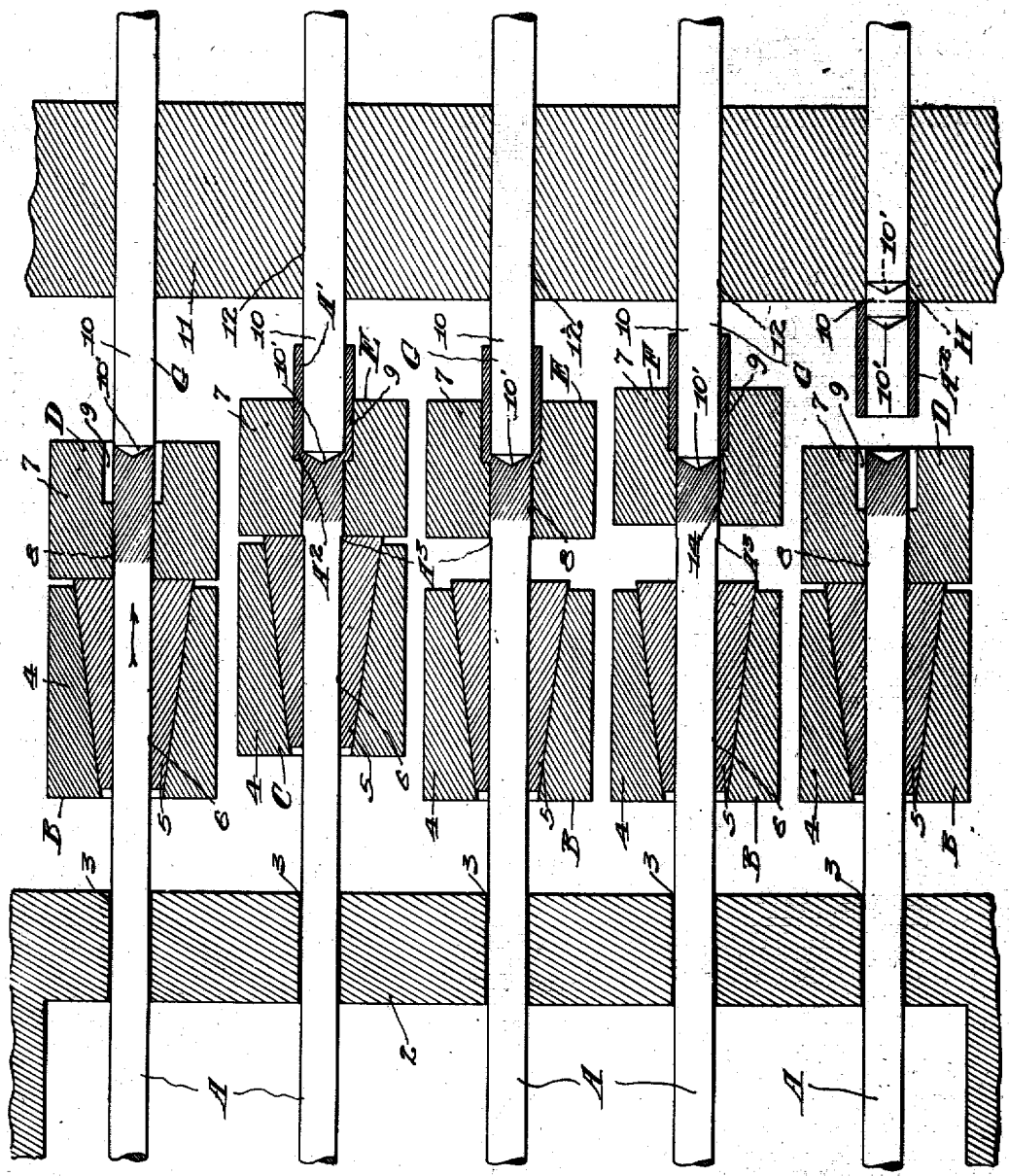
W. E. AMBERG.

TUBE MAKING PROCESS AND MACHINE.

APPLICATION FILED FEB. 5, 1918.

1,314,037. Patented Aug. 26, 1919.



