Aug. 21, 1945. G. E. HYDE, JR 2,383,315

AMMUNITION

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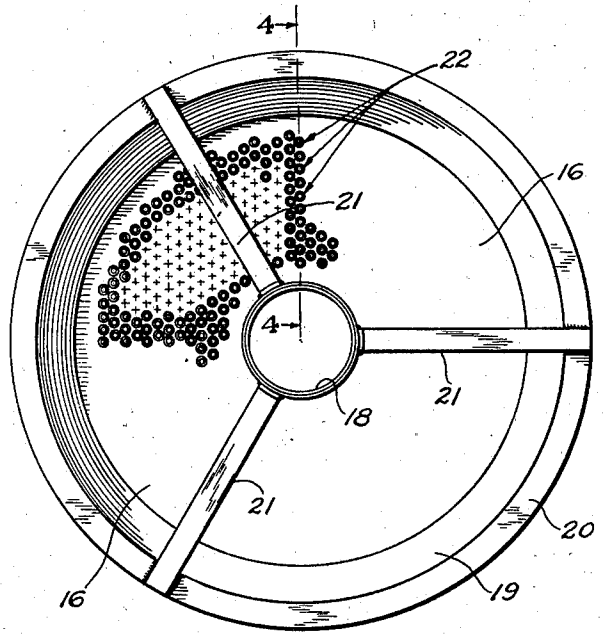


Fig. 2

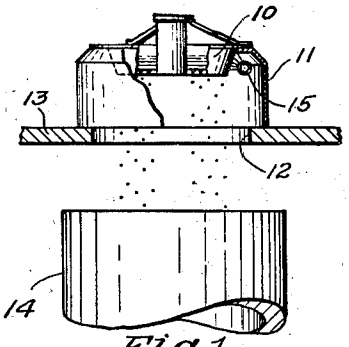


Fig. 1

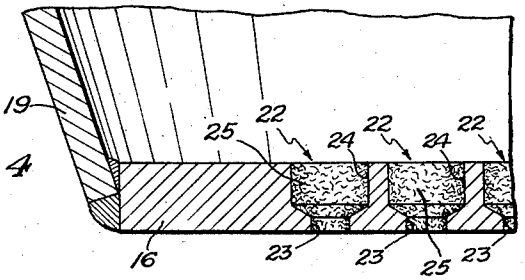


Fig. 4

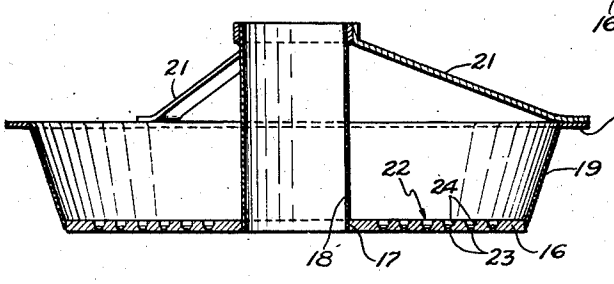


Fig. 3

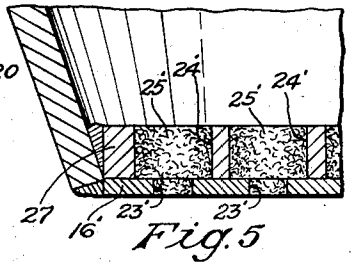


Fig. 5

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1 Claim. (Cl. 83—91)

This invention relates, in general, to ammunition, and, in particular, to an improved method and means for the production of dropped shot.

An object of the invention is to produce large size shot by drop shot methods. A further object is to provide an improved dross pouring pan for forming large size shot uniformly and consistently. The invention likewise includes other improvements in the production of shot as will hereinafter appear.

In general, shot are produced by two methods, namely, either by casting or by forming drops of the molten metal and enabling the drops to fall from a given height into a liquid bath.

The casting technique is used for the production of relatively large shot which, in accordance with accepted nomenclature, are termed buck shot and decrease in size from No. 000 buck shot, which is approximately 0.36 inch in diameter, to No. 4, which is substantially 0.24 inch in diameter. Moreover, all shot ranging from 0.23 inch to 0.21 inch in diameter and identified as FF, F and TT shot have heretofore been cast.

All shot smaller than No. TT is produced by either of two somewhat similar drop forming methods identified in the art as the shower pan and dross pan techniques.

