J. E. WILLIAMS.

METHOD OF MAKING BANDS FOR SHELLS OR PROJECTILES.

APPLICATION FILED DEC. 28, 1915.

1,205,301. Patented Nov. 21, 1916.

Fig. 5

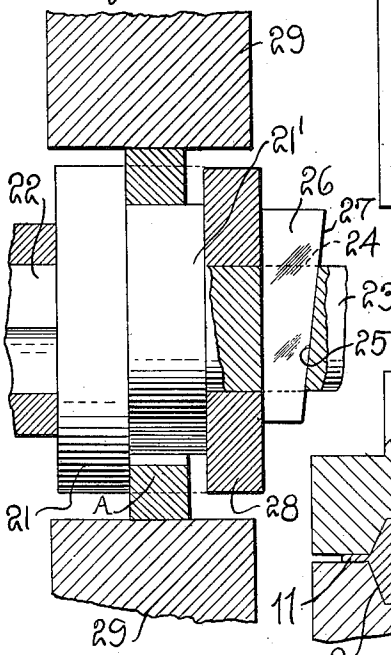


Fig. 1

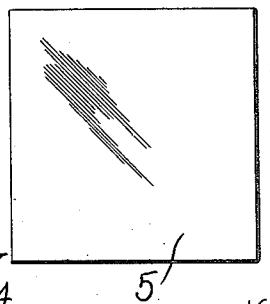


Fig. 4

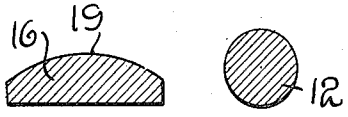


Fig. 2

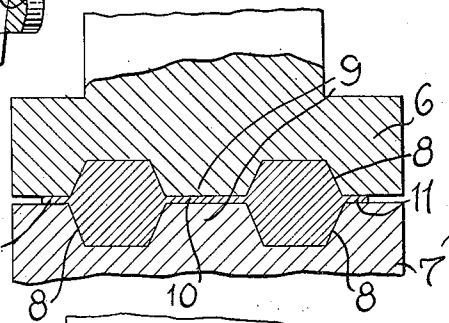
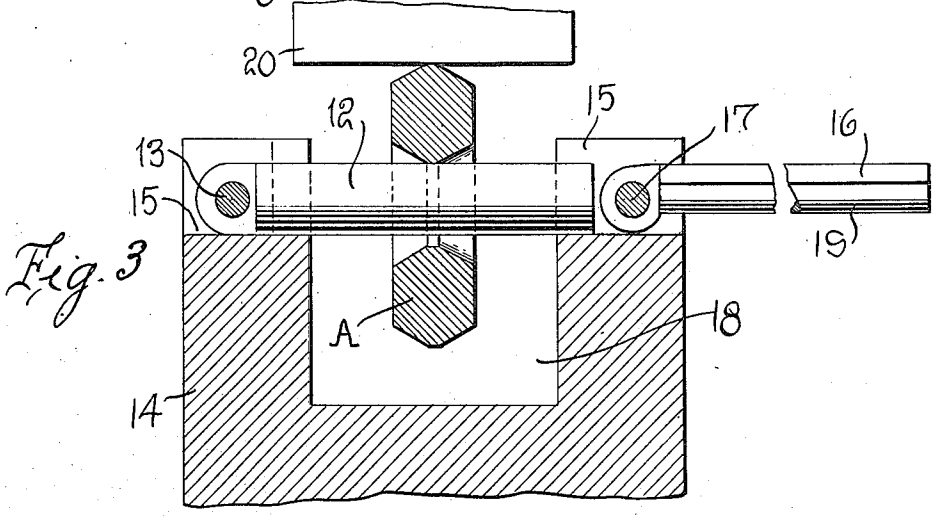


Fig. 3



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METHOD OF MAKING BANDS FOR SHELLS OR PROJECTILES.

1,205,301. Specification of Letters Patent. Patented Nov. 21, 1916.

Application filed December 28, 1915. Serial No. 69,023.

