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1,500,926

C. M. CURRY

ANVIL

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Fig. 1.

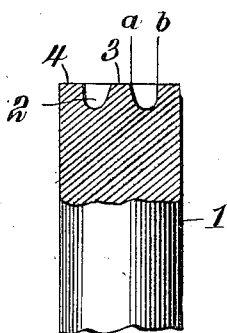


Fig. 2.

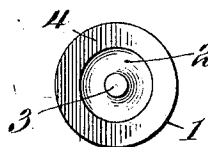


Fig. 3.

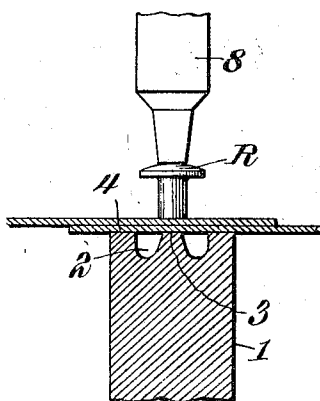


Fig. 4.

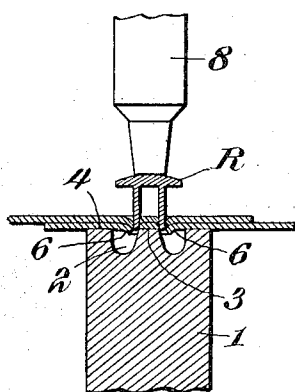


Fig. 5.

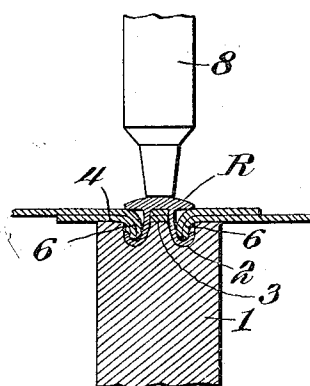


Fig. 6.

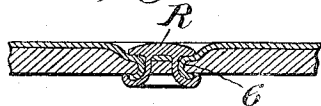
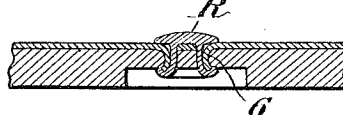


Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES M. CURRY, OF TULSA, OKLAHOMA.

ANVIL.

Application filed October 7, 1918. Serial No. 257,185.

To all whom it may concern:

Be it known that I, CHARLES M. CURRY, a citizen of the United States, residing at Tulsa, in the county of Tulsa and State of Oklahoma, have invented certain new and useful Improvements in Anvils, of which the following is a specification.

My invention relates to an improvement in anvils, and has to do with the art of driving a hollow metal rivet through metal, or metal and other material, to be riveted, without the necessity of punching a preliminary hole therefor, and the final upsetting of the rivet; and in other words it consists in forcing the rivet initially through the parts to be riveted and ultimately upsetting it.

Heretofore attempts have been made to force a hollow rivet directly through sheet-metal without previously punching a hole, but without success.

My invention is a demonstrated success, and it comprises an anvil or die fashioned on its working face to receive the parts to be riveted, and having an annular recess therein of definite depth and width with respect to the thickness of the metal to be riveted, over which recess the pressure of the rivet is applied against the sheet-metal, which latter can be stretched just so far and no further, and when the maximum point of tension is reached under the pressure of the rivet it will part, the metal to be stretched being forced down into the annular recess where the metal is allowed to flow to its maximum and part under the pressure of the rivet, after which the emerging end of the rivet is upset.

In the accompanying drawings:

Figure 1 is an enlarged vertical sectional view through the anvil;

Figure 2 is a plan view;

Figures 3, 4 and 5 show different positions of the rivet in its progress through the metal parts being riveted;

Figures 6 and 7 are sections showing the embedding of the head and opposite end of the rivet respectively.

The numeral 1 represents the anvil. An annular recess 2 is formed in the upper or working face of the anvil, leaving the central stud 3 with a conical base and the outer surface 4 flush or in the same plane with the outer surface of the stud.

While the width and depth of the recess 2 may be varied, and in fact are intended

to be for different purposes, nevertheless both its width and depth have some definite relation to the thickness of the metal or parts to be riveted, and, generally speaking, the depth of this recess is approximately four times the thickness of the metal being riveted, and it is desirable that the outer surface of the recess should be at or approximately at right-angles to the outer surface of the anvil.