Witness:
Earl Eaton.

Inventor:
Walter E. Amberg
By: [illegible]
Atty.

UNITED STATES PATENT OFFICE.

WALTER E. AMBERG, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMBERG STEEL COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TUBE-MAKING PROCESS AND MACHINE.

1,314,037. Specification of Letters Patent. Patented Aug. 26, 1919.

Application filed February 5, 1918. Serial No. 215,549.

To all whom it may concern:

Be it known that I, WALTER E. AMBERG, a citizen of the United States, and a resident of Chicago, Cook county, Illinois, have invented a certain new, useful, and Improved Tube-Making Process and Machine, of which the following is a specification.

My invention has to do with the production in large quantities of metal tubes, bushings and like articles of manufacture. Its object is to save metal and to expedite production. A further and special object is to provide for the continuous production of such articles, in a wholly automatic way and without waste, from rod stock which is readily obtainable in the market. A further object of the invention is to improve the quality and finish of such articles.

My invention comprises a novel process and mechanism whereby the above stated objects are attained, and will be readily understood on reference to the accompanying diagrammatic drawing which illustrates the direct working parts that I use in carrying out my novel process, and which themselves constitute a part of the invention.

The diagrammatic drawing, 2, represents a heating furnace or muffle for heating the stock or rods from which the tubes are made. In this particular drawing I have represented five such rods, A, and it will be understood that they are heated in the furnace, 2, and leave the same through the several mouths, 3. For each rod I provide a set of upsetting and tube-forming dies, and by arranging these dies in the different positions which they occupy at different stages in the process, I have been able to make this single diagrammatic view fully illustrative of the complete process.

The parts marked 4 are reciprocating propelling clutches. Each contains a split cone, 5, containing a central bore, 6, which fits the rod, A, whatever its cross section. Obviously this clutch is adapted to work the rod forward in the direction of the arrow and is so used. Reversely, the clutch is adapted to prevent retrograde movement of the stock or rod, A. The part 7 is a reciprocating die block, which contains a bore, 8, that is slightly larger than the rod A; and the die block also contains the die cavity, 9. Another movable part of the mechanism comprises a plunger, 10, preferably having a more or less pointed end, 10'. The part 11 represents a frame member which provides the guides, 12, for the several plungers. It will be noted that the parts bear corresponding figures in the five portions of the drawing.

It will be understood that the complete machine embraces levers or the like which are adapted to shift the propeller or clutch block, 4, from the position B, shown at the top of the drawing to the forward position, C. Likewise the machine includes levers or the like for shifting the die block, 7, from the position D (shown at the top of the drawing) to the position, E. The mechanism last mentioned is also adapted to forcibly move the block, 7, to the next position, F, and thence back to the position D. Similarly, in each case, a lever, or the like, is provided for moving the plunger, 10, from the position G to the position H indicated by the dotted lines at the bottom of the sheet. In the actual machine the several groups of dies composing the gang of five are separated sufficiently to allow the necessary connections to the several reciprocating parts. The diagrammatic view is simplified by omitting them.

Five stages or operations complete the cycle wherein a single tube is produced. The machine illustrated serves to show how five tubes may be produced with five sets of dies arranged to operate each one step ahead of the other in the cycle. In this manner the groups taken together serve to illustrate a single complete cycle.

At the beginning of the cycle of operations, the parts will be found in the positions, B, D, and G, as shown at the top of the drawing. In other words, the plunger point is situated within the die cavity, 9, and the end of the rod or stock, A, is in substantial abutment with the end of the plunger.

The next step consists in pushing forward the blocks, 4 and 7, to the positions C and E. This operation pushes forward the stock, A,

and thus drives the end thereof forcibly against the end of the then fixed plunger, 10. Obviously the effect is to upset the hot metal against the end of the plunger whereby the metal is forced out to fill the cavity, 9. The space between the plunger, 10, and the inner wall of the cavity, 9, determines the thickness of the tube to be produced. The length of the tube to be produced is determined by the extent to which the end of the stock is initially protruded into the cavity, 9 (see positions B and D). Thus, as illustrated in the positions C and E considerable more metal is displaced than is required to fill the die cavity, 9, with the result that at the end of the upsetting stroke of the propeller, 4, and the rod, A, the tube will have been partly projected or squeezed off of the cavity, 9, and a considerable distance along the plunger, 10. This is clearly represented at, A'. It is important to note that at this stage there remains an integral junction, A^2, which still connects the tubular part A', with the parent stock, A.