To all whom it may concern:

Be it known that I, JAMES E. WILLIAMS, a citizen of the United States, residing at Congress Heights, in the District of Columbia, have invented certain new and useful Improvements in Methods of Making Bands for Shells or Projectiles, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to an improved method of making bands for shells or projectiles, and has for its primary object to produce a band of the required thickness and diameter from a metal blank by certain mechanical operations, whereby the molecules of the metal will be homogeneously compacted or united so that the band will have a maximum tensile strength.

It is another important object of the invention to devise an improved method whereby the above desirable result may be obtained, which consists of three very simple primary operations whereby the operator is enabled to accurately form the band in a minimum length of time.

Heretofore, shell bands have been produced by drawing out a copper ring or blank into tubular form until the same is of the required diameter, and then cutting the tube into a multiplicity of rings or bands. By thus drawing the metal, its tensile strength is greatly decreased. The present improved method eliminates this drawing operation and the ring or annulus, in its original form, is produced from a blank by means of suitable dies. This ring varies in thickness and is placed upon suitable mandrels and radial pressure exerted thereon by means of a trip hammer to reduce the same to a uniform thickness. Finally, by suitable mechanical means, a compressing pressure is exerted upon the annulus to produce a band of the desired thickness, width and diameter.

With the above and other objects in view, my invention consists in the novel features of construction, combination and arrangement of parts to be hereinafter more fully described, claimed and illustrated in the accompanying drawing, in which,

Figure 1 is a plan view of the copper blank; Fig. 2 is a sectional view through the dies whereby the ring or annulus is formed from the blank; Fig. 3 is a vertical section through the mandrel support, showing the annulus arranged upon one of the mandrels and operated upon by a trip hammer; Fig. 4 shows detail transverse sectional views of the mandrels; and Fig. 5 is an elevation illustrating one means of mechanically applying pressure to the opposite faces of the annulus in the line of its axis.

Referring in detail to the drawing, in Fig. 1 thereof I have shown the rectangular copper blank 5 which, of course, is of the necessary dimensions to enable a band of the required diameter to be produced therefrom. The upper and lower die members 6 and 7 respectively, shown in Fig. 2, are each provided with an annular groove or channel 8 in its face and a central tapering boss 9, the end face of which is disposed in the same plane as the end face of the die. The metal blank 5 is heated and then placed between the die members, and the upper die 6 brought down by suitable mechanical means upon said blank. It is understood that the blank is suitably heated so that the compressing action of the upper die will force the same into the channels 8 of the die members, and mold from said blank an annulus of hexagonal form in cross-section. As shown in Fig. 2, the opposed end faces of the die bosses 9 do not touch each other in the final position of the upper die so that there remains, after the annulus is formed, a thin film or web of metal indicated at 10. The surplus metal from the blank is forced outwardly between the die faces and remains connected to the medial portion of the ring or annulus, as indicated at 11. The annulus is then removed from the dies, and the central web 10 and the outwardly extending flange 11 are trimmed off from the body of the annulus. The annulus is now placed upon a mandrel 12 which is pivotally mounted at one of its ends, as indicated at 13, on one side of a stand or support 14. The opposite sides of this saddle or support are recessed, as at 15, and the mandrel 12 which is pivotally mounted in one of these recesses is adapted to be seated at its other free end in the other recess 15. In this latter recess, a second mandrel 16 is pivoted, as at 17, and when the mandrel 12 is in operative

position, this latter mandrel 16 is in an inoperative position and extends laterally from the saddle or support. This saddle between the side standards in the upper ends of which the mandrels are mounted, is cut away, as at 18, to accommodate the annulus A from which the shell band is to be formed. The mandrel 12 is of cylindrical form, as shown in Fig. 4, and the diameter of this mandrel is less than the width of the other mandrel 16. This latter mandrel has a flat bottom face and a curved or convex upper face 19. The annulus A is first arranged upon the mandrel 12, and the free end of this mandrel is seated in the corresponding recess 15. As above stated, the annulus formed by the dies is of hexagonal form in cross-section, the inner and outer faces thereof being inclined or tapered. The meeting point or apex of the inner inclined faces of the annulus engages upon the mandrel 12.

