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METHOD AND MEANS FOR FORMING HOLLOW ARTICLES

Filed May 27, 1926

2 Sheets-Sheet 1

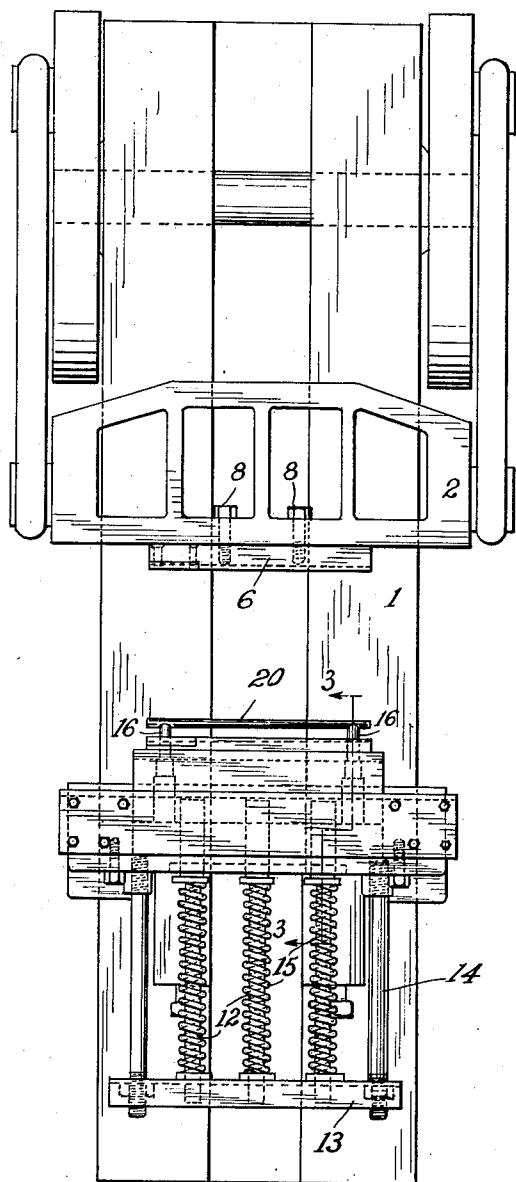


Fig. 1

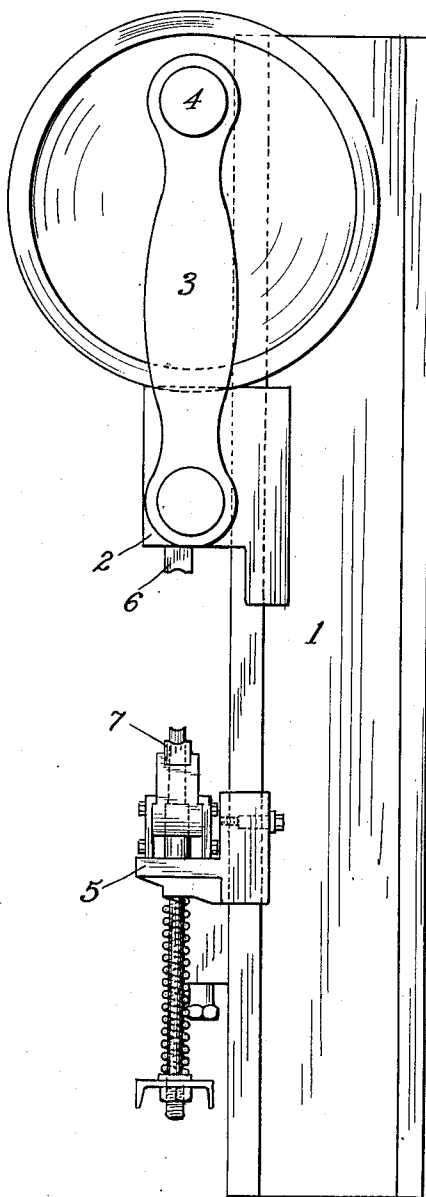


Fig. 2

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