The shower pan is used for the production of the smallest sizes of dropped shot which range from No. 12, which is approximately .05 inch in diameter, to No. 4, which is substantially 0.130 inch in diameter. The shower or "frying" pan from which this process takes its name consists simply of a pan having a thin bottom provided with a large number of drilled holes. The pan is supported in the top of a shot tower and when molten lead is poured therein the lead passes out through the holes forming substantially spherical drops on the bottom of the pan which detach themselves from the apertures and shower down into a liquid in the well at the bottom of the tower.

In general, a "dross" pan is used for the production of shot which are larger than No. 4 dropped shot but smaller than No. TT. This range includes dropped shot which increase in size from No. 3 which is substantially 0.140 inch in diameter through Nos. 2, 1, B, BB, BBB, AR and T. The latter size of shot are substantially 0.20 inch in diameter and are the largest size that it has heretofore been practicable to produce by prior art dropped shot methods.

Heretofore, the dross pan has comprised a relatively large receptacle having a comparatively thin bottom provided with a plurality of holes, each hole being substantially 30% larger than the desired shot size. A substantially one inch layer of filtering material, such as a lead oxide dross formed by blowing air through molten lead, is spread over the bottom of the pan filling the holes and quite frequently exuding down through the apertures in the form of attenuated teats. In use, molten metal is poured into the pan to form a substantially three or four inch pool of lead which trickles down through the filter and forms large drops on the bottom of the pan at the apertures or at the ends of the teats. When these drops have assumed a substantially spherical shape, they detach themselves from the apertures or teats and fall down into the well. Inasmuch as the apertures differ substantially in size from the attenuated teats and inasmuch as the teats themselves vary widely in size and shape the sizes of the lead shot formed by a single dross pan of this type have been numerous and non-uniform.

Although this type of dross pan has been used commercially for the production of dropped shot up to and including No. T shot, all efforts to produce dropped shot larger than No. T, and identified as Nos. TT, F and FF which range from 0.21 inch to 0.23 inch in diameter have heretofore been impracticable.

The primary cause of this lack of success has been the inability to maintain a proper dross bottom on the pan. Due to thermal stresses and erosion, cracks and splits tend to form in the filter, and, as soon as this occurs, the molten lead pours down through several of the relatively large apertures in the pan bottom in a substantially solid stream which causes great potential damage to the tower well and conveying chains and interrupts production until the dross bottom of the pan can be repaired which, in most instances, requires a prohibitive length of time. Moreover, although dross pans for No. TT shot have been operated for short intervals without mishap, the size of the shot produced has been primarily No. T shot plus a wide variety of smaller shot. In fact, there have been known instances when there were as many as twenty or more different sizes of shot falling into the well. As a consequence, the production of shot of the required size was practically nil. There has been, therefore, no practicable way heretofore of producing large quantities of the larger sizes of shot, except by casting, and this method is expensive and unsatisfactory.

The present invention provides an improved dross pan which is capable of producing large sizes of dropped shot consistently, of substantially uniform size, and in large quantity lots without the numerous disadvantages inherent in the equipment and methods heretofore used.

In the drawing:

Fig. 1 shows diagrammatically a fragmentary elevation partly in section of a dross pan mounted at the top of a drop tower.

Fig. 2 shows a plan view of the dross pan of this invention.

Fig. 3 shows a sectional elevation of the dross pan of Fig. 2.

Fig. 4 shows an enlarged fragmentary sectional view of the apertures in the bottom of the dross pan on line 4—4 of Fig. 2.

Fig. 5 is an enlarged fragmentary sectional view of a modification of the pan shown in Fig. 4.

Referring to Fig. 1, which shows a fragmentary exemplary embodiment of apparatus used in the production of dropped shot either by the shower pan or dross pan method, the pan, indicated generally at 10, is supported in a suitable housing 11 which is mounted over an aperture 12 in the topmost floor 13 of the shot tower and directly above the upper end of the shot tower tube 14. The housing 11 may include heating means such as the gas burners 15 for maintaining a molten lead bath in the pan. As is well understood, spherical drops of molten lead form at the apertures on the bottom of the pan. When these drops have partially congealed, they detach themselves from the bottom of the pan and fall down the tube 14 into a well of water in the base thereof from which they are collected and subsequently delivered into suitable storage bins.

