

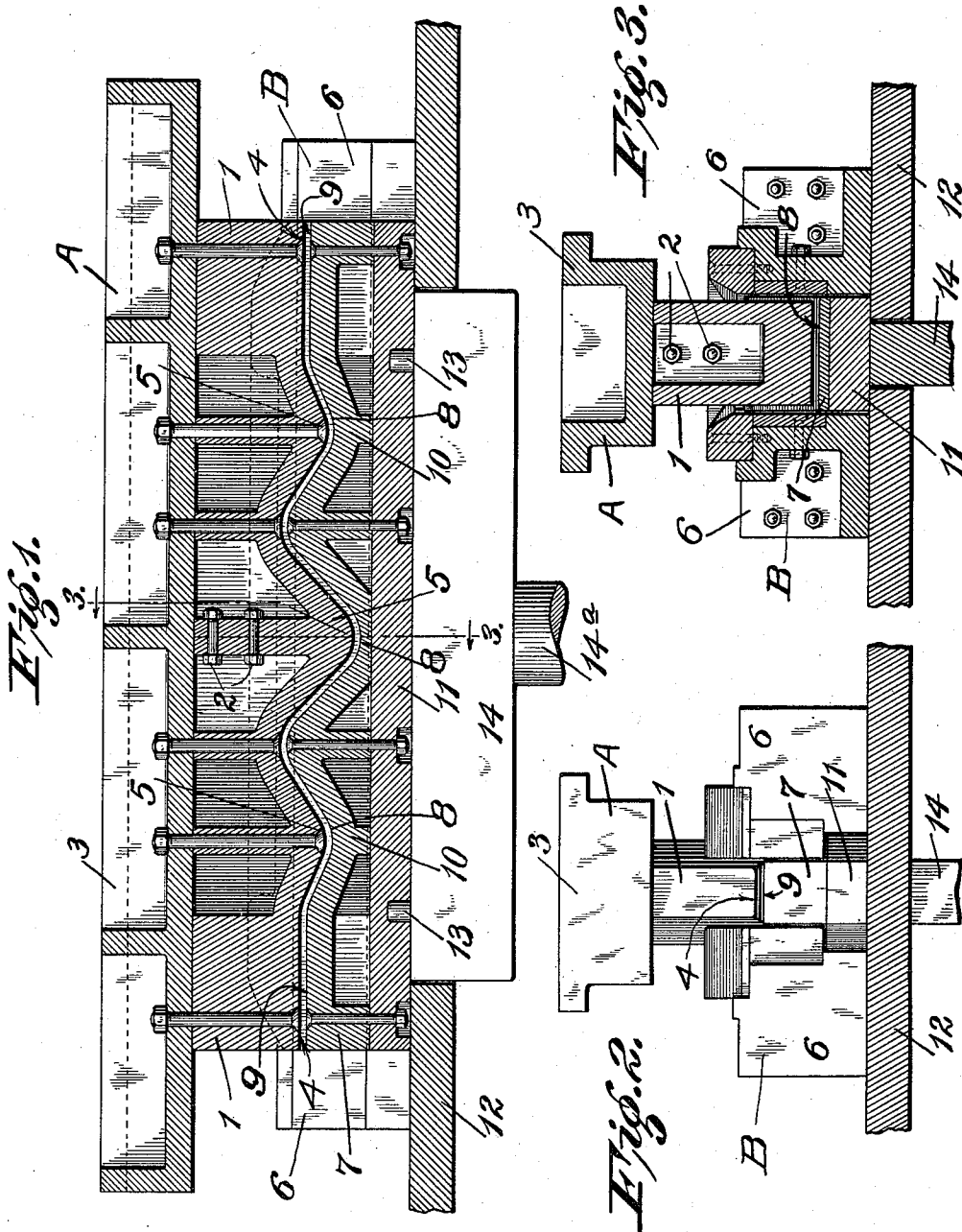
W. D. FORSYTH.
FORGING DIES.

APPLICATION FILED NOV. 27, 1914.

Patented Oct. 19, 1915.

3 SHEETS—SHEET 1.

1,157,213.



