R. S. SMITH.

PROCESS FOR MAKING CURVED FLANGED BARS.

APPLICATION FILED APR. 7, 1919.

1,343,647.

Patented June 15, 1920.

3 SHEETS—SHEET 1.

Fig. 1.

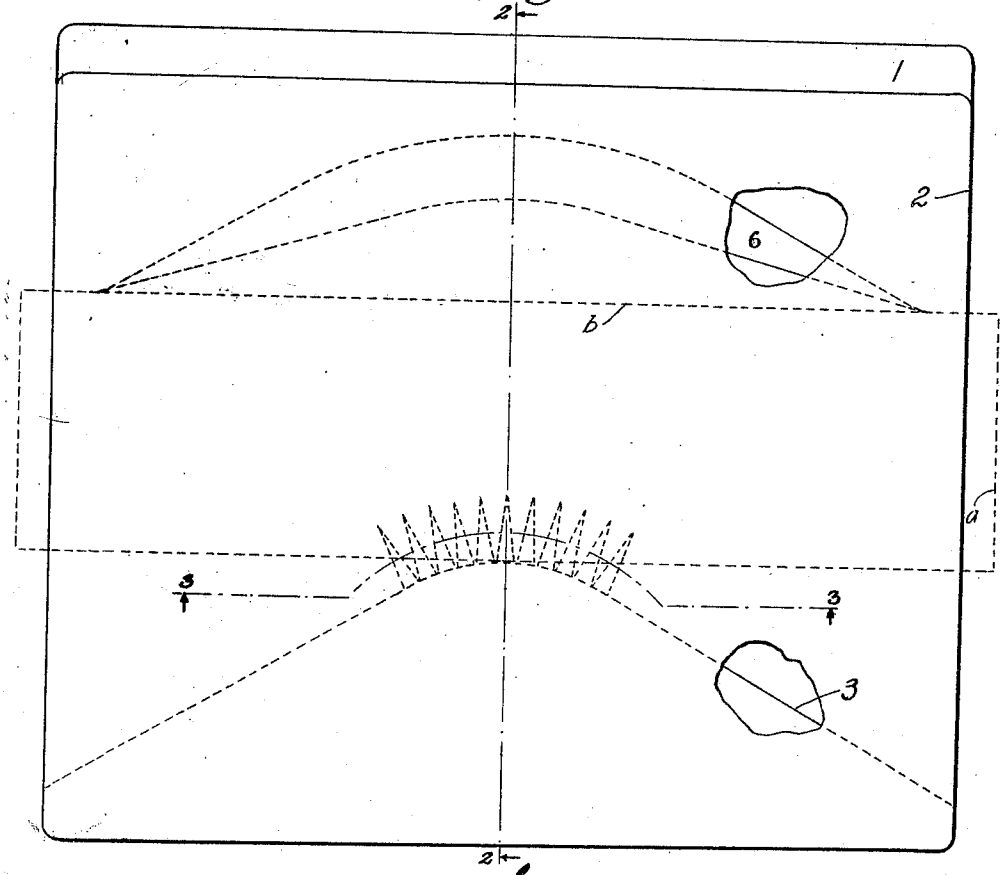
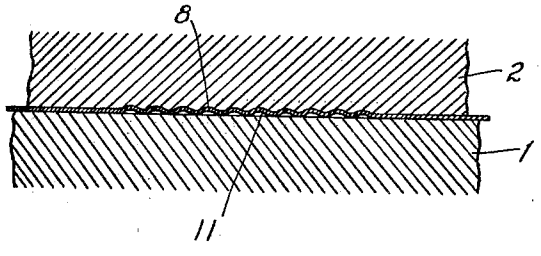


Fig. 3.



INVENTOR

REUBEN STANLEY SMITH

BY

Evans, Wheeler & Woolard,

ATTORNEYS.

R. S. SMITH.

PROCESS FOR MAKING CURVED FLANGED BARS.

APPLICATION FILED APR. 7, 1919.

1,343,647.

Patented June 15, 1920.

3 SHEETS—SHEET 2.

Fig. 2.