20 indicates a trip hammer which is arranged centrally above the saddle or support for the mandrel and is operated by compressed air or other suitable means. This hammer delivers rapid and powerful blows upon the outer peripheral face of the annulus at its center. The inner peripheral face of the annulus bears against the solid abutment or mandrel 12 so that the radial compressing force of the hammer blows upon the annulus acts to compactly or homogeneously unite the molecules of metal. In such operation, the inner and outer peripheral faces are gradually reduced to parallel relation to the mandrel so that the annulus will be of uniform thickness, while the internal diameter of the ring is gradually enlarged. It is understood, of course, that during this operation of the trip hammer, the annulus is being continually turned or rotated upon the mandrel.

The annulus is removed from the mandrel 12 and said mandrel swung over to the left of the position shown in Fig. 3, while the mandrel 16 is swung over to the position formerly occupied by the mandrel 12, the annulus being disposed upon said mandrel 16 in contact with the convex face 19 thereof. The mandrel 16 with the annulus thereon being arranged in operative position in the saddle or support, the outer face of the annulus is again acted upon by the trip hammer to further enlarge the internal diameter of the annulus and increase the width thereof. The annulus is now in proper condition for the final operation. In Fig. 5, I have shown a metal abutment in the form of a heavy disk 21, from one side of which a rectangular shank 22 projects. This shank is engaged and securely held by means of suitable tongs or other clamping device, and upon the opposite side of the abutment disk or head 21, a shoulder 21′ is formed, from which a reduced cylindrical stem 23 projects. This stem 23 is provided with an elongated opening or slot 24 therein, the outer end wall of which is transversely inclined as at 25.

26 designates a wedge pin or slug which is of greater length than the diameter of the stem 23 and has one of its longitudinal edges obliquely inclined, as at 27, for coöperative engagement with the inclined end wall 25 of the slot 24. The annulus, after being removed from the mandrel 16, is engaged upon the shoulder 21′, one side of said annulus contacting with the abutment or head disk 21, and a metal washer plate 28 is then fitted over the stem against the other face of the annulus. The wedging pin or slug 27 is now driven through the slot 24 in the stem, and one edge of this pin frictionally bears against the outer face of the washer 28 and forces the same inwardly upon the stem 23 against the shoulder 21′. Swaging dies, indicated at 29, are then engaged at opposite points upon the periphery of the annulus and substantially encircle the same, these dies being operated by any suitable mechanical means to exert pressure upon the annulus. Thus, a compressing force is exerted upon the annulus so that the same will be increased in width while decreased in diameter, as indicated in dotted lines in Fig. 5. This compression of the annulus is continued until the same is of the required thickness and diameter.

It is essential, for certain practical reasons, that the copper bands used upon gun shells shall have a high tensile strength, and in so far as I am aware, in the formation of these bands by prior methods or processes which have long been in use, the metal is, to a greater or less extent, reduced in tensile strength, as in all such methods the copper blank from which the bands are formed, is drawn.

As above disclosed, in the present method instead of drawing the metal, the same is hammered or compressed and the molecules thereof compacted together so that there will be a homogeneous unity of the same when the band is produced in its final completed form. I have herein referred to certain mechanical devices for operating upon the metal blank and the annulus, which I have found to be admirably adapted for the purpose in actual practice, but I desire it to be distinctly understood that I do not in any manner limit myself to the use of these illustrated and described mechanisms, as the method may as well be carried out by employing various other mechanical devices whereby the several operations could be as well performed with equal facility. I have also found in the practice of the new method, that the metal bands may be as quickly and accurately made as in the old methods and

processes heretofore employed, while at the same time, the very desirable and long sought for high tensile strength in the metal band is attained by working the metal while the same is hot.

Having thus fully described my invention, what I desire to claim and secure by Letters Patent is:—

1. A method of making ordnance shell bands which consists in heating a metal blank and forming an annulus therefrom having plane side faces and conical-shaped inner and outer peripheral faces, then applying radial pressures to the inner and outer peripheral faces of the annulus to reduce the same to uniform thickness and finally exerting a pressure upon the annulus to produce a band of the required thickness, width and diameter.