Referring to Fig. 1, the width of the recess or distance between the points *a* and *b* represents the quantity of metal to be dealt with, and a piece of metal corresponding in area to the distance from point *a* to *b* can be stretched just so far and no further, and, when the maximum point of tension due to the pressure of the rivet in penetrating the metal is reached, the sheet-metal will part. The sheet-metal to be stretched must be made to pass down into this annular recess, and it is very evident that if the metal should strike the outer side before it reaches its maximum flow, which flow is indicated by the numeral 6, and parted, the flow would be retarded or stopped altogether, and the rivet would not pass through. Again, if the annular recess 2 is not sufficiently deep to allow the metal to flow to its maximum and part, it would not rivet. Some metals will flow more than others, and some are thicker than others, and it is therefore evident that the width of the recess or distance from *a* to *b* must be determined by the metal and its thickness, so that not only is the relative depth of the recess which must afford abundant clearance for the flow of the metal around the rivet and the upsetting a factor, but also the distance across from *a* to *b* is of only secondary importance thereto.

By following the action illustrated in Figs. 3, 4 and 5, it will be noticed that the part of the metal 6 between the outer part of the rivet and the outer part of the annular recess in the anvil is stretched. This shows what is termed the "flow" of the metal, that is to say all metal under such conditions flows, and that explains why it is possible to force the rivet through it. Consequently if the outer edge of the annular recess in the anvil is not at right-angles or approximately at right-angles to the surface of the outer or top plane of the anvil, the metal flowing down around the outer edge of the rivet would come into

contact with the curved surface, thus stopping the flow of the metal, and the rivet would not penetrate it. As soon as it has reached its maximum flow, the metal under tension gives way, and the rivet passes through.

In Figs. 4 and 5, this flow is clearly shown at 6; in other words, it is only possible to stretch the metal to be riveted so far, and then it parts. The anvil is only a means for stretching the metal to a point to make a hole and allow the rivet to pass through, upsetting it. The art of penetration or insertion of the rivet is in effect one act, and the upsetting of the rivet is another and entirely distinct therefrom; in other words, making the hole is one act, and forcing the rivet through that hole and upsetting it, is another.

The numeral 8 represents the punch, for forcing the rivet through sheet-metal or other material.

In Figs. 6 and 7, I have simply illustrated different effects of punching the rivets through; in one the head is shown counter-sunk; and in the other the opposite end is similarly illustrated.

It will be noticed, as a resultant of the metal flow and the final rupture, a blank remains on the end of the stud, which is forced by the latter as if by a punch into the center of the hollow rivet, giving the rivet in effect a more or less solid center, thus adding materially to its strength and rigidity as a fastening device.

My invention has nothing to do with the feeding of the rivets, which is easily accomplished; and it has nothing to do with the riveting device, of which I have shown a diagrammatic representation indicated by the numeral 8, but it does relate to the peculiar fashioning of the anvil or die as well as the hollow rivet, and the relativity of the depth and width of the annular recess with respect to the material being riveted, thus bringing about an entirely new result with new means.

I claim:

1. An anyil or die for forcing tubular rivets through sheets of material to be fastened together, and upsetting the same,

the working end or face of said anvil or die having an annular curved groove or recess therein, leaving a tapering central stud and a surrounding surface, the outer ends of which are substantially flat and flush with each other, the external diameter of the outer end of the stud and the internal diameter of the tubular rivet to be upset being approximately the same, whereby to cause a sheering action between the stud and rivet upon the material to be riveted, thereby causing the rivet first to cut its own way through the material and then have its cutting end upset.

2. An anvil or die for forcing tubular rivets through sheet-metal and upsetting the same, comprising an inner central stud having a flat upper surface of substantial area, an outer concentric bearing surface in the same plane as the flat upper surface of the central stud, spaced therefrom by a concentric recess formed between the surfaces, the recess in cross-section being substantially greater than a semi-circumference in depth, and forming a shoulder with the outer bearing surface upon which the sheet-metal is bent, and between which shoulder and the rivet sheet-metal may flow beyond the breaking point into the recess, and the bottom of the recess being so formed as to upset such rivet.

3. An anvil or die for forcing tubular rivets through sheet-metal and upsetting the same, comprising an inner central stud having a flat upper surface of substantial area, an outer concentric bearing surface in the same plane as the flat upper surface of the central stud, spaced therefrom by a concentric recess formed between the surfaces, the recess in cross-section being substantially greater than a semi-circumference in depth, and forming a shoulder at substantially right-angles with the outer bearing surface upon which the sheet-metal is bent, and between which shoulder and the rivet sheet-metal may flow beyond the breaking point into the recess, and the bottom of the recess being so formed as to upset such rivet.

In testimony whereof I affix my signature.

CHARLES M. CURRY.