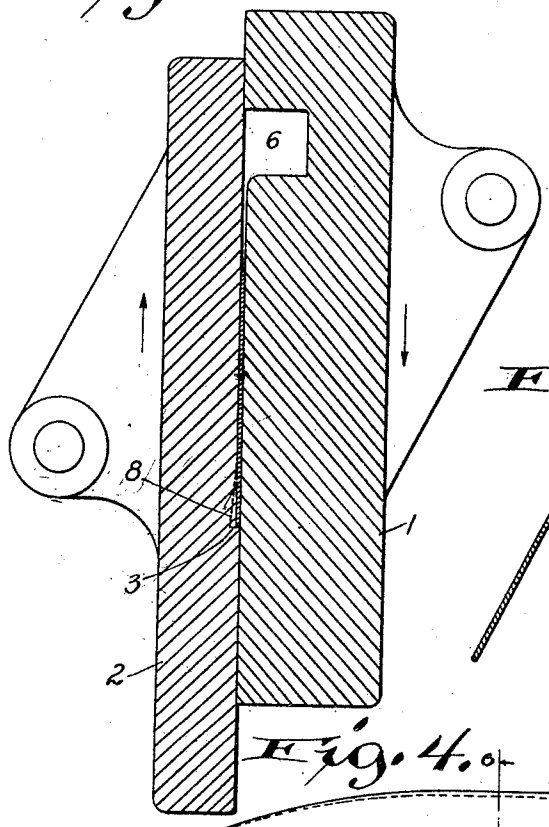


Fig. 6.

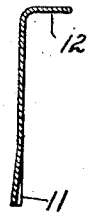


Fig. 7.

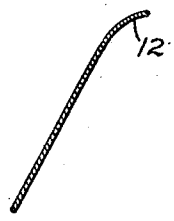


Fig. 8.

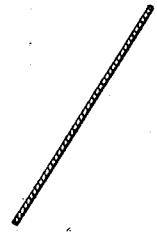


Fig. 4.

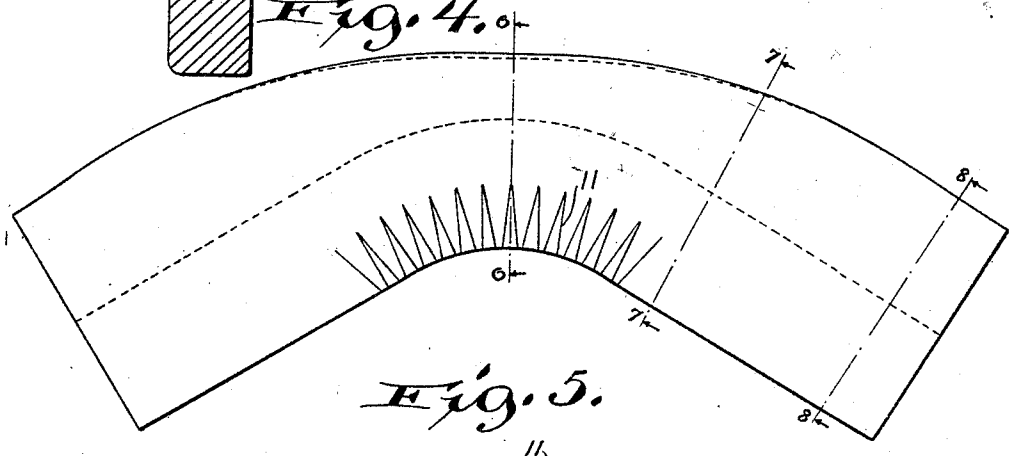


Fig. 5.



INVENTOR

REUBEN STANLEY SMITH

BY

Erwin, Wheeler & Woolard

ATTORNEYS.

R. S. SMITH.

PROCESS FOR MAKING CURVED FLANGED BARS.

APPLICATION FILED APR. 7, 1919.