2. A method of making ordnance shell bands, which consists first in heating a metal blank and mechanically forming an annulus therefrom of many-sided form in cross-section, then applying radial pressures to the meeting edges of adjacent faces of the annulus to reduce the same to uniform thickness, and finally exerting a compressing pressure upon the annulus to produce a band of the required thickness, width and diameter.

3. A method of making ordnance shell bands which consists first in heating a metal blank and mechanically forming an annulus therefrom of polygonal shape in cross-section and having inner and outer converging faces meeting at the transverse center of the annulus, then applying pressures to the meeting edges of said inner and outer faces to reduce the annulus to uniform thickness, and finally exerting a compressing pressure upon the annulus to produce a band of the required thickness, width and diameter.

4. A method of making ordnance shell bands which consists first in heating a metal blank and mechanically forming an annulus therefrom of hexagonal form in cross-section, said annulus having plane side faces and converging inner and outer faces meeting at the transverse center of the annulus, then arranging said annulus upon a mandrel and applying pressure to the meeting edges of the outer peripheral faces thereof to reduce the annulus to uniform thickness, and finally exerting a compressing pressure upon the annulus to produce a band of the required thickness, width and diameter.

5. A method of making ordnance shell bands which consists first in heating a metal blank and mechanically forming an annulus therefrom of varying thickness, then arranging said annulus upon a mandrel and applying radial pressure to the outer peripheral face thereof to reduce the annulus to uniform thickness, and finally exerting a compressing pressure upon the annulus to produce a band of the required thickness, width and diameter.

6. A method of making ordnance shell bands which consists first in heating a metal blank and mechanically forming an annulus therefrom of varying thickness, then arranging the annulus upon a mandrel and applying pressure to the outer peripheral face thereof to reduce the annulus to uniform thickness, then arranging said annulus upon a second mandrel and exerting further pressure upon its peripheral face, and finally applying mechanical pressures to the opposite side faces of the annulus to produce a band of the required thickness, width and diameter.

7. A method of making ordnance shell bands which consists first in heating a metal blank and mechanically forming an annulus therefrom of varying thickness, then arranging said annulus upon a mandrel, and applying pressure to the outer peripheral face thereof while the annulus is rotated, then arranging the annulus upon a second mandrel and again applying pressure to the outer face thereof whereby the annulus is reduced to a uniform thickness, and finally exerting a mechanical compressing pressure against the opposite sides of the annulus to produce a band of the required thickness, width and diameter.

8. A method of making ordnance shell bands which consists in confining a heated annulus against longitudinal expansion and then mechanically applying a radial compressing pressure against the inner and outer peripheral faces of said annulus.

9. A method of making ordnance shell bands which consists in applying in quick succession radial hammering pressures to the periphery of a heated annulus as the same is turned upon a mandrel to reduce the annulus to a desired cross-sectional form, and then mechanically applying a compressing pressure upon the annulus both radially and axially thereof to produce a band of the required thickness, width and diameter.

10. A method of making ordnance shell bands which consists in applying intermittent radial pressures in quick succession to a heated annulus to reduce the same to a desired cross-sectional form, and then applying a radial compressing pressure to the annulus uniformly throughout its area and during the continuance of such radial pressure causing a pressure upon the annulus in the line of its axis to produce a band of the required thickness, width and diameter.

11. A method of making ordnance shell bands which consists in heating a metal blank and forming an annulus therefrom, then applying intermittent radial pressures in quick succession to the inner and outer faces of the annulus to increase its internal diameter and reduce the annulus to a de-

sired cross-sectional form, then applying a radial compressing pressure to the annulus uniformly throughout its area and during the continuance of such radial pressure causing a pressure upon the annulus in the line of its axis, whereby the annulus is reduced to the desired thickness, width and diameter.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JAMES E. WILLIAMS.

Witnesses:
AMELIA S. WILLIAMS,
ANNIE I. HIND.