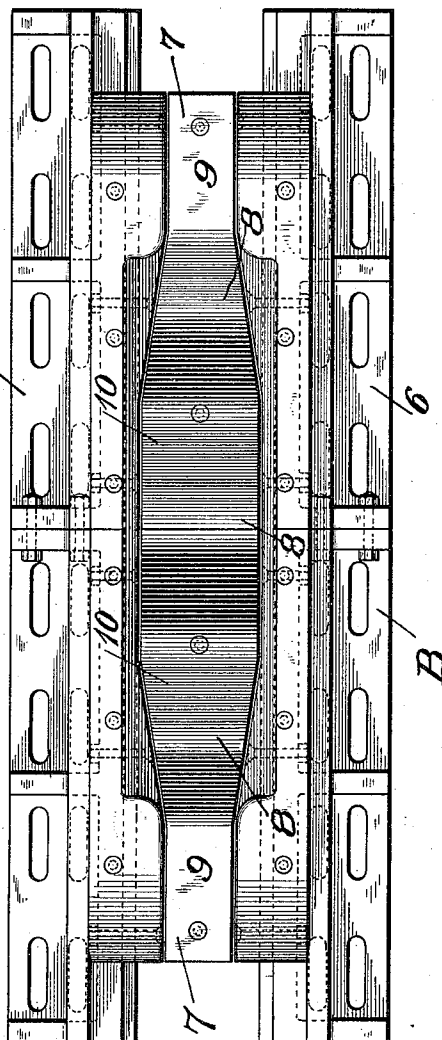
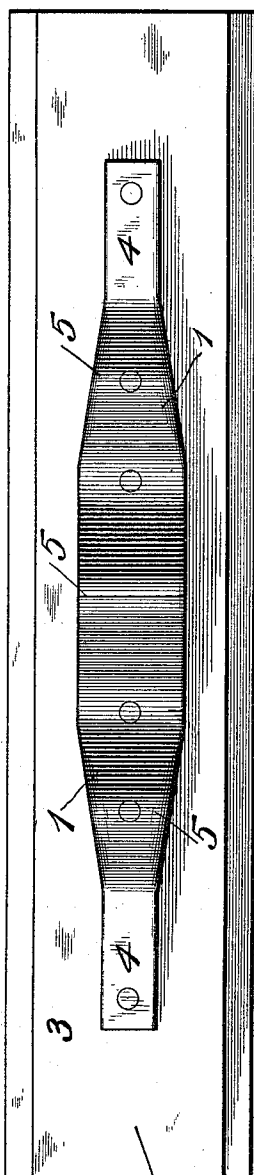
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 6.

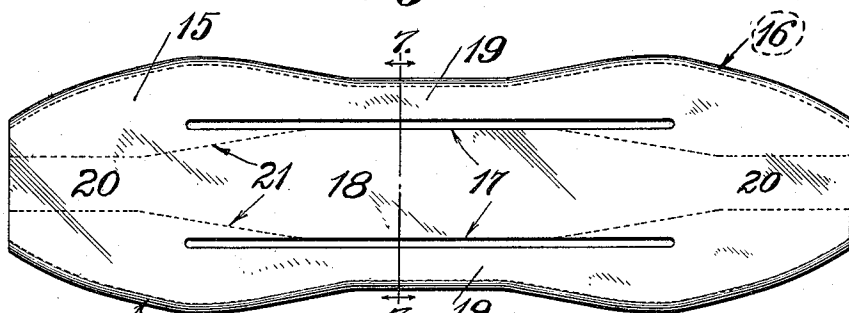


Fig. 7.

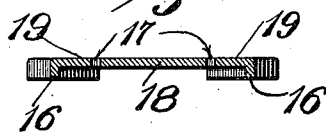


Fig. 8.

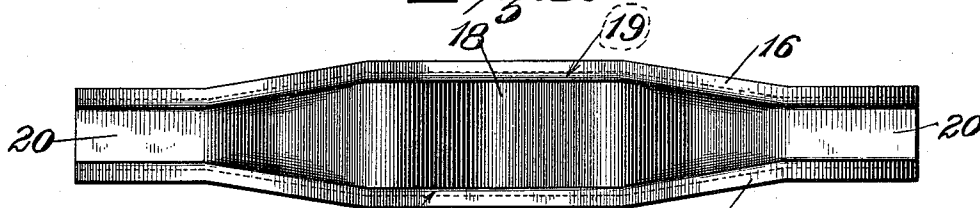


Fig. 9.

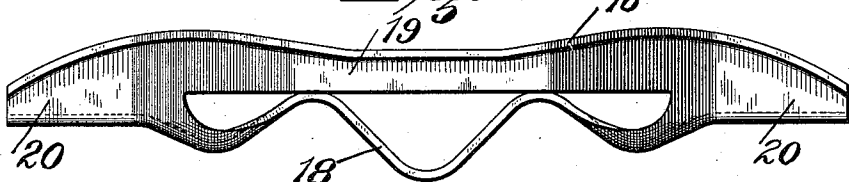
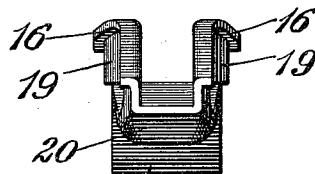


Fig. 10.