1,343,647. **Patented June 15, 1920.**

3 SHEETS—SHEET 3.

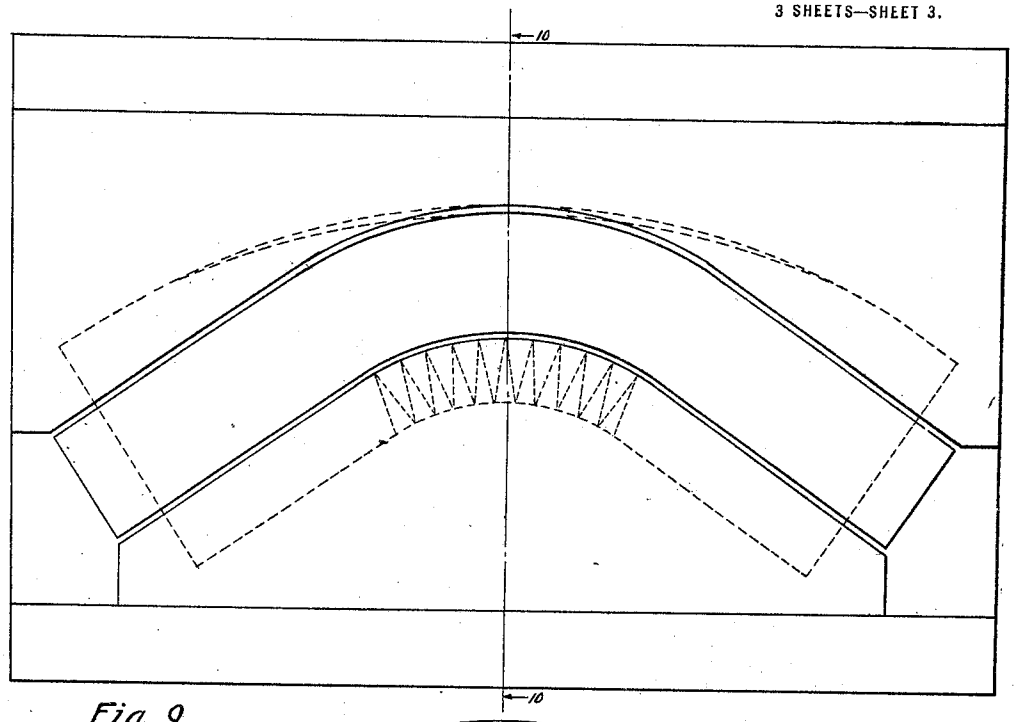


Fig. 9.

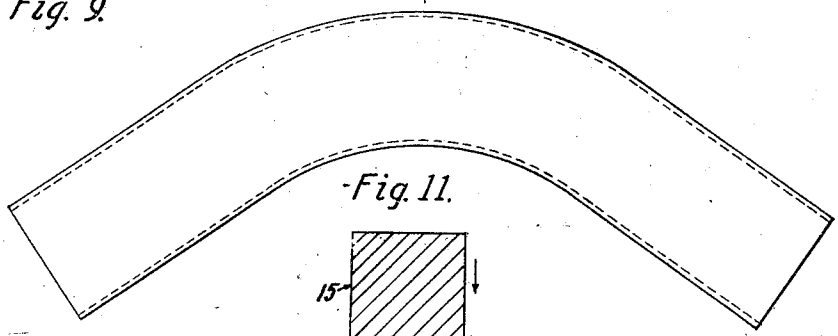


Fig. 11.

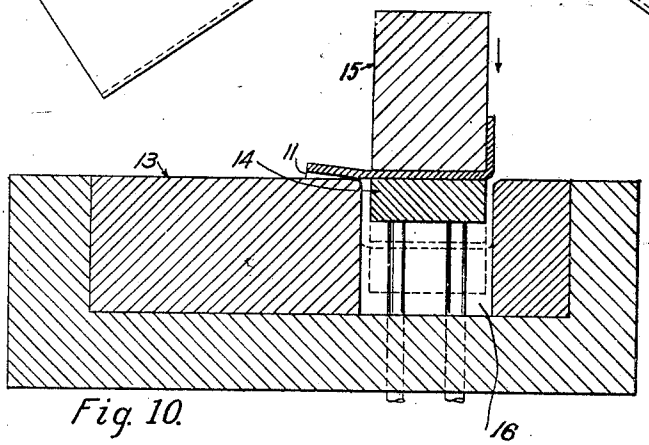


Fig. 10.



Fig. 12.

INVENTOR

REUBEN STANLEY SMITH

BY

Erwin, Wheeler & Woolard.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

REUBEN STANLEY SMITH, OF MILWAUKEE, WISCONSIN.

PROCESS FOR MAKING CURVED FLANGED BARS.

1,343,647. Specification of Letters Patent. Patented June 15, 1920.

