Jan. 14, 1941. W. L. FADER, JR 2,228,448

MANUFACTURE OF METAL ARTICLES

Filed Oct. 16, 1939 3 Sheets-Sheet 1

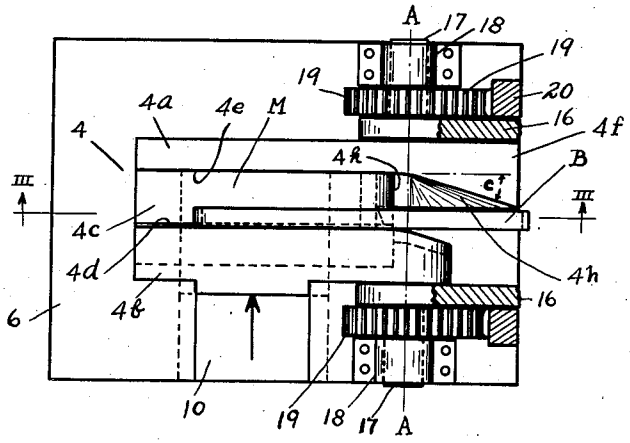


Fig. IV.

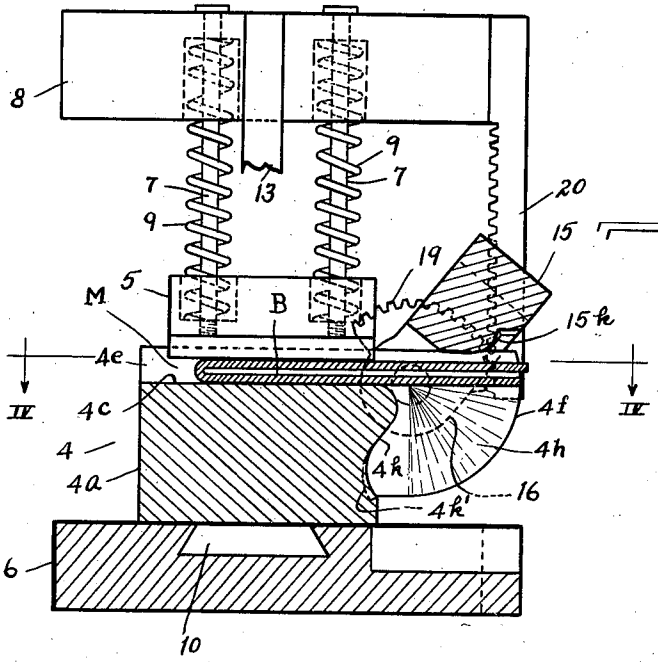


Fig. III.

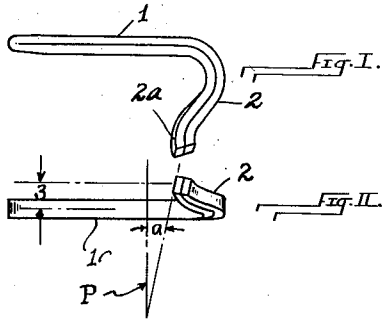


Fig. I.

Fig. II.

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MANUFACTURE OF METAL ARTICLES

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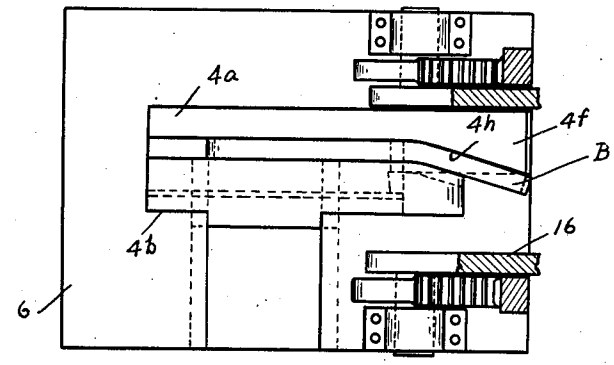


Fig. VI.

