(No Model.) 2 Sheets—Sheet 1.

F. H. SMITH.

METHOD OF UPSETTING BRIDGE BARS.

No. 387,824. Patented Aug. 14, 1888.

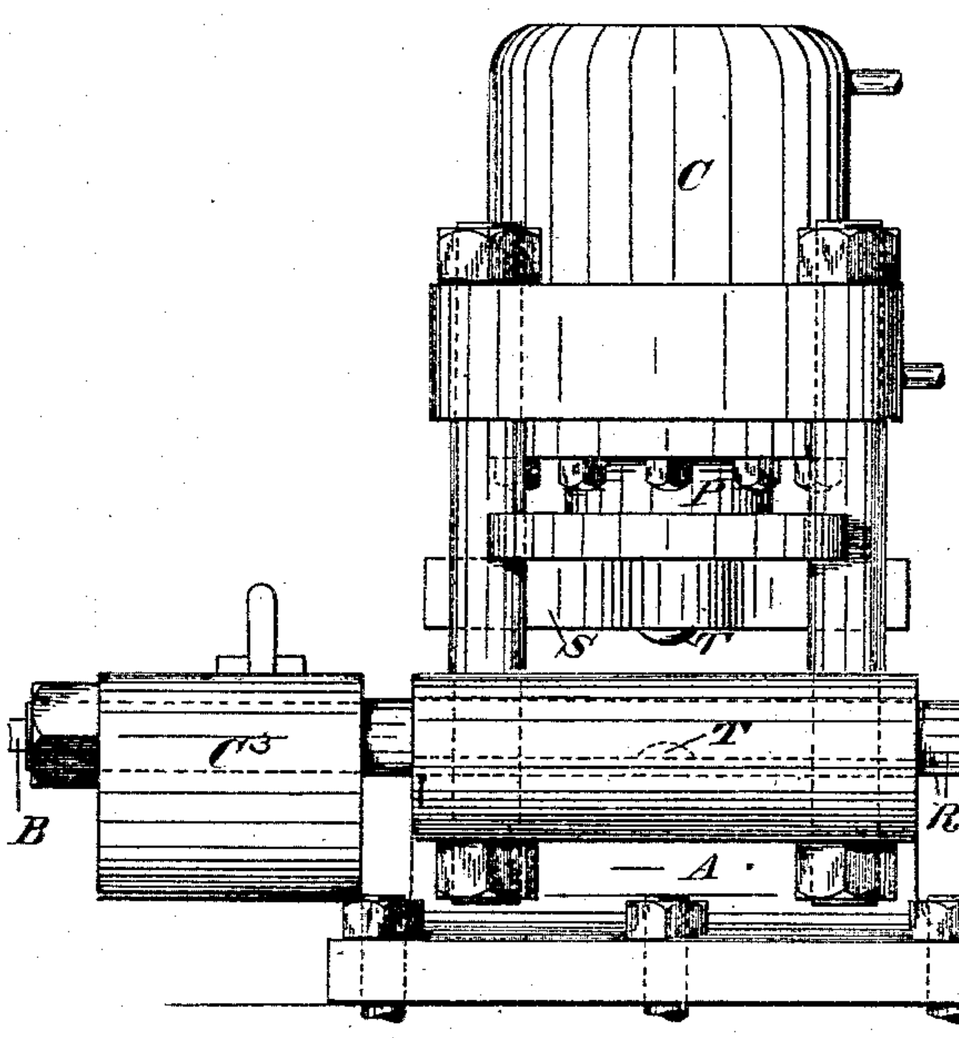

Fig. 2.

Fig. 3.