Application filed April 7, 1919. Serial No. 288,085.

To all whom it may concern:

Be it known that I, REUBEN STANLEY SMITH, a citizen of the United States, residing in the city of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Processes for Making Curved Flanged Bars, and do hereby declare that the following is a full, clear, and exact description thereof, such as will enable persons skilled in the art to which the invention pertains to make, use, and practise the same, reference being had to the drawings hereto attached for disclosure as to certain details of construction and arrangement of a press by which my process may be carried out.

My invention relates to improvements in processes of shaping sheet metal blanks, with particular reference to that class of operations in which the margins of a curved blank are to be bent perpendicularly to the central portion of the blank to form a channel iron frame bar such, for example, as the side bars and cross bars of motor driven vehicle frames.

Heretofore the general practice has been to cut the blank along curved lines from a rectangular strip or sheet of metal and subsequently shape the blank in a drawing press by bending the marginal portions thereof at right angles to the central or web portion. This process is not only wasteful when curved blanks are cut from rectangular strips or sheets, but the bending process weakens the bar and develops mechanical difficulties which affect the operation of the press, the material composing the marginal flanges of the bar being stretched on the concave side and compressed on the convex side, the margins of the blank tending to split or draw apart on the concave side and tending to wrinkle, bulge, or thicken on the convex side.

The object of my invention is to provide means whereby a rectangular strip of metal of the required width may be bodily displaced or offset laterally or edgewise to produce the required curve in the blank, this bodily displacement being utilized to partially fold the margin of the blank on the convex side to produce a flange substantially perpendicular to the web portion of the blank and thereby avoiding stretching this margin in a manner to weaken the flange, the marginal portion of the flange on the concave side being simultaneously crimped or corrugated to take up the surplus material and prevent undue crushing stresses or molecular displacement, such as would otherwise tend to thicken this portion of the blank. I then complete the operation in a drawing press by bending the marginal portions of the blank perpendicularly to the central or web portion, the corrugations tending to stretch out in conformity to a continuously concave curved line or cylindrical plane, the straightening out process being assisted by the pressure of the opposing walls of the matrix and the plunger. On the opposite side of the blank, the flange along the continuously curved portion will have been substantially completely formed in the central portion of the curve and the remaining marginal portions which enter into the flange will be formed in the drawing press in the usual manner.

My invention also comprises the step of crimping or wrinkling the margin of the blank in the vicinity of the points at which concave flanges are to be formed. This crimping or wrinkling will draw from the material of the plate a length somewhat greater than will be required in forming the flange. The fullness of material thus provided enables the flange to be turned in the drawing press, without unduly straining the metal, and thus structural weakness is avoided.

In the drawings:—

Figure 1 is a plan view of a set of press plates employed in carrying out my improved process, with dotted lines indicating the position of the blank and with the top plate partially broken away to show the means for applying pressure to one edge of the plate and to also show the recesses into which the other margin of the plate is turned when the plate is displaced laterally by pressure applied to the first mentioned edge thereof.

Fig. 2 is a sectional view drawn on line 2—2 of Fig. 1.

Fig. 3 is a sectional view drawn on line 3—3 of Fig. 1.

Fig. 4 is a plan view of the blank as it appears when removed from the offsetting press.

Fig. 5 is an edge view of the same as viewed from the conically curved corrugated side.

Figs. 6, 7, and 8 are sectional views drawn

respectively on lines 6—6, 7—7, and 8—8 of Fig. 4.

Fig. 9 is a plan view of the matrix and plunger of a drawing press, with dotted lines indicating the position in which the blank is placed upon the matrix.

Fig. 10 is a cross-sectional view of the same drawn on line 10—10 of Fig. 9.

Fig. 11 is a plan view of the completed bar as seen from the side opposite that from which the flanges project.

Fig. 12 is an end view of the same.

Like parts are identified by the same reference characters throughout the several views.

In carrying out my process, I first prepare a rectangular strip of metal of the desired width and length, such a strip being illustrated by the dotted lines *a*, *b*, in Fig. 1. I place this strip of metal upon a bed or platen 1, and subject it to the pressure of a moving press plate 2, having a depending shoulder at 3 conforming in contour to the desired curvature of the blank on the concave side thereof. The bed or platen 1 is provided with recesses 6 into which the projecting margin of the blank may be turned when the blank is bodily offset by the pressure of shoulder 3 against the opposite edge or margin thereof.