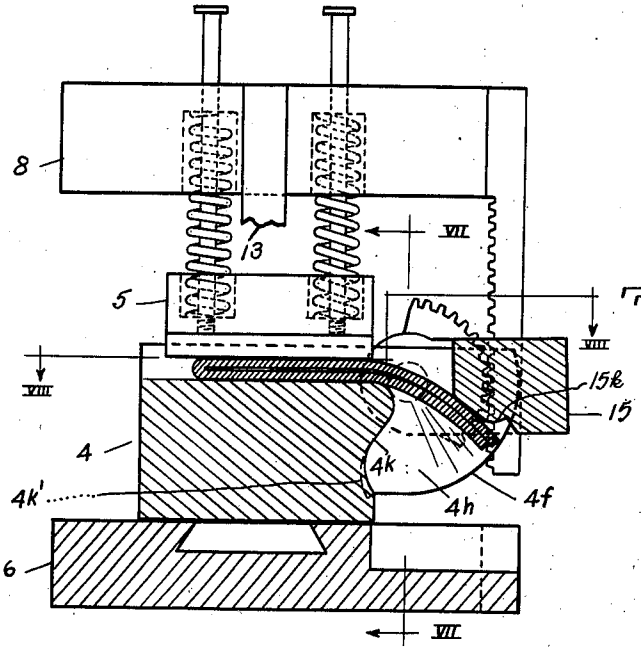


Fig. V.

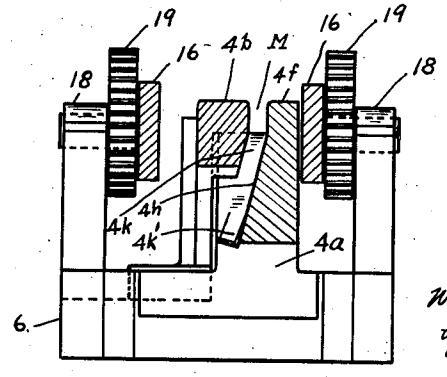


Fig. VII.

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MANUFACTURE OF METAL ARTICLES

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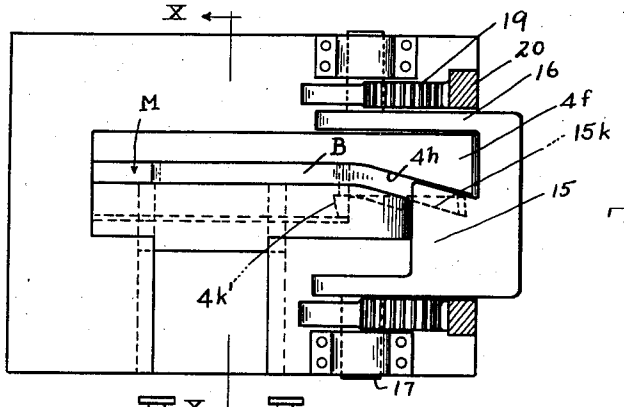


Fig. VIII.

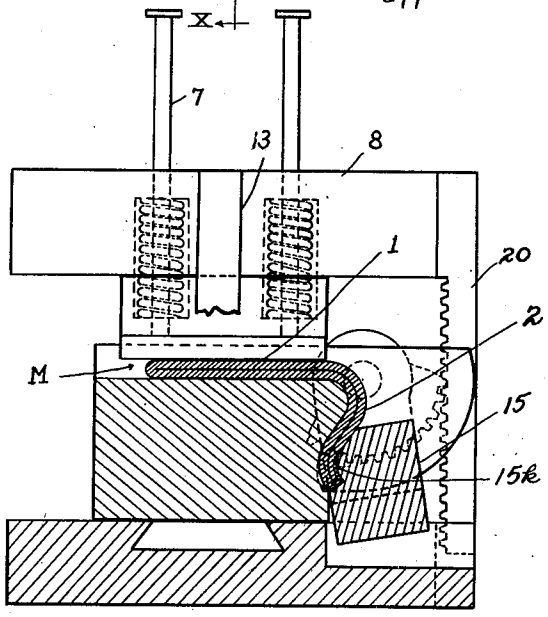


Fig. IX.

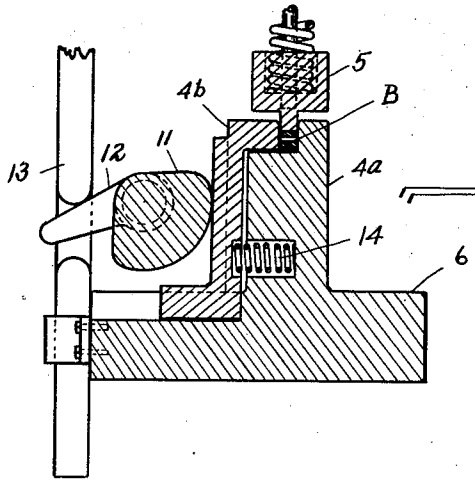


Fig. X.