In the upsetting operation the metal is caused to completely fill the bore, 8, to form its shoulder, A^3, against the end of the clutch, 5, rather than within the block, 7, or between the same and the part, 5. Either of the latter conditions would make difficult the next forward feed of the stock.

Having conditioned the metal as in positions C and E, I next retract the part, 4, to the position, B, leaving the block, 7, in the position, E, and leaving the plunger in the position, G. At that time the enlarged end or juncture, A^2, being interlocked with the then stationary block, 7, prevents the retraction of the rod, A, along with the clutch, 4—5.

Having restored the clutch in readiness to again feed the stock forward, I allow the same to remain stationary for a moment, and at that instant force the block, 7, forward to the position, F, meantime leaving the plunger still in the position, G. In consequence the block, 7, shears the integral junction, A^2, off over the end of the rod, thus severing the completed tube, A^x, from the parent stock, as well illustrated at the point, 14.

At the next instant I retract the die block, 7, thereby restoring the block, 7, to the position, D, and causing the stock to again protrude into the die cavity, 9. At the same time I retract the plunger, 10, and thus strip or release the completed tube, A^x, from the plunger, 10, as clearly shown at the bottom of the drawing.

The forward end of the tube abuts the member, 11, when the plunger, 10, is retracted and this abutment serves a useful purpose in that it tends to straighten the end of the still hot tube. Upon its release from the plunger, 10, the completed tube, A^x, falls into a receiving trough, not shown.

Obviously, it is only necessary to restore the plunger, 10, from the position, H, to position, D, to begin a new cycle of operations.

A complete cycle of operation, as above described, occurs within a fraction of a minute. As will be apparent to those skilled in the art, no part of the operation requires that either the stock or the die blocks shall move slowly. The capacity of the machine is great. It is wholly automatic in operation, once the end of a rod is caught in the clutch, 5, and power is supplied to move the several members as described.

As every article is subjected to compression within the forming or upsetting die, and as even the central opening in the article is formed while the metal is under compression, the article produced is of superior quality, both as to the state of the metal composing it and as to the character or finish of its surfaces.

In making such articles, I use metal rods; passing them through the heating furnace and preferably welding (electrically or otherwise) the end of one rod to that of the next, so that the process may proceed continuously, and without interruption; and thereby avoid a minor waste which would otherwise be suffered through the leaving of short ends of rods to be cared for. However, the word "continuous", as herein used, relates to the operation upon any single rod, however short or long it may be.

I have not herein attempted to illustrate means for imparting movement to the several reciprocating members. These parts may be moved by means of several lever mechanisms that will suggest themselves to a competent mechanic.

Various modifications of my invention will suggest themselves to those skilled in the art, and it is possible to modify the order of the steps described. Therefore I do not limit the invention to the precise preferred order or to the preferred construction herein described, except as prescribed by the hereunto appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. The improvement in the art of making metal tubes and the like, without waste of metal, which consists in simultaneously upsetting and piercing the end of a rod to form the body of the article, while leaving the latter integrally connected with the parent rod, then shearing that connection from the end of the rod, leaving as the extreme end of said rod the portion of metal which previously formed the corresponding portion of the upset body.

2. The herein described apparatus for making tubes and the like without waste, which comprises a rod propelling member, in combination with a die-block which is coaxial therewith and is adapted to receive the end of the rod from said member and through which the rod feeds, an upsetting and piercing plunger coaxial with said die block and adapted to coact therewith to first form the tubular article upon and then strip or shear it from the end of the present rod, and the said plunger being adapted for retraction to discharge the completed article.

In testimony whereof, I have hereunto set my hand this 30th day of January, 1918.

WALTER E. AMBERG.

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