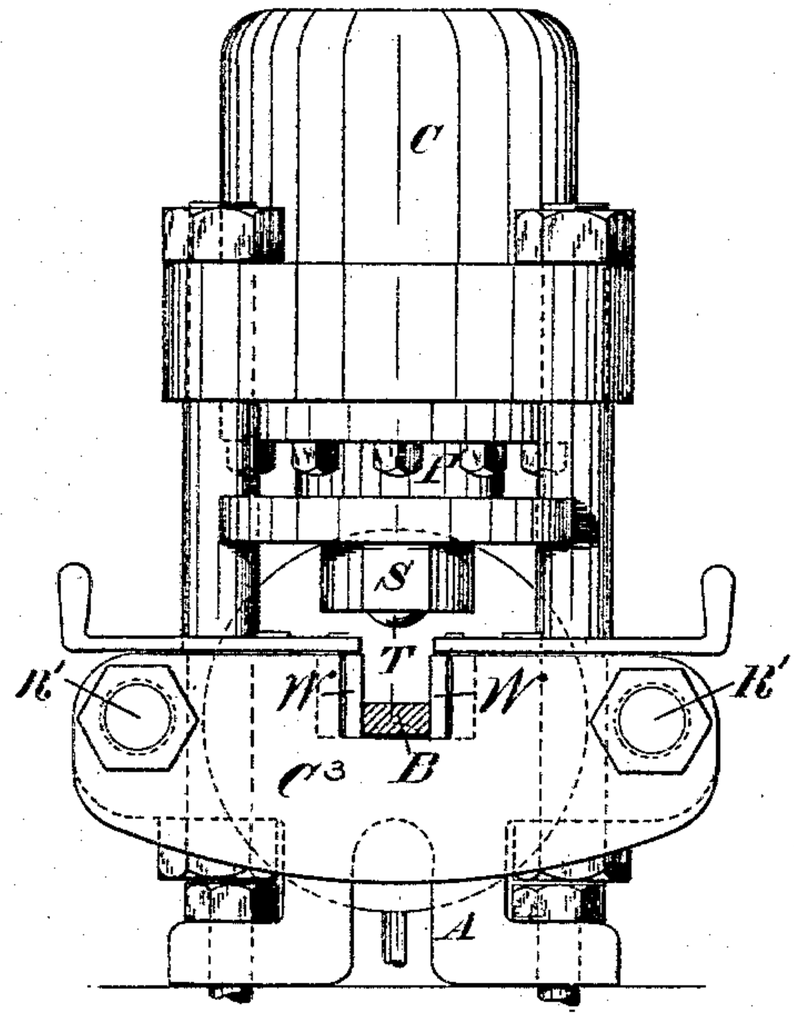

Fig. 4.

