J. W. OFFUTT, J. J. DUNN & J. H. NICHOLSON.

METHOD OF MAKING CARTRIDGE CASES.

APPLICATION FILED DEC. 18, 1915.

1,296,842. Patented Mar. 11, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

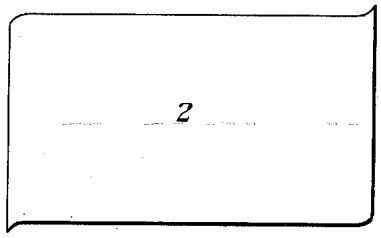


Fig. 2.

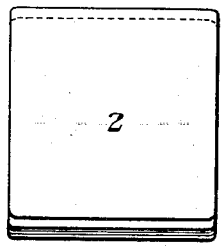


Fig. 3.

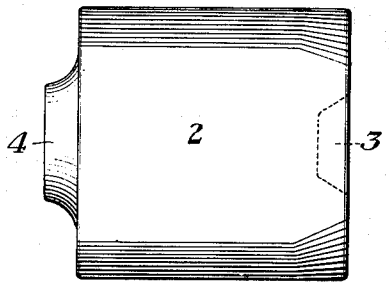


Fig. 4.

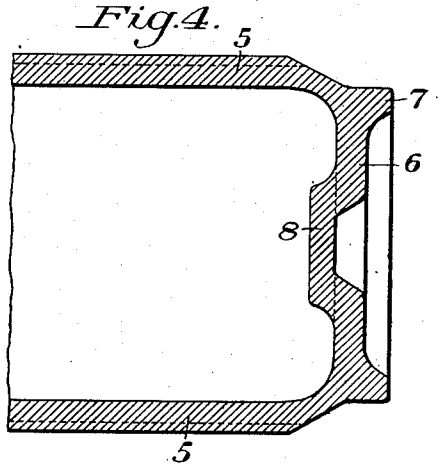
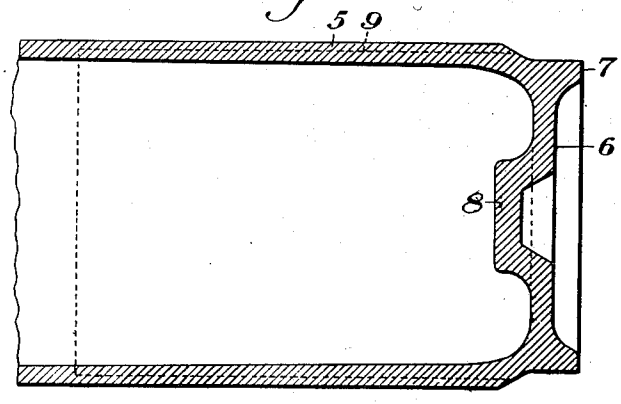


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 6.

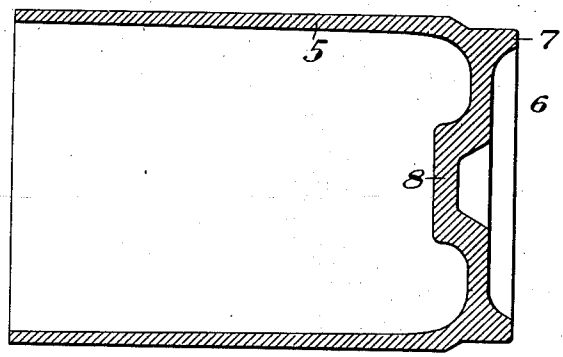


Fig. 7.

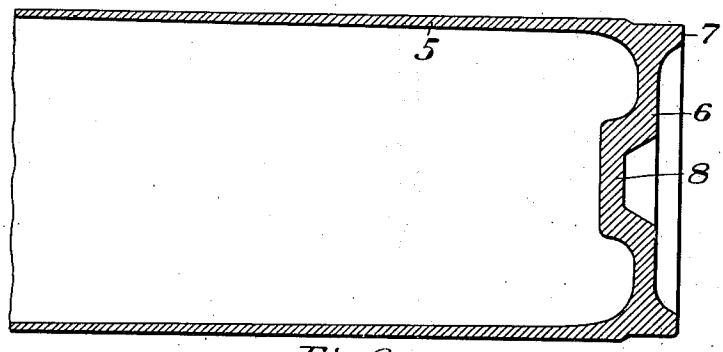


Fig. 8.

