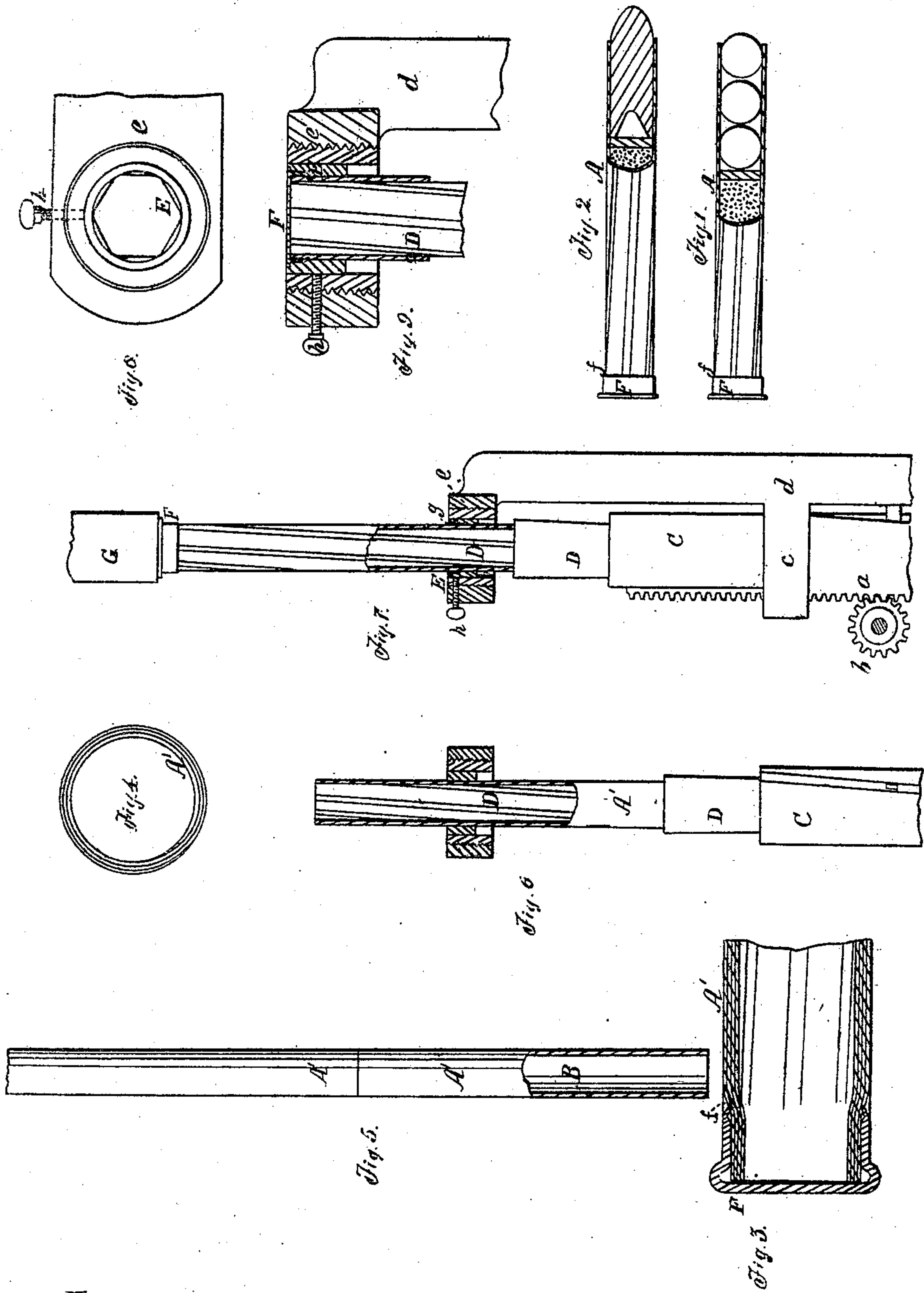


H. BERDAN. Cartridge.

No. 46,292.

Patented Feb. 7, 1865.



Witnesses:
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IMPROVEMENT IN CARTRIDGES FOR BREECH-LOADING RIFLED FIRE-ARMS.

Specification forming part of Letters Patent No. 46,292, dated February 7, 1865.