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UNITED STATES PATENT OFFICE.

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FORGING-DIES.

1,157,213.

Specification of Letters Patent.

Patented Oct. 19, 1915.

Application filed November 27, 1914. Serial No. 874,192.

To all whom it may concern:

Be it known that I, WILLIAM D. FORSYTH, a citizen of the United States, and a resident of the city of Youngstown, in the county of Mahoning and State of Ohio, have invented a new and useful Improvement in Forging-Dies, of which the following is a specification.

The invention relates to dies for forging or shaping metal blanks by pressure.

The invention relates particularly to dies which can be used to perform a step in the method of making car parts described in my Patent No. 1,125,296, dated January 19, 1915; namely, the step in which the middle portion of the flat blank between the longitudinal slots in said blank is bent sinusoidally and stretched longitudinally, and the side portions of said blank are simultaneously bent at right angles to their former position.

The invention has for one of its objects two cooperating dies which are adapted to forge a blank having two longitudinal slots therein terminating short of its ends, and which dies will stretch the middle portion of the blank between said slots longitudinally without materially affecting the remaining portions of the blank.

A further object is to make two dies which will perform the operation above stated in one movement, and which will not require additional devices for holding or gripping the blank.

A still further object is to make two dies which will not only perform the operation above stated, but will also simultaneously bend the side portions of said blank at right angles to their former positions.

Further objects of the inventions are to attain certain advantages which will be more fully set forth hereinafter.

Generally stated, the invention consists in two dies whose end portions cooperate to grip the end portions of the blank, and whose middle portions have the surfaces thereof undulated, whereby, when said dies are brought together, the middle portion of said blank between the slits in said blank is bent sinusoidally and stretched longitudinally.

In the accompanying drawing which forms part of this specification, and in which like symbols refer to like parts wherever they occur, Figure 1 is a vertical longitudinal

section through two dies embodying the invention, showing them brought together; Fig. 2 is an end elevation of the dies brought together; Fig. 3 is a vertical transverse section on the line 3—3 on Fig. 1; Fig. 4 is a bottom plan view of the upper die or punch; Fig. 5 is a top plan view of the lower die; Fig. 6 is a plan view of the blank, with which the dies are designed to be used; Fig. 7 is a transverse section of the blank, taken on the line 7—7 on Fig. 6; Fig. 8 is a top plan view of the forging made by the dies; Fig. 9 is a side elevation of the forging made by the dies; and Fig. 10 is an end elevation of the forging made by the dies.

Referring to the accompanying drawing, the upper die or punch A preferably consists of two members 1 which are fastened together end to end by bolts 2 and which are hollowed out to make them lighter. The upper die A is fastened to a block 3 which is adapted to be bolted or otherwise fastened to the ram of a die press. The longitudinal sides of the upper die A are vertical, but are farthest apart throughout a region midway of its ends, said region being equivalent to approximately one-third of the total length of said die. Outwardly in both directions from said middle region, the upper die A narrows gradually; and throughout the remaining end portions 4 of the upper die A, said die is of uniform width, each of said end portions 4 extending approximately one-sixth of the entire length of the die. Said end portions 4, being of uniform width and having flat under faces, are rectangular in cross-section.

The under surface of the upper die A between the end portions 4, is formed with a series of transverse ridges 5 V-shaped in cross-section. The lower edges or crests of the ridges 5 are below the plane of the under faces of the end portions 4; and the bottoms of the hollows between said ridges lie in a plane above the plane of the under faces of said end portions 4. The upper die A preferably has three ridges 5, a middle ridge and two end ridges. The lower edge of the middle ridge 5 is below the lower edges of the end ridges 5. The lower longitudinal edges of the upper die A adjacent to the end ridges 5 are preferably rounded (see Fig. 4).

The lower die B preferably comprises three members, two side members 6 and a middle member 7. The middle member 7

of the lower die B is a counterpart of the upper die A, and the under surface of said upper die A and the top surface of said middle member 7 are equally distant from each other throughout when the dies are brought together. The middle member 7 of the lower die B also has two flat end portions 9 which correspond to the under face of end portions 4 of the upper die A; and in the top surface of the middle member 7 between the end portions 4 are three transverse hollow or depressions 8 V-shaped in cross-section which correspond to the three ridges 5 of the upper die A. The middle member 7 of the lower die B preferably comprises two pieces 10 bolted end to end to a block or bar 11, which extends the full length of said middle member.