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Patented Jan. 14, 1941 2,228,448

UNITED STATES PATENT OFFICE

2,228,448

MANUFACTURE OF METAL ARTICLES

William L. Fader, Jr., Sewickley, Pa., assignor to Pittsburgh Forgings Company, a corporation of Delaware

Application October 16, 1939, Serial No. 299,600

2 Claims. (Cl. 153—3)

This invention relates to the manufacture of metal articles, particularly to articles that are shaped from bars or straps of steel, and consists in a method of shaping.

In Letters Patent of the United States, No. 2,015,194, granted on September 24, 1935, to one Max Ruping, a resilient rail fastener is illustrated and described. Such rail fastener consists in an elongate shank continued at one end in a resilient crook-shaped head. The head and the shank are centered in a common plane. The device is of compound or bipartite structure; it is formed of two parallel limbs of spring steel, integrated at one end, and pressed in surface-to-surface contact into the form of the fastener. In service the shank is anchored in the body of a rail-tie or sleeper, with the tip of the crook-shaped head pressed in rail-securing engagement upon the basal flange of the rail borne by the sleeper.

In order to obtain greater efficiency in particular installations, it has recently been proposed to construct the fastener in more refined or elaborated form; that is, to construct the fastener with its crook-shaped head canted and twisted in its extent from the shank.

More particularly, the invention consists in a method that is specifically, though not exclusively, designed for the economical production of such elaborated rail fastener.

In the accompanying drawings Fig. I is a view in side elevation, and Fig. II a view in front elevation, of the fastener that in this case forms the product of the method of the invention. Fig. III is a view, partly in vertical section and partly in side elevation of an apparatus, in the operation of which the invention is realized. Fig. IV is a view, partly in plan from above and partly in horizontal section, of such apparatus. The plane of section of Fig. III is indicated by the line III—III in Fig. IV, and the plane of section of Fig. IV is indicated by the line IV—IV in Fig. III, and in both Figs. III and IV the apparatus is shown in an initial stage of operation. Figs. V and VI are views comparable respectively with Figs. III and IV, illustrating the apparatus in a more advanced stage of operation. Fig. VII is a sectional view of the lower portion of the apparatus, as seen on the vertical plane VII—VII of Fig. V, and Fig. VIII is a view of the same portion of the apparatus, as seen on the broken horizontal plane VIII—VIII of Fig. V. Fig. IX is a view comparable with Figs. III and V, illustrating the apparatus in the final stage of operation. And Fig. X is a fragmentary sectional view of the apparatus, on the plane X—X of Fig. VIII, illustrating means (not elsewhere shown in the drawings) for operating one of the die members of the apparatus.

Referring to Figs. I and II, the reference numeral 1 is applied to the shank and 2 to the head of the rail fastener. The device, though integrally formed, is of laminar or bipartite structure. More specifically, the fastener is formed from an U-shaped blank B (Figs. III and IV), rounded at one end, with the two legs of the U of substantially equal length, parallel, and centered in common plane. In this case the blank consists in a strap of spring steel medially folded into the form of an U. In the finished article the two limbs of the U extend in surface-to-surface contact. The folded end of the blank forms the shank 1 of the device, while the opposite bipartite end, fashioned into the form of a shepherd's crook, forms the head 2. As mentioned above, and as may be perceived in the drawings, the reversely curved head 2 is bent aside or canted with respect to the shank 1, and towards the tip of the crook the head is bodily twisted. The form of the article is such that the tip of the crook-shaped head is offset an interval 3 (Fig. II) from the axis of the shank 1, with the surface portion 2*a* of such tip (the surface portion that in service bears immediately upon the flange of the rail to be secured) inclined to a plane P normal to the axis of the shank 1. Typically, the angle (*a*) of such inclination is 14°.