To all whom it may concern :

Be it known that I, HIRAM BERDAN, of the city, county, and State of New York, have invented a new and useful Improvement in Cartridges; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figures 1 and 2 are side elevations, in part sectional, of the completed cartridges. Fig. 3 is an enlarged sectional elevation of a portion of the cartridge-case and metallic head, showing the appearance of the parts when combined. Fig. 4 is an end or cross-sectional elevation of the cartridge-case. Fig. 5 is an elevation of the cylinder upon which the material composing the cartridge-case is rolled preparatory to compression. Figs. 6, 7, 8, and 9 are parts of the mechanism or devices used in compressing the cartridge case or shell and in attaching the metallic head or cap.

Similar letters of reference indicate corresponding parts.

My improved cartridge has a case of sufficiently rigid and impervious material to resist the action of the gases in firing, and constitute an efficient guide to the balls. The exterior of the said case is of irregular form to fit within a counter-bore of corresponding shape, and its interior is rifled to correspond in shape as well as in size with the bore proper, which the balls themselves are previously prepared to fit.

My improved cartridges may have their cases A made either wholly of paper or of some textile fabric or pliable material; or the said cases may be composed partly of paper and partly of some textile fabric or pliable material, or they may be made wholly or in part of metal. I prefer to make them of paper, in the manner which I will now proceed fully to describe.

I first cover the paper of which the body of the case or shell is made with paste or other suitable adhesive material, in order to cause the folds of paper to adhere together. I then (see Fig. 5) roll the pasted paper A' upon a

round mandrel, B, of about the intended size of the bore of the fire-arm in which the cartridge is to be used. I then divide the cylinder of paper thus made into suitable sections A', of the proper lengths for cartridge-cases, and withdraw all of the sections from the cylinder B.

The paper sections A' are now ready to be compressed into the exact shape of the counter-bore or cartridge-chamber of the fire-arm in which the cartridges are to be used.

In order to effect this compression I provide a movable plunger or die-holder, C, which is moved longitudinally by means of a rack and pinion, *a b*. (See Fig. 7.) The plunger moves through an eye, *c*, attached to a frame or support, *d*, as shown.

At the upper end of the plunger C, I insert a mandrel, D, which exactly corresponds in form to the shape of the bore of the fire-arm. In the illustration here presented the exterior of the mandrel is provided with rifled feathers, to correspond with the rifled bore of an ordinary rifled gun.

Supported in a suitable eye or holder, *e*, attached to the upper part of the support *d*, I secure a nut or die, E, which is of the exact form and size of the interior of the counter-bore or cartridge-chamber of the gun in which the cartridge is to be used.

Having placed the paper cylinder A' upon the mandrel D, I cause the latter to rise by means of the rack and pinion, and I thus, with immense force, compress the paper section between the mandrel D and the nut or die E, so that when the paper section has passed entirely through the die E it will have assumed the exact form of the counter-bore of the gun. The enormous pressure thus given to the paper condenses and solidifies its substance, and causes it to become very hard and rigid, while it insures accuracy of fit in the counter-bore or cartridge-chamber of the gun.

The next operation is to attach the metallic head or cap F, which is to close one end of the paper section or cylinder. This head or cap may be made much in the same manner as the ordinary metallic cartridges or caps are

made. I, however, make the body part of the cap F, near the edge *f*, quite thin, in order that when the edge *f* is bent inward so as to grasp the paper body of the cartridge, the body of the cap F will not be bent or thrown out of its cylindrical shape.

The cap F, thus prepared, is now placed upon the upper end of the paper case or section A', while it still remains upon the mandrel D, (see Fig. 7,) and a follower, G, is then made to descend and drive downward the mandrel, cap, and paper section toward the die E.

It will be observed that the upper end of the die is furnished with a recess, *g*, of sufficient size to admit the cap F. The bottom of this recess, it will also be observed, is made to incline inward toward the mandrel D. The depth of the recess is purposely made less than the length of the cap F. When, therefore, the cap and paper section are pressed down by the follower G, the cap will enter the recess, and its thin edge *f* will strike against the inclined bottom of the recess, and will be deflected inward toward the paper into which it will enter, as shown in the enlarged Figs. 3 and 9. The firmness with which the cap and the paper section will be combined will depend upon the pressure applied to the follower G, which may be regulated at pleasure.