Referring to Fig. 3, which shows an elevation in section of the dross pan 10 of this invention, the pan comprises a disk-shaped bottom 16 of a suitable metal, such as machine steel, which, for the purposes of this specification, is substantially twenty-six inches in diameter and one-half inch thick. The disk is provided with a central aperture 17 for accommodating the lower end of a cylindrical steel sleeve 18 which is welded or otherwise secured therein. The wall 19 of the pan comprises a relatively thin sheet of steel welded at its lower edge around the periphery of the bottom 16 and provided with a substantially horizontally disposed rim 20 at its upper edge. In the present embodiment, the walls of the pan converge downwardly towards the bottom of the pan. Suitable braces or reinforcing members 21, three being shown in the present embodiment, are secured at their lower ends to the rim 20 and at their upper ends to the upper end of the sleeve 18.

The bottom 16 of the pan is provided with a plurality of holes, indicated generally at 22, see Fig. 4, and in the present embodiment number approximately 764 within the limits of the drilled area.

Each hole 22 comprises an aperture 23 drilled in the lower surface of the bottom 16, the aperture being substantially $\frac{3}{64}$ of an inch deep and $\frac{5}{16}$ of an inch in diameter. These dimensions govern the size of the shot which will be produced by this particular dross pan, and, for most satisfactory results, the diameter of each aperture is made substantially 30% greater than the actual size of the shot which forms at the aperture.

The specific dimensions given herein are for a dross pan having apertures adapted to form No. TT shot, but, it will be understood that the pan may comprise other equivalent materials and have other shapes and dimensions depending upon the size of shot to be formed. Each aperture 23 is provided with a concentric counterbore 24, the diameter which is substantially $\frac{5}{8}$ of an inch and which extends down from the upper surface of the bottom 16 and constitutes, in effect, a pocket or cell above its respective aperture 23.

These counterbores or cells are to be filled with a plug of a suitable filter material 25 such as lead oxide dross. This filter material is compacted and kneaded into the individual cells in substantially the same manner used heretofore in forming a single layer of dross on the bottom of the pan. In general, the dross plugs are formed by placing the required number of lead oxide pigs in the bottom of the pouring pan and then immersing the pan in a bath of molten lead. The dross pigs soon soften and the softened material may then be kneaded into the individual cells or counterbores while slowly withdrawing the pouring pan from the lead bath. Thus, each aperture 23 of the pouring pan will, when ready for the production of lead shot, be filled by a lead plug 25 of dross or similar filter material. Moreover, due to the converging walls of each counterbore 24, the dross material tends to bridge across the upper end of its aperture 23 thus preventing the dross from exuding from the bottom of the aperture in the form of an attenuated teat.

In operation, when molten lead is poured into the pan, the lead will seep down slowly through the dross plugs and form substantially spherical drops of lead at the lower ends of the apertures 23. These globules of lead will subsequently detach themselves and fall in a substantially frozen condition down into the well of the tower where they will be collected and removed in the well known manner. Since all the globules are formed at the lower ends of the apertures 23 and not at the ends of dross teats projecting from the apertures as heretofore practiced, the drops are all of a substantially uniform size.

It will be evident that the counterbores 24 constitute means for segregating the dross into a plurality of isolated filters 25, each located over an aperture 23 so that the formation of large areas of dross susceptible to cracks and splits is obviated. Thus, even though an individual filter plug fails, the result will be simply the escape of a thin stream of lead which atomizes into a shower of fine shot directed straight down the tower and is neither hazardous nor does it interfere with the continuous production of shot.

Although the pan shown and described is particularly suited to form size TT shot, it will be understood that similar pans having proportional dimensions may be used effectively for the production of size F and FF dropped shot.

A modification of the proposed dross pan is shown in Fig. 5. In this embodiment, the pan comprises the usual type of dross pan having a relatively thin bottom 16' provided with drilled apertures 23'. Placed on top of this apertured bottom is a suitable metal plate 27 substantially equal in thickness to the bottom 16 minus the thickness of the bottom 16'. The plate 27 is drilled with apertures 24'. Both the apertures 24' and 16' are substantially equal in diameter to the corresponding holes 23 and 24 of the bottom shown in Fig. 4 and are adapted to be filled with filter plugs 25'. This modified pan is thus substantially equivalent to the dross pan discussed above but affords a somewhat simpler and more inexpensive construction.

What is claimed is:

A pouring receptacle for producing shot comprising a pan for holding molten metal; a bottom in said pan, said bottom comprising a pair of superposed plates each having a plurality of apertures, the apertures of the upper plate being larger than and in axial alignment with the apertures of the lower plate; and dross in each pair of axially aligned apertures, said dross terminating flush with the upper and lower ends thereof.

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