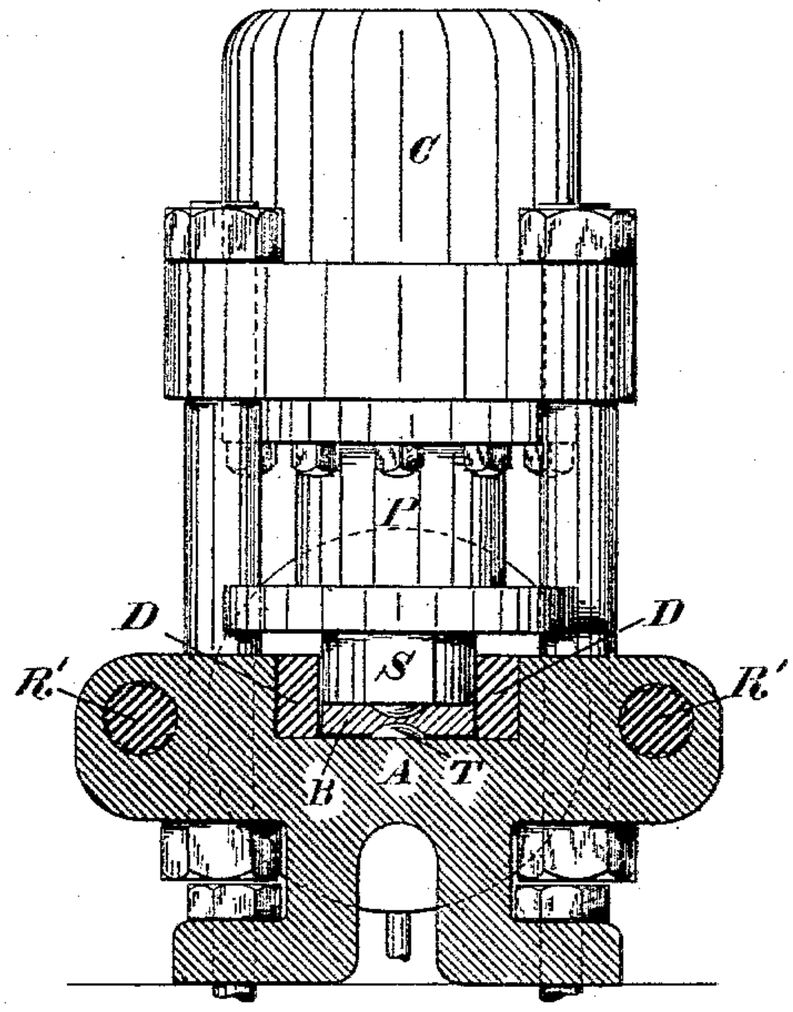

Fig. 5.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

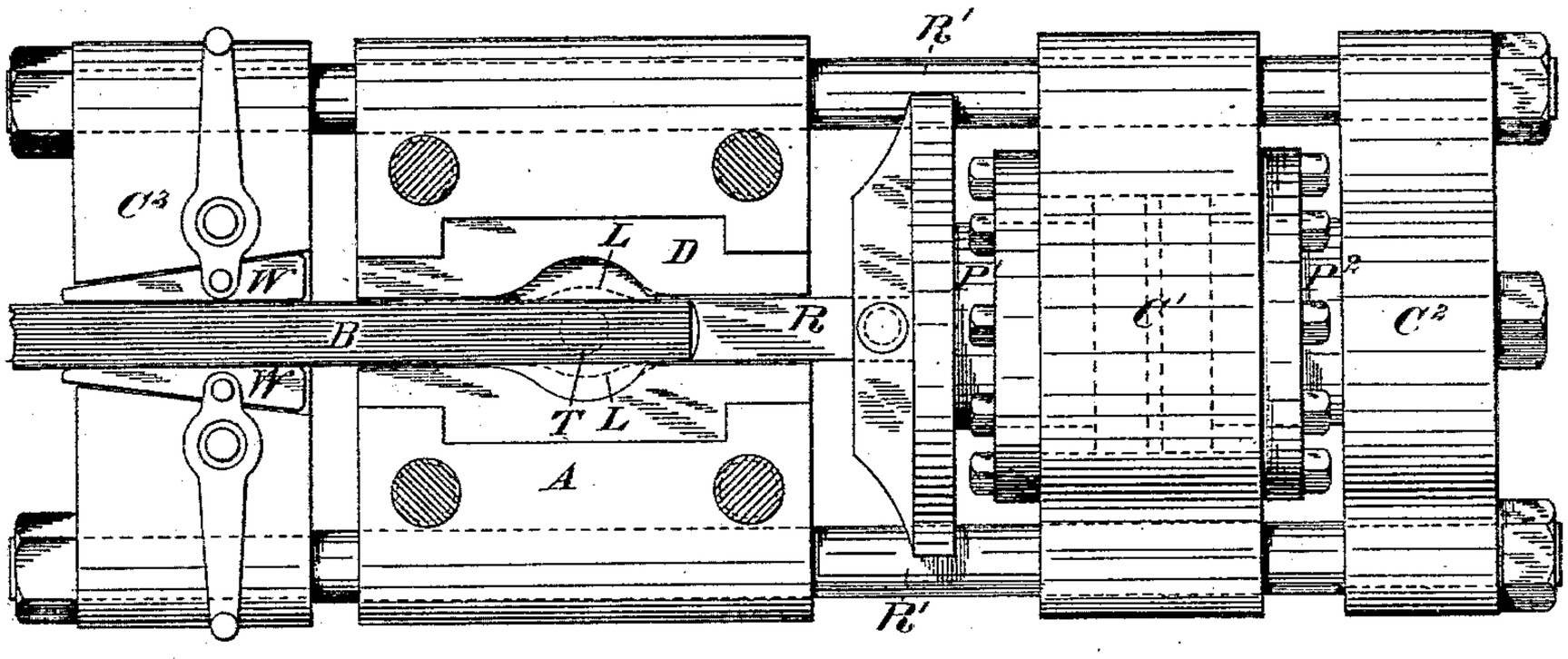
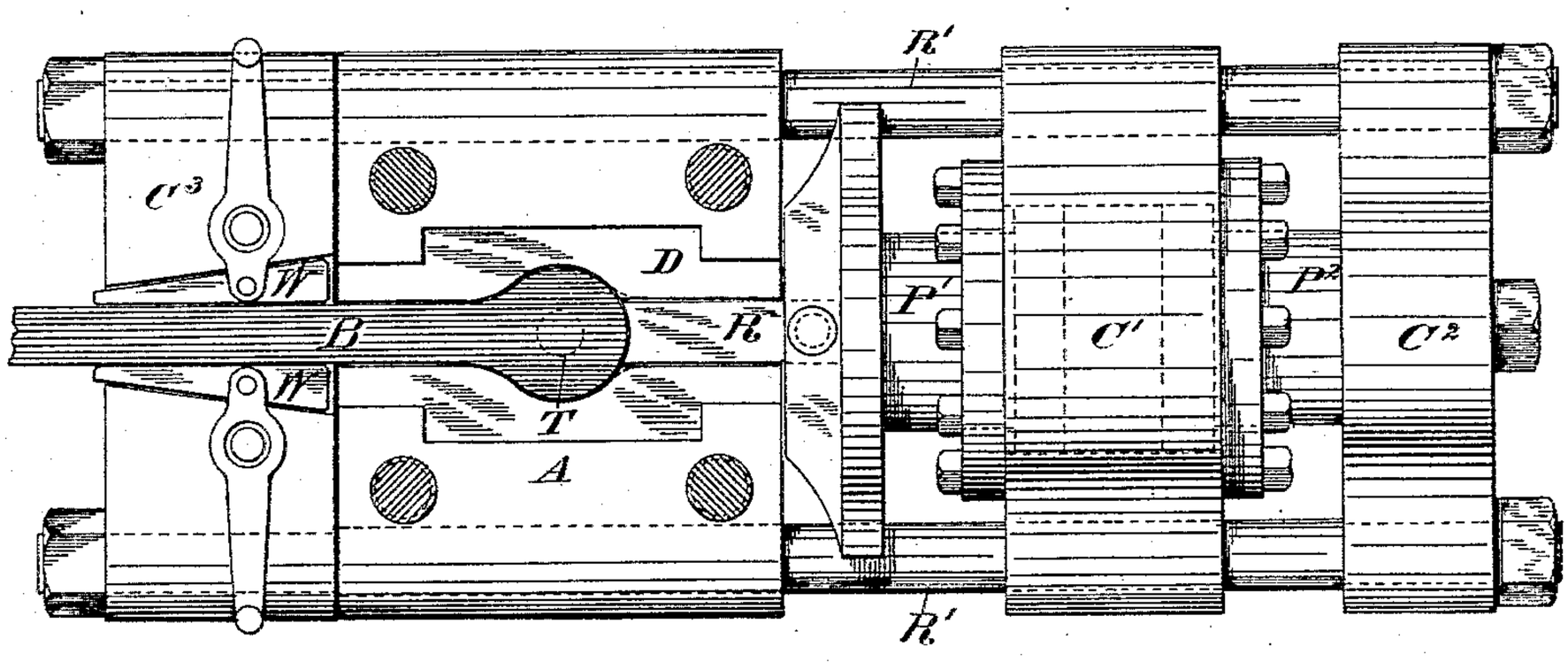


Fig. 5.



Witnesses,

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UNITED STATES PATENT OFFICE.

FREDERICK H. SMITH, OF BALTIMORE, MARYLAND.

METHOD OF UPSETTING BRIDGE-BARS.