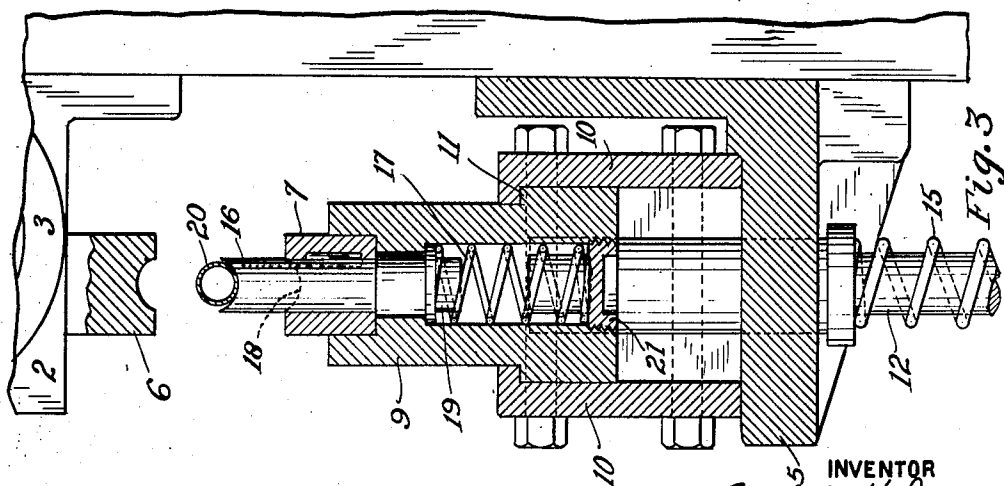
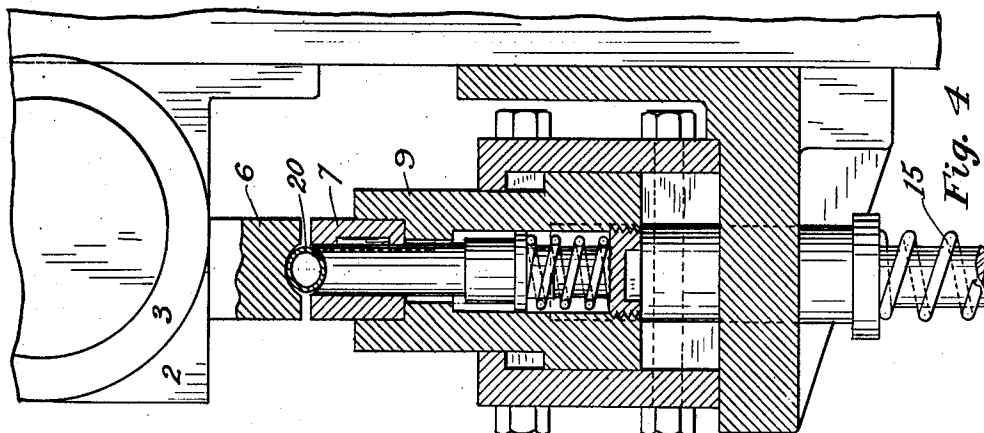
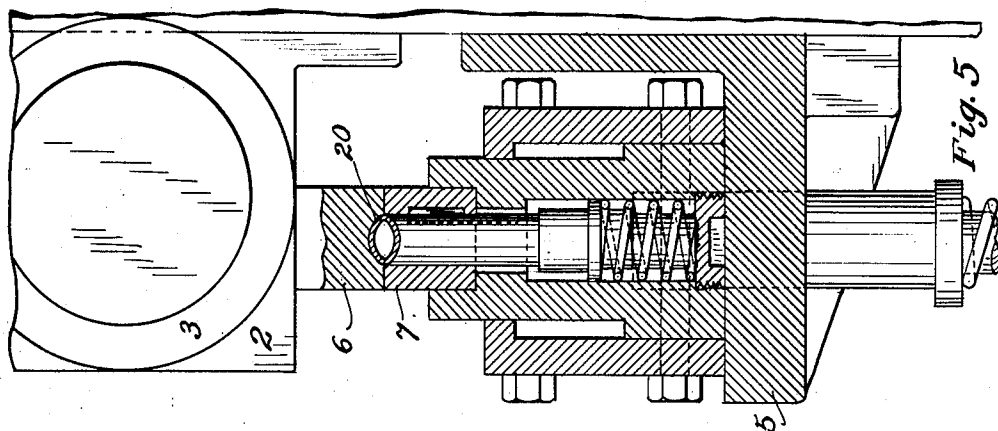
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METHOD AND MEANS FOR FORMING HOLLOW ARTICLES

Application filed May 27, 1926. Serial No. 111,990.