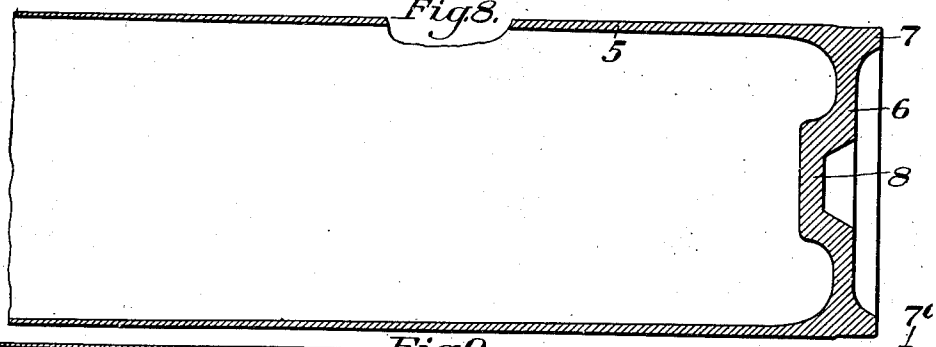
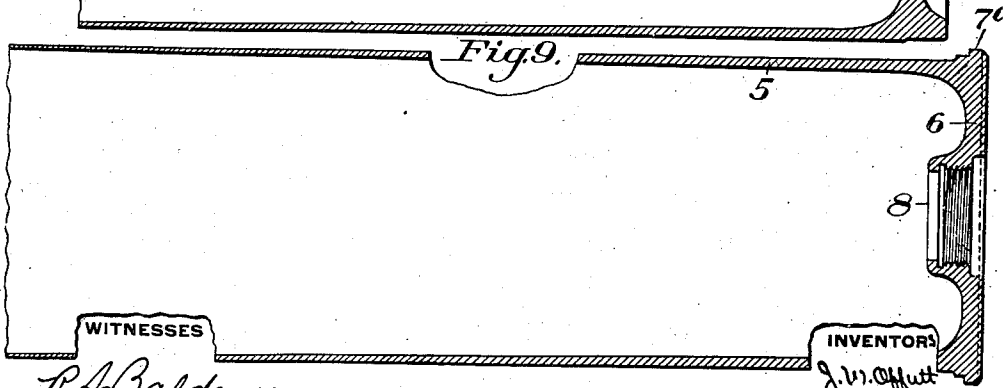


Fig. 9.



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METHOD OF MAKING CARTRIDGE-CASES.

1,296,842. Specification of Letters Patent. Patented Mar. 11, 1919.

Application filed December 18, 1915. Serial No. 67,579.

To all whom it may concern:

Be it known that we, JOHN W. OFFUTT and JERRY J. DUNN, citizens of the United States, residing at Ellwood City in the county of Lawrence and State of Pennsylvania, together with JOHN H. NICHOLSON, a citizen of the United States, residing at Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Making Cartridge-Cases, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 shows the heated blank cut from a bar, bloom or billet.

Fig. 2 is an end elevation of the same.

Fig. 3 shows the first forming step.

Fig. 4 is a partial longitudinal section of the blank after piercing.

Fig. 5 shows the hot drawn blank, indicating in dotted lines the machining of the same.

Fig. 6 shows the turned and trimmed cut blank.

Figs. 7 and 8 show portions of the blank after two successive cold drawing operations, and

Fig. 9 is a view of the blank after the third cold drawing operation and the pressing out of the base rim portion.

Our invention relates to the manufacture of steel cartridge cases. Heretofore these have generally been made of brass on account of the difficulty of forming and drawing steel cases and of obtaining therein the necessary physical properties to prevent splitting or permanent expansion of the case when subject to the firing pressure. These physical properties are necessary in order to avoid the difficulty of extraction due to jamming of the case in the breech of the gun resulting from such splitting or permanent expansion.

We have discovered a method by which, using the proper grade of steel and subjecting it to our process, steel cartridge cases may be made which will fulfil all the requirements and provide a cheaper case than that made of brass.

In carrying out our process, we employ a class or grade of steel having a moderate amount of a hardening or toughening agent, preferably carbon. Other hardening agents may be employed, but the steel must be of a grade which may be worked in the forming operations and at the same time may be toughened or tempered by heat treatment thereafter to give it the required resilience or elastic recovery properties necessary in cartridge cases, to enable them to resume substantially their original size and shape, after release of the pressure of the firing charge. For this purpose we prefer to employ a steel of about .40 carbon, as we have found that such steel may be worked both hot and cold in the necessary forming operations for cartridge cases, and at the same time the base portion which is the part particularly requiring the elastic recovery properties may be toughened and tempered at a temperature which will not destroy the effects of cold drawing, but will raise the elastic recovery to the desired extent.