SPECIFICATION forming part of Letters Patent No. 387,824, dated August 14, 1888.

Application filed April 28, 1888. Serial No. 272,102. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK H. SMITH, a citizen of the United States, residing in the city of Baltimore, State of Maryland, have invented certain new and useful Improvements in the Process of Upsetting Bridge-Bars, the objects and nature of which improvements are fully explained, described, and shown in the following specification and accompanying drawings.

In upsetting bridge-bars the practice has heretofore been to heat a portion of the bar and inclose such heated portion in dies, which hold one end of the heated portion stationary, while the other end is driven toward the stationary end. The heated metal by this method is thus caused to upset upon itself from one end only. This process is seen in Kloman's reissue, No. 4,911, where the bar is held stationary in the front half of the die, while the moving rear half upsets the metal back on itself toward the front; and it is also seen in my application, Serial No. 256,803, in which the bar is held stationary in the front half of the die, while a moving plunger or ram upsets the metal back on itself toward the front, and it is again seen in my application, Serial No. 256,804, where the movable bar is driven in through the front end of the die and upsets against the back thereof. In all these methods or processes the upsetting is done from one end only of the bar, which causes great and prolonged friction of the traveling or displaced hot metal against the top and bottom surfaces of the die, and there is correspondingly great wear of these surfaces and expenditure of power and uncertainty of result. By my present method or process I very greatly reduce these undesirable items by driving the hot metal from both ends—that is, from opposite directions toward the center, instead of from one end toward the other end.

In present upsetting practice, particularly with steel bars of ordinary sizes, it is found that when the upsetting-pressure is first applied it causes the bar to buckle or bend laterally inside the die at about the middle thereof, instead of upsetting and expanding at both edges equally. This tendency is usually counteracted by grooving longitudinally the surface of the hot bar and ribbing correspondingly the surface of the die, as seen in Cooke and Carlough's patent, No. 345,573; or by ribbing the bar and grooving the die, as seen in Seller's patent, No. 372,571; or by distorting the bar into an angular shape, as seen in Kingley's patent, No. 357,833. In all these, however, the distortion disturbs the skin of the bar at a vital point and requires the use of further machinery to flatten out the head of the bar to a plane surface.

By my present improvement I avoid all disturbance of the skin of the metal, except at the eye-seat, which is the point in the bar where the eye is to be drilled, and also fully counteract the tendency of the bar to move in the die by driving a bulb or other protuberance into one or both sides of the hot metal at the eye-seat, and thus penetrating, partially penetrating, or transfixing the bar, which firmly holds it stationary, while the adjacent parts are expanded in the die by driving both ends from opposite directions. This penetrating or transfixing of the bar also expands laterally the metal immediately at the eye-seat, and such expansion gives efficient initial direction to the inflowing metal coming centerward from the opposite ends of the die, and thus reduces the danger of clogging by reason of local overheating or underheating.

In practicing this process for upsetting bridge-bars different arrangements of dies and mechanisms for driving the hot metal centerward from both ends may be used to suit individual shop requirements.

The accompanying drawings illustrate an adaptation of the dies and mechanisms shown in my two above-named applications; and in order that my improved process may be clearly understood I will now describe the mechanisms and their movements.

Referring to the drawings, Figure 1 is a side elevation. Fig. 2 is an end elevation. Fig. 3 is an elevation of the vertical cylinder and a transverse section of the lower part. Fig. 4 is a plan view showing beginning of movement, and Fig. 5 is a plan view showing end of movement.

In the figures, A designates the anvil or bed upon which the work is done; B, the bar to be operated upon; D, the die within which the upsetting is done.

In Figs. 1, 2, and 3 the upright cylinder C and the piston P, with its shoes S, which closes

the die D, constitute the vertical mechanism for opening and closing the die, and this mechanism is removed from the plan views, Figs. 4 and 5, in order to show the operation of the double-end upsetting process.