In the manufacture of the above-described rail fastener, in keeping with the method of this invention, the outer or free ends of the legs of the U-shaped blank are bent to a position of angularity with respect to the plane of the U, and the so bent-aside ends of the lugs are brought into surface-to-surface contact and shaped into the form of the crook-shaped head 2. More specifically, and as will presently more fully appear, the free, angularly extending ends of the legs are bent, relatively to the united ends, and swung through a path that extends in, and circumferentially of, a conical surface, and in the course of such operation the said free ends of the legs are closed in surface-to-surface contact, and shaped into a crook, with the body of the crook axially twisted in its extent from a medial point towards its tip. Otherwise expressed, the bent-aside bipartite end of the blank is curved to a diminishing spiral, a spiral that conforms to a conical surface, and the tip of the so-shaped end of the blank is axially twisted, and

bent with reversal of curvature from the spiral. While thus shaping the legs into a crook, or immediately thereafter, the U is closed; that is, the united ends of the legs of the U are pressed together and formed into a shank. Thus, the rail fastener is produced, with its crook-shaped head 2 canted and twisted in its extent from the shank 1.

Turning to a consideration of the apparatus illustrated in Figs. III to X, a more comprehensive understanding of the method will be obtained, although it is to be remarked that, while such apparatus is particularly efficient and valuable, it is not the only apparatus which, conceivably, might be used in the practice of the invention defined within the terms and intent of the appended method claims.

The apparatus consists in a female die 4 and a male die 5. The female die is rigidly mounted upon a base 6 that may comprise, or may be secured to, the stationary bed of a mechanical press or bulldozer (not shown), and the male die is borne upon two or more posts 7 carried telescopically by a head 8, that may comprise, or may be secured to, the powerfully reciprocated head of such press or bulldozer. In service the male die is reciprocated relatively to the female die, into and from metal-shaping position, and in the course of such reciprocation the head 8 travels through a greater range than the die 5 carried thereby. That is to say, the male die 5 is normally spaced at an interval from the head 8, with springs 9 arranged between, and in the downward stroke of the reciprocating parts the die 5 closes upon the die 4 (i. e. upon a blank in the die 4) and comes to rest, while the head 8 continues in its descent, against the tension of springs 9, and, coming to abutment upon the male die 5, forces such die into ultimate blank-shaping position. The relative movement of the parts is reversed during the upstroke of the head.

The female die includes two die blocks 4*a* and 4*b*, which together form a work-receiving matrix M that has a floor 4*c* and two plane side walls 4*d* and 4*e*. The matrix side wall 4*d* is formed in the block 4*b*, while the matrix floor 4*c* and side wall 4*e* are formed in the block 4*a*, and the two blocks are relatively movable, such that the matrix M may be alternately widened, to receive a blank B (cf. Fig. IV), and narrowed, to engage the blank (cf. Fig. VI). More specifically, the block 4*a* is rigid with the base 6; the block 4*b* is secured to the base in a tongue-and-groove engagement 10; and block 4*b* is slideable in the groove relatively to block 4*a*. The advance of block 4*b* into blank-engaging position may be effected by any suitable means, say a cam 11 (Fig. X) mounted for rotary movement in suitable bearings (not shown) on the base 6. Integral with the cam an arm 12 may be provided, and such arm may be engaged, as shown, by a vertical bar 13 carried by the reciprocating head 8. During the descent of the head the cam is rotated counterclockwise (Fig. X), and in manifest way it shifts block 4*b* towards block 4*a* and closes the matrix upon the blank introduced thereto. Upon the rise of the head 8, and the consequent clockwise rotation of the cam, one or more springs 14, arranged between the blocks, operate to shift block 4*b* away from block 4*a* and open the matrix.

Integral with the die-block 4*a* is a portion 4*f* that extends outward and downward from the matrix M. The side face 4*h* of such portion provides, above the horizontal plane of the matrix floor 4*c*, an angular continuation of the side face 4*e* of the matrix, the degree of angularity being indicated at *c* in Fig. IV. Below such horizontal plane, this angularly extending side face 4*h* is continued downward and inward to the vertically extending, curved edge 4*k* of the block 4*a*, which edge, as shown in Figs. III and VII, is contoured to the curvature of the crook-shaped head of the rail fastener 1, 2, and is canted with respect to the matrix M, to the same degree that the head of the rail fastener is canted to the shank. The face 4*h* of the die portion 4*f* is of concave, conical form. More specifically, the face 4*h* comprises, substantially, a quarter segment of the side surface of a cone, whose axis is indicated at A—A, Fig. IV, and as presently will appear such face operates as a guide, defining or establishing the path through which the free ends of the blank are bent—the path that, in accordance with the method described above, extends in, and circumferentially of, a conical surface.

