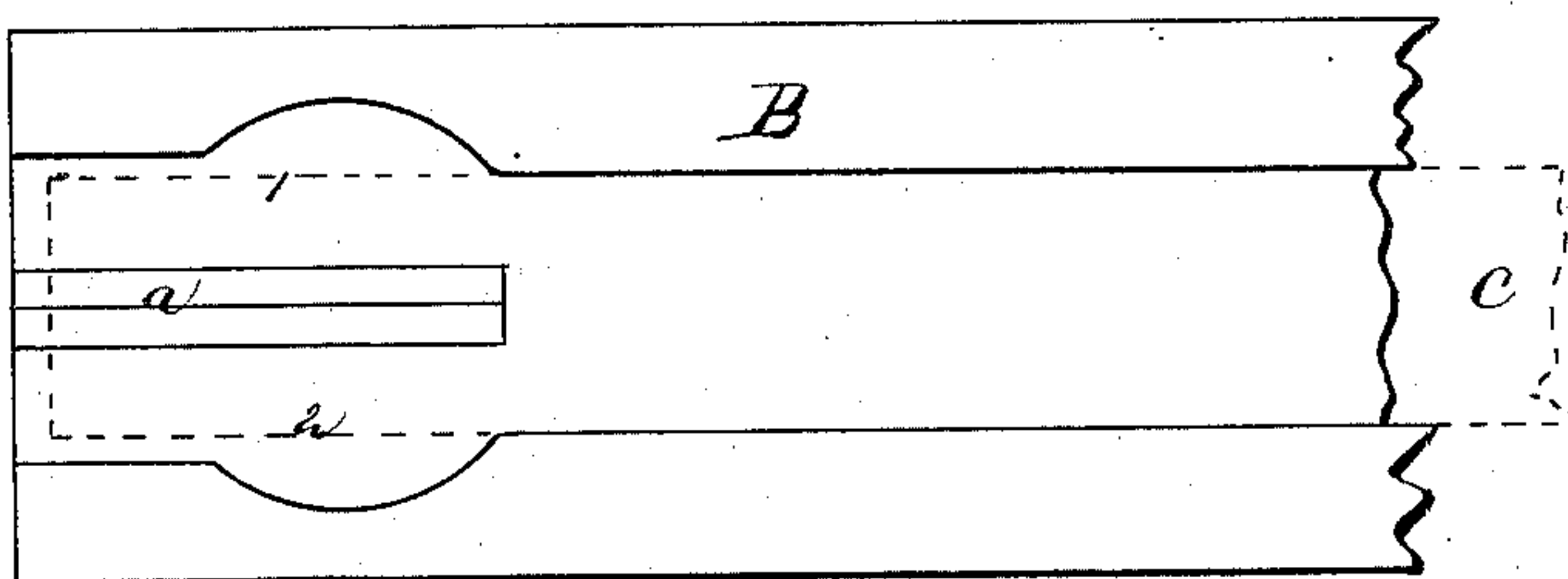
Patented May 29, 1888.



*Fig. 1.*



*Fig. 2.*



*Fig. 3.*

WITNESSES:

*Chas. A. Makony,*  
*W. L. Shaw.*

INVENTOR.

*William R. Webster,*  
*by his attorney*  
*Chas. A. Ritter.*

# UNITED STATES PATENT OFFICE.

WILLIAM R. WEBSTER, OF PHILADELPHIA, PENNSYLVANIA.

## METHOD OF SPREADING THE ENDS OF EYE-BARS.

SPECIFICATION forming part of Letters Patent No. 383,508, dated May 29, 1889.

Application filed August 20, 1887. Serial No. 247,416. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM R. WEBSTER, of the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in the Method of Spreading the Ends of Rectangular Metal Bars to Form Eye-Bars, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to the spreading and thickening of the ends of rectangular metal bars in the process of converting them into what are known as "eye-bars" for bridges and the like.

Prior to my invention eye-bars were formed from flat rectangular bars by methods which, while differing in some details, may be grouped as follows: first, by upsetting the heated end of a bar in a die of the required shape, and while it was clamped between plain die-faces; second, by piling the end to be formed into an eye and then swaging the thickened end into shape; third, by upsetting the end of the bar in dies in which the sides or faces, or both the sides and faces, were made to yield or move outward, so as to permit the bar to spread and thicken without at any time leaving room enough for any considerable bending or buckling; fourth, by upsetting the end so as to thicken it, then upsetting the thickened end in spreading-dies, and then forging down the spread and thickened end to the required shape and thickness in forming dies.

The necessity of the two upsetting operations in the last-mentioned method arose from the difficulty found in preventing the bars from folding and buckling, the only method practiced for preventing this being to so form the dies that they would engage the corners or edges of the bars and thus support them longitudinally while being upset—a plan sufficiently effective when thickening the ends, but not practicable where any considerable spreading was required. The spreading of the eye in this method was accomplished by the same means as in the first; but the preliminary thickening diminished the tendency to buckle or fold between the flat die-faces. Another method practiced was by forming an enlarged end on the bar in rolling it and spreading this end out by a hammer.