C′ designates the double upsetting-cylinder, which has the piston P′ working through one end and the piston P^2 working through the other end. The piston P′ operates the ram R, which slides in the rear end of the die D, and the piston P^2 operates the rear cross-head, C^2, which in turn operates the sliding side rods, R′, and through them the gripping cross-head C^3 in front of the die.

In working my process a portion of the bar B is heated, and the hot part is placed in the die D in the position shown in Fig. 4, and the bar is then gripped by the wedges W W′. The vertical piston P is then lowered until its shoe S closes the top of the die D. The water or other power is then applied within the upsetting-cylinder C′ between the two pistons, thus forcing them apart. One piston, P′, through its ram R, drives the end of the hot bar backward into the die D to the position shown in Fig. 5, while simultaneously with this action the other piston, P^2, through its connected cross-heads and side rods, drives the opposite portion of the heated bar forward into the die D. The two streams of hot metal, coming from opposite directions and meeting in the middle of the die, upset therein very uniformly with certain sizes of bars. With other sizes of bars, especially of steel, the bar at first bends laterally instead of upsetting; and in order to counteract this tendency I firmly fix the heated bar at the point where the eye-seat will come by using a suitable protuberance on the shoe S, and then upset the heated portion adjacent to the said fixed point by driving the metal from opposite directions toward said fixed point.

In order to give an initial lateral expansive direction to the metal the protuberance may be of a shape to penetrate the bar. For this purpose I use the bulb or protuberance T, shown as protruding downward from the bottom of the shoe S and protruding upward from the bottom of the die D. I may use either one or both of these upper and lower bulbs T, and drive or press them into the hot metal of the bar by closing the die. The middle of the bar is thereby penetrated or transfixed on one or both surfaces at the eye-seat or point for drilling the pin-hole, and the bar is thus held firmly against lateral bending, while the hot metal displaced by the said penetration or transfixing is expanded laterally on both sides, as indicated by the dotted lines L in Fig. 4, thus giving an equal lateral initial direction to the oppositely-inflowing streams of hot upsetting metal.

During the progress of the upsetting, or after its completion, the shoe S can be raised and lowered with more or less force, as may be required, to compact the hot metal and assist in its expansion, and the horizontal upsetting mechanisms can be worked either by a continuous advance or by a series of short advances, which may coincide with the strokes of the vertical mechanism; or the short horizontal advances may alternate with the vertical strokes, thus upsetting and expanding the bar by alternately arching and flattening it. To this end or for other reasons steam may be used in the vertical cylinder, while a slower power may be used in the horizontal cylinder.

Obviously some form of screw or other power may be used to operate either or both the vertical and horizontal mechanisms. The shape of the dies may be varied to suit the requirements of the design or the material by turning off the sharp corners at the back of the die, or by using Kloman's above-mentioned movable half-die, or in many other ways known to the art. In some shops having large steam-hammers not fully occupied the anvil and upsetting mechanisms shown in Figs. 4 and 5 may be profitably used as temporary substitutes for the anvil regularly used under such hammers, the shoe S in such cases being temporarily attached to the hammer.

Having thus described my improved process and shown wherein it differs from other processes heretofore employed, and having also shown how it may be put in practice by those skilled in the art, I now desire to claim as new the following:

1. As an improvement in the art of upsetting bridge-bars, the hereinbefore-described process, consisting of first heating a portion of a metal bar, inclosing the heated portion within a die of any desired shape, and driving both ends of the heated portion of the bar toward the center of the die, for the purposes described.

2. As an improvement in the art of upsetting bridge-bars, the hereinbefore-described process, consisting of inclosing the heated bar within a die, firmly fixing the heated bar at the point where the eye-seat will come, so ás to prevent it from bending laterally when the upsetting-pressure is applied, and upsetting the heated portions adjacent to the said fixed point by driving the metal from opposite directions toward said fixed point.

3. As an improvement in the art of upsetting bridge-bars, the hereinbefore-described process, consisting of inclosing the heated bar within a die, penetrating one or both sides of the heated bar at the point where the eye-seat will come, so as to give an initial lateral expansive direction to the metal and driving the metal from opposite directions toward the said penetrated point.

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