This invention relates to the art of forming hollow metal articles and more particularly to means and methods for changing the configuration of hollow or tubular metal pieces.

5 An object of this invention is to provide a method by which hollow or tubular metal articles may be readily and easily given a desired cross-sectional configuration.

Another object is to provide means for 10 changing the cross sectional configuration of hollow articles without causing undesired changes such as collapsing or buckling of the articles.

Another object is to provide a simple apparatus for changing the configuration of hollow articles which may be readily applied to 15 standard machines.

Other objects will hereinafter appear.

The invention will be better understood 20 from the description of one practical embodiment of the apparatus comprising a part thereof, illustrated in the accompanying drawings, in which,

Fig. 1 is a front elevation of a vertical 25 press, provided with dies for deforming a metal tube.

Fig. 2 is a side elevation of the press shown in Fig. 1.

Fig. 3 is a fragmentary cross section of the 30 apparatus shown in Figs. 1 and 2 taken on the line 3-3 and shown on an enlarged scale.

Fig. 4 is a view similar to Fig. 3, but showing the parts in a different position, and,

35 Fig. 5 is another view similar to Fig. 3 and showing the parts in still another position.

The machine illustrated comprises a standard 1 carrying a cross-head 2 which is 40 reciprocated vertically by links 3 and cranks 4. Below the cross-head, the frame is provided with a stationary abutment 5. Dies 6 and 7 are carried by the cross-head and abutment, respectively, and are brought together 45 by the reciprocation of the cross-head to form articles into the shape desired.

Die 6 is directly and rigidly connected to the cross-head as by bolts 8 while die 7 is resiliently supported above the abutment 5. 50 Die 7 is rigidly attached to a block 9 which

reciprocates between plates 10 attached to the abutment. Shoulders on the blocks and plates engage each other at 11 to limit upward movement of the blocks. A plurality of rods 12 are fixed to the block and extend 55 through the abutment and through a channel 13 carried by rods 14 threaded at their upper ends into the abutment. Around the rods 12 are helical compression springs 15 which press at their lower ends upon the channel 60 and at their upper ends upon shoulders on the rods, and thus normally maintain the block at its uppermost position, where the shoulders 11 are in engagement. Extending 65 through the die 7 and block 9 are ejector plungers 16 urged upwardly by comparatively weak helical springs 17 positioned within the block. The plungers are prevented from rotation by being keyed to the die to maintain the concave upper ends of the plunger 70 in proper relation to the die surface.

Cylindrical plugs 19 are provided under the ejector plungers to limit their downward movement, so that the upper surface of the plungers in their lowermost position will 75 form continuations of the die surface.

The operation of the device is as follows:

With the dies separated, as shown in Figs. 1, 2 and 3, the operator places a tube 20 on the concave ends of the plungers 16. He 80 then engages the power for bringing the cross-head 2 down toward the abutment. As soon as die 6 engages the upper surface of tube 20, the plungers 16 are pressed downwardly, compressing the springs 17, until the 85 plugs 19 abut the fixed plugs 21 at the bottom of the cylindrical spring recesses. The ejector plunger tops are now aligned with the surface of die 7 and through the remainder of the forming operation may be 90 considered as a part of die 7.

As the cross-head continues downwardly, parts of its force goes into compressing springs 15 and part into deforming tube 20, the parts assuming substantially the position 95 shown in Fig. 4, wherein the tube is slightly flattened, but die 7 and block 9 have been moved downwardly, compressing springs 15. By permitting this downward movement against the springs, the deform- 100

ing force is applied to the tube much more slowly and smoothly than would be the case if the lower die were fixed and this permits the metal in the tube to flow or readjust itself, so that the tube flattens gradually instead of buckling at the points of contact with the die, as would be the case if the deforming force were more suddenly applied.