The means for bending the legs of the blank consist in an auxiliary die block 15 having a contoured face 15*k* complementary in form to the contoured edge 4*k* of block 4*a*, and adapted to cooperate therewith in forming the head 2 of the rail fastener. The auxiliary die 15 is secured to and between a pair of radial arms 16. The arms 16 are arranged astraddle the die assembly 4, 5; the arms are provided with journals 17 that are rotatable on the cone axis A—A, in bearings 18 fixed to base 6. On each journal a segmental gear 19 is secured, and meshing with each gear is gear-rack 20, carried by the reciprocating head 8.

When the head 8 is at the upper limit of its range of reciprocation the dies 4 and 5 are spread and the matrix M is open, as shown in Fig. IV, and the auxiliary die 15 and its associate parts are in the positions illustrated in Fig. III. Then it is that a blank B is introduced to the matrix, it being noted that the folded or closed end of the blank is positioned in the matrix, with the opposite, bipartite end of the blank extending outward from the matrix adjacent to the conical face 4*h* of the die portion 4*f*. As in the course of its reciprocation, the head 8 descends, the die block 4*b* closes laterally, while the male die closes vertically, upon the blank, and the auxiliary die 15 swings in clockwise direction (Fig. III) towards engagement with the projecting legs of the blank. The die block 4*b*, in its matrix-closing movement, presses the blank B against the surfaces 4*e* and 4*h*, with the consequence and effect that the outer or free ends of the legs of the blank are (as shown in Fig. VI) bent from the plane in which such legs were initially centered. The descent of the head continues unabated, and, while the male die 5 under spring tension clamps the folded end of the blank in the matrix, the auxiliary die 15 comes to engagement with the projecting ends of the blank. The rotating die 15 closes the engaged ends of the blank upon one another (Fig. V), and, while securing such ends in contact with the conical guiding surface 4*h*, bends and shapes them against the contoured edge 4*k* of die block 4*a*, under the pressure of the contoured face 15*k* of the die 15, into the crook-shaped head 2, as shown in Fig. IX. As the die 15 approaches this ultimate position or stage of operation, and clamps the shaped bipartite end (2) of the blank against the block 4, the descending head 8 closes upon the male die 5, forcing

such die downward and closing the leg portions of the blank in the matrix into the form of the shank 1. In such way the rail fastener is produced.

The contoured edge 4*k* of the block 4*a* includes a recess or groove 4*k'*, which is of such form that, when the complementary face 15*k* of the die 15 shapes the blank against the said edge 4*k*, not only is the canted crook-shaped head formed, but the desired twist is given to the tip of the crook.

It is to be understood that the method of this invention affords many advantages over such other methods as may be employed in the production of the article in mind. For example, article may be produced in a single machine operation; economy and speed of production are realized; accuracy in structural detail is obtained; and the two legs or limbs of spring steel, forming the body of the finished article, are secure in the desired surface-to-surface contact—a condition difficult to obtain in the manufacture of such bipartite and resilient articles.

Notice is hereby given of an application, Serial Number 324,458, filed by me on March 18, 1940, as a division of the application for this patent.

I claim as my invention:

1. The method herein described that includes folding a strap of spring steel into an U-shaped blank, clamping the folded end of the blank, pressing the free ends of the legs of the blank together and bending them, relatively to the united ends of the legs, to a diminishing spiral that conforms to a conical surface and shaping the so-bent ends of the legs into a crook, and, while clamping the ends of the legs of the bipartite crook together, pressing the folded end of the blank into a shank.

2. The method herein described that consists in folding a strap of spring steel into an U-shaped blank, with the legs of the U centered in a common plane, pressing the free ends of the legs to a position of angularity with respect to such plane, and pressing the so bent-aside ends of the legs together and bending them, relatively to the folded end of the blank, to a reversely curved crook that conforms to a conical surface, and twisting the tip of the so-curved end of the blank on the axis of its extent from the body of the crook, and, while clamping the legs of the bipartite twisted crook in surface-to-surface contact, closing the folded end of the blank into the form of a shank.

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