The side members 6 of the lower die B are arranged one on each side of the middle member 7 and project above it. The inner side walls of the side members 6, that is, the walls adjacent to the middle member 7, are vertical throughout the greater part of their depth, and are shaped to fit close to the sides of said middle member, so that the space between said inner walls of said side members has an outline conforming to the outline of the upper die A. The space between the side members 6 of the lower die B, while of the same outline as the upper die A, is uniformly larger than said upper die, corresponding to the thickness of the blank to be forged. The upper edges of the inner side walls of the side members 6 between the straight end portions thereof are rounded or beveled off outwardly (see Fig. 5). Each side member 6 preferably comprises several longitudinal pieces bolted together, so that the side members may be easily constructed. The outer walls of the side members 6 of the lower die B are vertical so that a frame may be placed around them, if necessary, to keep said side members from spreading.

In effect, the lower die B has a longitudinal recess in its upper face, the bottom and sides of said recess being formed by the top surface of the middle member 7 and the inner walls of the side members 6 of the lower die respectively. Throughout the end portions of the lower die B, this recess is channel-shaped.

The side members 6 and the middle member 7 of the lower die B rest upon a bolster or bed plate 12 of suitable construction. The side members 6 are held in proper position by bolts (not shown) which pass through slots in said side members. The middle member 7 is held in proper position by pins 13 extending downwardly into an ejecting bar 14. The ejecting bar 14 extends upwardly through an opening in the bolster 12 and bears against the block 11 of the middle member 7. After the dies have forged the blank, and are drawn apart, the ejecting

bar 14 is raised by an auxiliary ram 14^a or by other suitable means to eject or push the forging out of the lower die B.

The dies shown in the drawing and hereinafter described are designed to forge a blank 15 (see Figs. 6 and 7) consisting of a plate which is of full width approximately midway between its middle and each end thereof and comparatively narrow at the middle and at each end. Along each longitudinal edge of the blank 15 is a narrow flange 16, said flanges projecting from said blank in the same direction. In the blank 15 are two parallel slots 17 which extend longitudinally thereof and terminate short of its ends. Said slots 17 divide the blank 15 for part of its length between its ends into a middle portion 18 between said slots 17 and two side portions 19. Between the ends of the slots 17 and the ends of the blank 15 are flat end portions 20 of said blank. The distance between the slots 17 is equal to the greatest width of the upper die A.

In using the dies, the blank 15 is placed on the lower die B, and is positioned thereon so that the middle portion 18 of the blank, that is the portion between the slots 17, is directly over the space between the side members 6 of the lower die B, the narrow flanges 16 projecting downwardly. As the upper die A descends, the lower edge of the middle ridge 5 strikes the blank first. The side portions 19 of the blank 15 are supported by the side members 6 of the lower die B, and the first action of the dies is to depress the middle portion 18 of the blank. As the upper die A descends farther, the end portions 20 of the blank are pressed into the lower die B and also bent closely into contact with the outer sloping faces of the end ridges 5 of said upper die A. In this way, the end portions 20 of the blank 15 are hooked over said end ridges 5 and are also gripped between the end portions 4 of the upper die A and the end portions of the lower die B, so that the said end portions 20 of the blank 15 cannot move inwardly toward each other. Further downward movement of the upper die A bends the middle portion 18 of the blank in opposite directions sinusoidally; and, since the end portions 20 of the blank cannot move together, this sinusoidal bending stretches or elongates the middle portion 18 of the blank 15. Simultaneously with the stretching of the middle portion 18 of the blank 15, the side portions 19 of said blank are bent up along longitudinal lines 21 to a position at right angles to their original position. The side portions 19 of the blank 15 are preferably bent up at right angles to their original position so that they are farther apart throughout a region midway of the ends of the blank 15 than at the ends of said blank. The distance between the side portions 19 of the blank 15 throughout the

region where said side portions 19 are farthest apart is about equal to the distance between the slots 17 of the blank 15. Thus, where the side portions 19 are farthest apart, the middle portion 18 of the blank 15 may be bent up between said side portions 19, if necessary, as shown in Fig. 9. The blank 15, after it has been forged or pressed as above described, (see Figs. 8, 9 and 10) is channel-shaped, and has its middle portion 18 bent sinusoidally lengthwise and stretched longitudinally.

The dies hereinbefore described perform two operations, namely, first, stretching the middle portion of the blank between the slots therein, and second, bending the blank into a channel-shape. The dies are single acting and do not require any movable parts to grip or hold the end portions of the blank while its middle portion is being stretched. Also, special devices for removing the forging are dispensed with, since the middle member of the lower die is movable and is used to eject the forging from the lower die.