When block 9 reaches its lowermost position, shown in Fig. 5, in which it rests upon the abutment 5, the dies will be nearly in contact and the tube substantially in the form shown in Fig. 5. The cross-head will continue further sufficiently to press the dies tightly together, completing the forming of the tube. Upon upward movement of the cross-head, springs 15 return the die 7 and block 9 to their original position. After shoulders 11 are in engagement with the block 9, further upward motion on the part of die 6 permits the ejector plungers to move upwardly and return the tube to its original position, permitting it to be easily removed and another inserted.

The above process is both simple and rapidly performed, the apparatus likewise being simple and efficient, and is applicable to hard or brittle materials which cannot be readily formed by common forming operations, for instance, tubes of high carbon steel, which would collapse or buckle under ordinary forming operations may be readily shaped by the apparatus and process above set forth.

While I have described the apparatus embodying one form of my invention and the method connected therewith in some detail, it will be obvious that many modifications and variations may be made in both the apparatus and method above set forth, without departing from the scope of the invention and I therefore do not limit myself to the precise embodiments shown, but claim as my invention all such variations and modifications coming within the scope of the appended claims.

What is claimed is:

1. Apparatus for changing the cross sectional configuration of a hard steel tube which comprises a suitably recessed die, means for advancing the said die, an oppositely disposed die toward which the first said die may be advanced and being suitably recessed, the second said die being composed of a plurality of parts, certain of the parts projecting above others of the parts, means for yieldingly supporting the said projecting parts, means for yieldingly supporting the remaining parts of the said die, and means for fixedly supporting all of the parts of the die at one end of the stroke.

2. The method of shaping a length of brittle metal tubing which comprises placing the tubing between spaced dies, causing relative movement of the dies to compress the tubing therebetween, and causing one of the dies to

yieldably with progressively increasing force resist the movement of the opposing die until the cross-sectional configuration of the length of tubing is changed.

3. The method of shaping a length of brittle metal tubing which comprises placing the tubing between spaced movable dies, advancing one of said dies toward the opposing die to compress the article therebetween, and causing the last mentioned die to resist yieldably and with progressively increasing force the advancing die until the cross-sectional shape of the tubing is changed.

4. The method of transversely shaping a tubular metal article which comprises placing the article between spaced recessed die members, forcing the die members together under yieldable progressively increasing pressure to partially bend the article transversely, and applying unyielding pressure to completely shape the article.

5. The method of transversely shaping a hollow metal article which comprises placing the article between spaced movable dies, advancing one of said dies toward the opposed die and against the article whereby opposite exterior sides of the article are forced toward each other causing the last mentioned die to resist yieldably and with increasing pressure the advancing die until the article is partially shaped, and finally causing the last mentioned die to rigidly resist the advance whereby the article is completely shaped.

6. The method of transversely shaping a hollow metal article which comprises placing the article between spaced recessed die members which are adapted to cooperate to form a cavity of the desired shape, forcing the die members together under yieldable progressively increasing pressure to bend the tube, and finally forcing the die members together under unyielding pressure until the article assumes the shape of the cavity.

7. A device for shaping a hollow metal article which comprises oppositely recessed die members, means for positively advancing one die member toward the opposing die member to compress a hollow metal article, means causing the opposing die member to yieldably increasingly resist the pressure of the advancing die member, and means for finally causing the opposing die member to rigidly resist the advancing die member.

8. A device for shaping a hollow metal article which comprises oppositely recessed die members, means for advancing one die member towards the opposed die member, compressing the article therebetween, means for yieldably supporting the said opposed die member and for gradually increasing the resistance thereof to the advancing die member, and means for finally rigidly supporting the said opposed die member, while the advancing die member further com-

presses the article and finally contacts with the opposing die member.

9. A device for shaping a hollow metal article which comprises upper and lower oppositely recessed die members adapted to receive the article, means for advancing one die member toward the opposing die member whereby the article is compressed therebetween, means for gradually increasing the resistance of the one die member to the advance of the opposing die member, and a plunger for lifting the article from the recess of the opposing die member upon separation of the of the die members.

15 In testimony whereof I hereunto affix my signature this 4th day of May, 1926.

EARL K. HOLMES.

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