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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN CARTRIDGES MADE OF FUSIBLE METALS, &c.

Specification forming part of Letters Patent No. 136,468, dated March 4, 1873.

*To all whom it may concern:*

Be it known that I, WILLIAM HENRY TOOTH, of Brixton, in the county of Surrey, England, have invented an Improvement in Cartridges, of which the following is a specification:

My invention has for its object to furnish metallic cartridges which can be expelled from the guns, cannons, or fire-arms with the projectiles without leaving any residue behind to foul the barrels; and my said improvements also avoid the great waste of powder or explosive composition which sometimes takes place in consequence of the powder or explosive composition being blown out of the guns without having exploded or ignited. The invention consists in constructing the cartridges and projectiles or bullets either of one piece by stamping, pressing, casting, forcing through dies, spinning on a lathe, or passing through rollers, or they may be made of two or more pieces joined together, and for some purposes metallic cases are made to take in the projectiles and powder or explosive composition. The invention also refers to an improved manufacture of gunpowder or explosive composition, hereafter described, for charging the cartridges or otherwise.

In the manufacture of my cartridges I use any metal or semi-metal or compound thereof which is not corrosive—such, for instance, as tin-foil and compositions of lead and tin, and any other metallic substance which will fuse or melt at a comparatively low temperature, whereby the destruction of the cartridge is completely effected; or for a cartridge which is itself explosive, I use in making the body of the same the metallic substance or substances above enumerated with the addition of bismuth, such cartridge to be filled with powder or other explosive composition.

It will be seen that my said metallic cartridges differ from other cartridges, inasmuch as they can be blown out of the muzzle of the gun or fire-arm, whereas the metallic cases of other cartridges have to be extracted or withdrawn from the breech of the gun or fire-arm; but my cartridges may be inserted in the usual metallic cases, which will not be discharged; though this is a system that I do not recommend.

The practical application of this invention

can be effected according to the following details:

No. 1. To make metallic cartridges (*a*) which will fuse or melt in the barrel on firing the gun, I make use of the following alloys of metals—namely: Tin, seven and one-fourth parts; lead, thirteen parts; or (*b*) tin, twenty-one and three-fourths parts; lead, seventeen and one-half parts; or (*c*) tin, fourteen and one-half parts; lead, thirteen parts; or (*d*) tin, six parts; lead, one part; or (*e*) tin, nine parts; lead, one part; or (*f*) tin, two parts; lead, one part; or (*g*) tin, one part; lead, one part.

No. 2. To make a cartridge which will ignite and inflame, and also fuse or melt away in the barrel of the gun, but will not explode, I use the following alloys: (*a*) six tin, one lead, one zinc; or (*b*) four tin, two lead, one zinc; or (*c*) three tin, one zinc; or (*d*) two chemical equivalents of bismuth, one chemical equivalent of lead, and one chemical equivalent of tin.

These cartridges I prefer to manufacture by casting them in molds and forcing them through dies or rollers with a hollow core or plunger open at its ends. The before-mentioned cartridges can, as regards those under head No. 1, be made with bullets all in one piece and of the same alloy of metal; but in the case of those under head No. 2 I prefer to dispense with the zinc, since that substance would cause a festering wound, as zinc is generally combined with arsenic, and therefore the bullet in this case should be in a separate piece, (dispensing with the zinc,) and such bullet should be combined with the cartridge by casting the before-mentioned alloys around the same, and afterward forcing the whole through dies or rollers, as before mentioned.

No. 3. Under this head I proceed as follows: I take the before-mentioned alloy metal and roll the same into thin sheets, like tin-foil sheets, which I cut up into suitable sizes to form cartridges, and I place these to soak for, say, fifteen minutes in a strong solution of nitrate of potash. I then take the same out of the solution, allow them to dry, and then soak them again for another fifteen minutes, or thereabout.

Another mode of accomplishing this object is to place the sheets of any of the before-mentioned alloys of metal on sheets of paper, and



roll them together between a pair of strong calender-rollers, so as to get paper on the one side and metal on the other; or I take the common tin-foil or silver-covered paper and treat it in the same way as before described—that is, I soak it in nitrate of potash or nitrate of soda, although the latter will not so well accomplish the object. To form these matters into a cartridge, I take an ordinary bullet and I make up the following composition—that is to say: Starch, say, one pound, with a solution of one pound nitrate of potash and one-fourth pound of gunpowder, triturating or mixing them well together in a mortar or mill, and then take a brush and spread out a portion of the mixture sufficient to make the sheet adhesive, and roll the same on a mandrel with the bullet at the end, the mandrel and bullet being simply made equal to the size of the bore of the barrel in which it is to be used. This last-mentioned cartridge is an explosive cartridge, and in addition to which I use the before-mentioned explosive compound, which consists of two and one-half drams of gunpowder, three grains nitrate of potash, one grain oxide of manganese, and two grains chloride of potash; but I reduce these proportions, when required, according to the strengths of

the barrels of the guns; and I find that even one grain of nitrate of potash is quite sufficient when added to the charge of powder to produce an explosion in the barrel. The base or cap of the cartridge I prefer to make in one piece, stamped or pressed out to form a hollow chamber in the center for the reception of the fulminate. The size of base is of course made to suit the size or diameter of cartridge to which it is fixed.

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

1. Constructing cartridge-shells of fusible metals, whether formed in one piece with the projectile or separately attached thereto, as herein set forth.

2. Ignitable or inflammable cartridge-shells formed of the ingredients specified, or their chemical equivalents, substantially as set forth.

3. Explosive cartridges formed of the ingredients and in the manner herein described.

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