Now I have discovered that by clamping the end of a bar heated to the temperature necessary for upsetting between die-faces, in one or both of which a longitudinal rib or projection is formed so as to rest under or over the median line of the flat sides of the bar throughout the length of its heated end, and then upsetting the bar by pressure upon its end acting in the line of the central rib or projection, the said bar will be entirely free from any tendency to buckle or bend sidewise, and will be expanded or spread evenly on both sides of its center line, the reason for this being that a longitudinal groove or depression is formed all along the center of the flat side or sides of the heated bar end corresponding with and filled by the longitudinal rib or ribs in the die-faces, and the end of the bar is thus, as it were, interlocked with the die-face, and all tendency to bend is overcome, while the freedom of the bar to spread on each side of the center line is in no wise interfered with.

It is not at all necessary that the bar should be tightly clamped between the upper and lower die-faces of the spreading-die, as the first action of the upsetting-plunger will cause the soft metal of the heated end to expand on each side of the rib of the die-face, and the continuation of the pressure only serves to increase and maintain the hold of the rib on the swelling bar, said rib, as it were, pressing deeper and deeper into the metal until the bar is expanded to the full thickness permitted by the die.

I have in another application, which relates to certain new features of construction in the dies used in my improved process, described the use of a spreading-die made up of one die-face having the central longitudinal rib and another die-face having a corresponding groove or depression, which said depression coacted with the rib in preventing buckling in the bar, and also the use of a plain flat-faced die in connection with the ribbed die. The conjoint use of a ribbed lower die with a similarly-ribbed upper die has, however, the advantage of more promptly and firmly taking hold of the bar along its median line and more securely holding it against buckling than any other device, and where the bars being upset are to have a very large eye in proportion to the width of the bar, and require subsequent



treatment after upsetting to expand their eyes to the desired breadth, it is an advantage to have the greatest thickness of metal on the edges of the partially-formed eye, as the work  
5 of pressing out the eye to the desired breadth by a hammer or other tool is in this way more easily performed.

Reference being now had to the drawings, which illustrate dies adapted for use in my  
10 new process, Figure 1 is an end elevation of such a die; Fig. 2, a side elevation of the upper die-face, and Fig. 3 a plan of the lower die-face.

A and B are the upper and lower die-faces,  
15 constituting together, and with the usual cheek-pieces, plunger, &c., the spreading-die.

C is a flat rectangular bar of the kind for which my improved process is adapted.

1 and 2 represent the spaces into which the  
20 metal of the bar is forced in the process of spreading. *a* indicates the central longitudinal ribs formed on the die-faces.

From what has been already said, the mode of handling the bar in carrying out my process will be readily understood. The end to  
25 be spread into an eye is first heated to the required temperature and then placed in the die, as shown by dotted lines in Fig. 3, so that the center of one of its flat sides will lie through-  
30 out along the longitudinal rib formed on the die-face which supports its said side. The bar is then clamped in the usual way to resist a longitudinal thrust, and the upper die, which is also preferably ribbed, but may be of  
35 any desired form, is placed in position, as in Fig. 1, upon the opposite side of the flat bar and firmly secured in place. The plunger then acts against the heated end of the bar, its line of motion being parallel to the rib or ribs  
40 formed on the die-faces, and the metal of the bar is upset and forced backward into the dies. The pressure being equal in all directions, the metal will flow not only into the cavities 1 and 2, but also up alongside of the ribs *a*,

which will soon be completely embedded in 15 the thickening metal.

In cases where a considerable thickening of the bar is desired—as, for instance, where the eye is to be further spread in a hammer-die or otherwise—it is desirable to make the rib 50 or ribs *a* very broad in proportion to their depth, so that the metal after the upsetting will be thickest at the side edges of the eye. A very considerable increase in average thick- 55 ness can thus be attained, and with a distribution of the metal which makes the subsequent broadening of the eyes easier.

It is of prime importance that the rib or ribs *a* should extend along the whole length of the heated bar end, so as to engage it from 60 end to end and prevent the least tendency to bend during upsetting, for if the free end of the bar is bent at any point it is impossible to afterward correct the distortion, and the metal in the eye will be unevenly distributed, 65 even if the distortion is not sufficient to make what is known as a buckle or fold.

Having now described my invention, what I claim as new, and desire to secure by Letters 70 Patent, is—

The process of spreading the end of a rectangular metal bar, which consists in heating said end to the required temperature for upsetting, clamping it between die-faces, one or both of which are provided with a continuous 75 central longitudinal rib or projection arranged to lie along the whole length of the heated end, and then upsetting it by pressure on its end and in the line of the central rib on the supporting die-face, all substantially as specified, 80 and so that the heated end of the bar will be distorted and engaged with the ribbed die-face along its median line and throughout its length during the upsetting.

WM. R. WEBSTER.

Witnesses:

CHAS. A. RUTTER,

CHAS. A. MAHONY.