The dies which are shown and described are designed to be used with a flat plate as a blank, but may be altered without departing from my invention so as to be used with blanks made of structural shapes. Also, while the blank is shown as having straight parallel slots therein, the slots may be curved or otherwise shaped. Also, while the die A is shown and described as the upper die and as moving vertically into the lower die B, the dies A and B may be reversed, or arranged to move together horizontally, and either or both dies may be made to move.

Other changes may be made in the construction of the dies shown and described without departing from the invention, and I do not wish to be limited to the details of that construction.

What I claim is:

1. A lower forging die having a longitudinal recess in the upper face thereof, said recess throughout the end portions of said die being channel-shaped, the bottom of said recess throughout the middle portion of said die being formed with a series of straight hollows, and an upper forging die cooperating with said lower forging die and having the end portions thereof rectangular in cross-section to conform to the end portions of the recess in said lower die said upper die having throughout the middle portion of its under face a series of ridges, said ridges corresponding in shape and position to said hollows.

2. A lower forging die having a longitudinal recess in the upper face thereof, the bottom of said recess throughout the middle portion of said die being formed with a series of transverse hollows V-shaped in cross-section, and an upper forging die cooperating with said lower die and having on

the under face thereof throughout a region midway of its ends a series of transverse ridges, said ridges corresponding in shape and position to said hollows and being adapted to enter said hollows.

3. A lower forging die having a longitudinal recess in the upper face thereof, said recess throughout the end portions of said die being channel-shaped, the bottom of said recess throughout the middle portion of said die being formed with a series of straight hollows, said recess being widest throughout a region midway of the ends of said die, and an upper die cooperating with said lower die and having a downwardly projecting portion shaped to conform to the shape of said recess in said lower die.

4. A lower forging die having a longitudinal recess in the upper face thereof, the end portions of said recess being channel-shaped, the bottom of said recess throughout the middle portion of said die having a series of transverse hollows therein, said die consisting of a middle member and two side members, one side member being arranged on each side of said middle member, the upper surface of said middle member constituting the bottom of said recess, the inner side walls of said side members constituting the side wall of said recess, said middle member being movable vertically between said side members.

5. A lower forging die having a longitudinal recess in its upper face, said recess throughout a region midway of the ends of said die being wider than at the ends of said die, the bottom of said recess throughout the middle portion of said die being formed with a series of transverse hollows, and an upper forging die cooperating with said lower die, said upper die being shaped to enter said recess and having ridges throughout the middle portion of its under surface which are adapted to enter said hollows.

6. An upper forging die having a series of transverse ridges on its under surface throughout the middle portion thereof, the end portions of said die being rectangular in cross-section, said die being widest throughout a region midway of its ends, and a lower die cooperating with said upper die and having a series of ridges arranged to enter the spaces between the ridges of said upper die when said dies are brought together, said lower die having a recess in its upper face shaped to receive the end portions of said upper die.

7. A lower forging die having a recess in its upper face, the end portions of said recess being channel-shaped, the bottom of said recess between said end portions having a series of transverse hollows therein, the side walls of said recess near the upper edges thereof and between the end portions of said

recess being inclined upwardly and downwardly, and an upper die cooperating with said lower die and having a downwardly projecting portion shaped to conform to the shape of said recess in said lower die.

8. A device for stretching the middle portion of a blank included between two spaced slots extending longitudinally of said blank and terminating short of the ends thereof comprising two cooperating dies having counterpart end portions for gripping the end portions of said blank and matching hollows and ridges between said end portions for bending the middle portion of said blank along transverse lines in opposite directions.

9. A device for stretching the middle portion of a blank included between two slots extending longitudinally of said blank and terminating short of the ends thereof and for bending said blank into a channel-shape, said device comprising two cooperating dies, the lower die having a longitudinal recess therein, the end portions of said recess being narrower than the middle portion of said recess, the bottom of said recess having

a series of transverse hollows therein, an upper die having its sides and under face shaped to conform to the sides and the bottom of said recess of said lower die, whereby the end portions of said blank are gripped by the end portions of said dies and the middle portion of said blank is bent along transverse lines in opposite directions.

10. An upper forging die which is rectangular in cross-section throughout its length, the end portions of said die being narrower than the middle portion thereof and having flat under faces, the under face of said die adjacent to each flat under face projecting downwardly below the plane of said flat faces, the under surface of said die between said ridges being undulated, and a lower die cooperating with said upper die and having a recess in its upper face shaped to receive said upper die.

Signed at St. Louis, Missouri, this 19th day of November, 1914.

WILLIAM D. FORSYTH.

In the presence of—

NEIL D. PRESTON,

MARTHA A. SHELTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."