The shell thus made I now saturate with hot tallow, which not only lubricates the shell, but renders the cartridge weather-proof, and prevents the gases arising from the powder from entering the pores of the shell and thus destroying it. The paper case A is then charged with fulminate powder and ball in any convenient manner. A single ball, as in Fig. 2, or more than one ball may be employed, as in Fig. 1.

Both the exterior and the interior of the cartridge-case made as described may have the same rifled twist, or the form of the interior and exterior vary, the latter being of any irregular shape, but the exterior must be of the same form as the counter-bore or cartridge-chamber of the gun in which the cartridge is to be employed, and so arranged as to guide the cartridge into proper position, so that when interior rifling is used, it will correspond in position, as well as in form, with the rifling of the bore proper.

The balls used in such cartridges are to be previously rifled or prepared upon their exterior surfaces to fit the bore of the gun, and also to fit the interior of the cartridge-case, which is intended to be exactly similar in form and size to the interior of the bore of the gun. I prepare the balls for these cartridges by forcing them with a suitable punch through a die or nut which exactly corresponds to the shape and size of the bore of the gun, or nearly so.

My invention thus enables me to use projectiles of sufficiently hard material to adapt them to keep their proper form in firing in-

stead of being "upset" or pressed out of shape, as is the case with projectiles which are sufficiently soft to be pressed or expanded into the grooves by the action of the gas.

The hardness of the metal is important where two or more balls are used, in order to prevent upsetting or flattening by inertia and by the pressure of gas in firing; and they must be rifled or prepared to fit the bore, in order to prevent their being pressed out of shape by the force of the gas against the rear one when the front one takes the grooves. Three balls applied one before the other, in the manner above described, are found in practice to spread about five feet in two hundred yards.

A long ball is valuable for long range, by reason of its smaller area of resistance in proportion to its weight, and the hardness of the metal is important in such a projectile to prevent its upsetting at the base by the action of the gas, and in order, also, that it may have strength to prevent the stripping of the lands of the ball with the rapid twist which is necessary to impart to a long projectile sufficient rotation to maintain its proper position during its flight.

The hardness and previous formation of the long ball are also important, to admit of effective patching, and to prevent the destruction of the patch and consequent leading of the gun, which invariably take place with projectiles of sufficiently soft metal to be pressed into the grooves by the gases.

Prepared projectiles, to be loaded from the muzzle, must be made smaller than the bore, to admit of their being forced down with a ramrod, and must therefore be made sufficiently soft to be upset by the action of the gases, to close the windage and form a guiding surface. By this means the guiding surface is confined to the rear part of the projectile.

My projectiles are specially valuable with breech-loading rifles, because I am enabled to make them of such size and shape that they will accurately fit the bore, and of such hardness that they will not be upset or compressed in firing.

I am aware that prepared hexagonal balls have before been used in cartridges in breech-loading guns; but I do not know of any instance of previously-prepared projectiles having been used in an indestructible cartridge-case which by fitting an irregular counter-bore would locate the projectiles in position to coincide with the bore proper, without their entering the same in the act of loading. Heretofore all cartridge-cases with balls prepared to fit the rifling have been used in the bore proper, and hence required to be thin and combustible, which allowed the charge-chamber to become foul after a few rounds, so as to make it difficult to enter a cartridge, especially at the breech, where a ramrod could not be used, and in no case could a plurality of balls be used in so delicate a cartridge, as the

case would twist and throw the balls out of line. I employ an indestructible case which effectually prevents the fouling of the chamber, and is strong enough to keep the balls in line.

As I propose making a separate application for Letters Patent for my process or machinery for making cartridge-cases, I do not here claim novelty therein.

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

An indestructible cartridge-case with an irregular exterior to correspond with the counter-bore with which it is to be used, and

a rifled interior to correspond in size and form with the bore proper, in combination with one or more projectiles previously prepared to fit the rifling of the bore, the whole constructed and arranged substantially as herein described, so that the chamber will be protected from fouling, and the balls properly located in respect to the rifling of the bore without the necessity of their entering the latter in the act of loading.

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Witnesses:

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