The press plate 2 is provided with radiating corrugations 8, each perpendicular to the curving line of the shoulder 3, in the central portion thereof and extending from the shoulder forwardly from the blank.

A relative movement of the platen 1 and press plate 2 upon each other in the direction indicated by the arrows in Fig. 2 will force the central portion of the blank toward the recess 6. Along the curved margin, the blank will be allowed to wrinkle, the material being forced into the corrugations 8 of the press plate 2, thereby taking up the surplus stock due to the inwardly swinging movement of the blank on opposite sides of the central line at the apex of shoulder 3. On the opposite side of the blank, the margin will fold sharply into the recess in proportion to the extent of the bulge produced by the pressure of the shoulder 3 against the opposite side of the blank. At the center or apex of the curve, the bulging margin of the blank will fold or turn and form substantially a right angle to the plane of the sheet, as illustrated in Fig. 6. Near the ends of the curve, it will fold into the recess 6 to a less extent as indicated in Fig. 7 which shows a section of the blank drawn on line 7—7 of Fig 4. The straight end portions of the blank will remain flat as indicated by the sectional view shown in Fig. 8.

The blank will, therefore, assume the form illustrated in Figs. 4 to 8 inclusive, the concave margin of the curved central portion of the blank being provided with corrugations 11 and the opposite margin being folded to produce the flange 12, the central portion of the blank and also the end portions remaining flat.

The blank is then placed in a drawing press as illustrated in Fig. 10 with the central portion of the blank supported by a knock-out plate 14, which also serves as a clamping member, whereby the central portion of the blank is held between it and the plunger 15. The central portion of the flange 12 bears against the side of the plunger 15 as shown in Fig. 10, when the plunger has descended to gripping position preparatory to forcing the blank into the matrix cavity 16.

It is obvious that, if the plunger is actuated in the direction indicated by the arrow in Fig. 10, the plunger will be carried into the matrix cavity 16 and the side margins will be completely folded along the sides of the plunger 15 and substantially at right angles to the portion which is gripped between the plunger and the plate 14. The clearance between the plunger and the side walls of the matrix cavity 16 is substantially equal to the thickness of the blank and therefore the corrugations 11 will be flattened out simultaneously with the folding operation. Where this folding takes place along a concavely curved line, it is obvious that the folding operation tends to stretch the margin of the blank and this facilitates flattening out the corrugations. The blank illustrated in the drawings will, therefore, assume the form of a completed channel iron frame bar of substantially the form as illustrated in Figs. 11 and 12.

The form of the press plates 1 and 2, and their arrangement and manner of operation as herein illustrated is disclosed in a former application, Serial No. 225,791, filed March 30, 1918, by Henry Miller, and is not herein claimed as a part of the present invention. For the purposes of the invention herein claimed, any means for curving a blank by applying an offsetting pressure to one edge margin thereof, while holding the side faces in parallel planes except along the bulging margin of the blank where the latter is permitted to fold in one direction, may be adapted for the purpose of carrying out my process.

In crimping or wrinkling the margin of the blank at points where the curved flanges are to be formed, the stretching or expansion of the metal is distributed over an area which is greater in a longitudinal direction than the length of the arc forming the curve. Thus, a fullness is provided in the margin of the blank, by drawing the substance thereof from a greater area of the blank than is required for the formation of the curved flange. In other words, the strain on the metal is taken up by and evenly dis-

tributed through the crimped portion of the margin. In the further operation of turning the curved flange, no stretching occurs, other than that which is incident to smoothing out the wrinkled portions.

What I claim and desire to secure by Letters Patent is:—

1. The process of shaping sheet metal blanks, consisting in applying a blank bending pressure to one edge of the blank along a convexly curved line to concavely bend said edge and offset the blank laterally, simultaneously crimping the blank along said curved line to form corrugations therein extending perpendicularly to said line from the edge of the blank inwardly and bending the bulging margin of the blank on the opposite side thereof away from the plane of the sheet in which said pressure is exerted.