The steel is rolled into the form of a bar or billet either round or square, or of any desirable shape, which is heated and cut into suitable lengths, such as shown in Fig. 1. This blank is then preferably given a preliminary forging operation to furnish the blank of Fig. 3, in which a central indentation 3 is formed at one end, and a central projection 4 at the other end. This may be carried out at the first heat, after which the blank is preferably reheated. After reheating, the blank is put in a suitable die and hot-pierced and shaped to form the hollow blank of Fig. 4. This blank has the side walls 5 and the base 6 with an endwise annular projection 7, the central portion being inset at 8. It is then hot-drawn in a drawing machine, preferably at the same heat, to elongate it and thin the side walls, as shown in Fig. 5. The blank is then allowed to cool and the outer portion of the cylindrical wall is turned off in a lathe or suitable machine, as indicated in dotted lines at 9 in Fig. 5, and the open end portion of the blank is cut off or trimmed, giving the blank of Fig. 6. This machining operation is of great advantage preliminary to the cold-drawing of the blank. This blank is then subjected to several cold drawing operations, preferably three in number.

Figs. 7 and 8 show the blank after two of these cold drawing operations; and after the third cold drawing operation the blank is put in a suitable press and while the metal is cold the base flange 7 is forced outwardly, as shown in Fig. 9, to form the projecting rim of the cartridge case. In this operation

this projecting flange is forced out and brought substantially into the plane of the base portion proper.

The walls of the case are tapered, preferably by means of shaping dies, after the cold drawing operations are finished and either before or after the rim portion is formed from the annular projection at the base, preferably after this rim portion is formed.

We then heat-treat the base portion of the case, including a short portion of the side walls, preferably by heating this portion to a proper temperature and oil tempering the same. This tempering operation toughens and increases the strength of the base portion which is otherwise liable to permanently bulge under the high pressures of firing charge. The cold drawing operations give the thin side walls of the case the requisite physical properties, but this cold drawing does not affect the base portion sufficiently to give the required strength and characteristics. Consequently, we heat-treat this lower thicker base part, including the juncture with the side walls, in order to secure these properties.

The case is then also preferably coated with a protective metal, such as copper, and this may be carried out by electro-plating, or any other desirable process, to avoid corrosion during storage.

The advantages of our invention will be obvious to those skilled in the art, since the process enables a cheaper case to be made while, at the same time, the required physical characteristics of material are provided. The lower side walls of the case must be of such a character as to contract after being relieved of the firing pressure. In the firing operation the walls of the case and the bottom are distended against the wall of the cartridge chamber and breech block of the gun, and these case walls and bottom must then contract after the pressure is released, in order to provide for easy withdrawal of the used case.

We can obtain these desired characteristics by using a steel having a moderate amount of hardening or toughening agent; as we find that the cold drawing operations, together with heat treatment thereafter, will impart the necessary resilience to the lower portion of the case as well as increase the strength of the portion of the case joining the base and side walls.

Steel containing other hardening agents than carbon may be employed, the shaping steps may be varied, and other variations may be made without departing from our invention, as we consider ourselves the first to obtain a steel case having the required strength and elastic recovery characteristics essential in this article.

We claim:

1. In the manufacture of steel cartridge cases, the steps consisting of hot-drawing a hollow blank, allowing the same to cool, machining the exterior of the wall, then cold-drawing the blank, and then heat-treating the base of the case to raise its coefficient of elastic recovery, substantially as described.

2. In the manufacture of steel cartridge cases, the steps consisting of cold-drawing a hollow blank of a hardening steel, and then heat-treating the lower portion of the blank to raise its coefficient of elastic recovery, substantially as described.

3. In the manufacture of steel cartridge cases, the steps consisting of hot-shaping a hollow blank of a hardening steel, cutting away the exterior portion of the wall, then subjecting the same to two or more drawing operations, and then heat-treating the base of the blank to raise its coefficient of elastic recovery, substantially as described.

4. In the manufacture of steel cartridge cases, the steps consisting of hot-shaping a hollow blank from a hardening steel, hot-drawing the same, then cold-drawing the hollow blank, and then heat-treating the base of the blank to raise its coefficient of elastic recovery, substantially as described.

5. In the manufacture of steel cartridge cases, the steps consisting of hot-forging a hollow blank from steel containing a sufficient amount of a hardening agent to provide for tempering under heat treatment while not preventing the hot forging thereof, thereafter cold-drawing the blank, and thereafter heat-treating the lower portion of the blank to raise its coefficient of elastic recovery, substantially as described.

6. In the manufacture of steel cartridge cases, the steps consisting of subjecting a hollow blank containing approximately .40 carbon to a succession of cold-drawing operations, and thereafter heat-treating the lower portion of the blank to raise its coefficient of elastic recovery, substantially as described.

In testimony whereof, we have hereunto set our hands.

JOHN W. OFFUTT.
JERRY J. DUNN.
JOHN H. NICHOLSON.

Witnesses as to John W. Offutt and Jerry J. Dunn:
G. E. MOYERS,
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Witnesses as to John H. Nicholson:
CHRIS SPRING,
P. F. HELBLING.