2. The process of shaping sheet metal blanks, consisting in applying a blank bending pressure to one edge of the blank along a convexly curved line to concavely bend said edge and offset the blank laterally, simultaneously crimping the blank along said curved line to form corrugations therein extending perpendicularly to said line from the edge of the blank inwardly, and bending the bulging margin of the blank on the opposite side thereof away from the plane in which said pressure is exerted, and subsequently bending the remaining portions of the side margins of the blank in the same direction.

3. The process of shaping sheet metal blanks, consisting in applying a blank bending pressure to one edge of the plate along a convexly curved line to concavely bend said edge and offset the blank laterally, simultaneously crimping the blank along said curved line to form corrugations therein extending perpendicularly to said line from the edge of the blank inwardly and bending the bulging margin of the blank on the opposite side thereof away from the plane in which said pressure is exerted, and subsequently bending the other portions of the side margins in the same direction, and subjecting the crimped margins to pressure exerted against the bulging portions of the corrugations to flatten them and eliminate the corrugations.

4. The process of shaping sheet metal blanks, consisting in forcing one edge of the blank inwardly along a concavely curving line, corrugating the marginal portion perpendicularly to its inwardly curving edge, and simultaneously holding the flat surfaces of the blank from distortion except in the direction of said pressure and along the bulging margin opposite that against which said pressure is exerted, permitting said bulging margin to bend away from the plane in which said pressure is exerted, and along a curved line substantially parallel to the concavely curving line.

5. The process of forming a curved channel bar, which consists, first, in imparting the desired outline by offsetting the blank edgewise, simultaneously corrugating the edge of the blank on the shorter radius and turning the margin on the longer radius away from the plane of the blank, and, second, bending the margins of the blank into the desired angular positions.

6. The process of forming curved channel bars, from sheet metal plates, which consists in simultaneously offsetting the blank edgewise and turning the margin on the longer radius away from the plane of the blank, and subsequently bringing the flanges into shape.

7. The process of making curved flanged bars from sheet metal plates, which consists, first, in offsetting the blank edgewise and crimping the margin of the plate to provide a fullness at the point where the curved flange is to be formed, and, second, bending the margin of the blank into the desired angular position to form the flange of the bar.

8. The process of making curved flanged bars from sheet metal plates, which consists, first, in offsetting the blank edgewise and crimping the margin of the plate at points to provide a fullness to avoid subsequent stretching of the metal in producing curved flanges, and, second, bending the margins of the blank into the desired angular positions to form the flange of the bar and simultaneously eliminating the corrugations by pressure.

9. The process of forming curved flanged bars from sheet metal plates, which consists in crimping the margin of the plate at points so as to provide a fullness to avoid subsequent stretching of the metal in producing concave flange portions, offsetting the margin from the plane of the plate at other points where convex flange portions are to be produced, and bending the margins of the plate into the desired angular positions to form the flanges of the bar.

10. The process of forming curved flanged bars from sheet metal plates, which consists in crimping the margin of the plate at points so as to provide a fullness to avoid subsequent stretching of the metal in producing concave flange portions, offsetting the margin from the plane of the plate at other points where convex flange portions are to be produced, and bending the crimped and offset margins of the plate into the desired angular positions to form the flanges of the bar.

11. The process of forming curved channel bars, from sheet metal plates, which consists in simultaneously offsetting the blank edgewise and turning the margin on the

longer radius away from the plane of the blank and crimping the blank at its concave marginal portion, and subsequently bringing the flanges into shape.

12. The process of forming curved channel bars, from sheet metal plates, which consists in simultaneously offsetting the blank edgewise and crimping the margin at the offset portions, and subsequently bringing the flanges into shape.

13. The process of forming curved channel bars, from sheet metal plates, which consists in simultaneously offsetting the blank edgewise and crimping the blank at its concave marginal portion, and subsequently bringing the flanges into shape.

14. The process of making flanged bars from flat sheet metal plates, which consists, in corrugating the flange forming margin of the flat plate at points, clamping the plate to preserve the plane of the central portion thereof, and bending the margin to form the flange and simultaneously eliminating the corrugations in the margin by pressure.

In tesimony whereof I have signed my name at Milwaukee, Wisconsin, this 5th day of April, 1919.

R. STANLEY SMITH.

Witnesses:
W. F. WOOLARD,
R. J. MCKERIHAN.