BULLETS, CANNON PROJECTILES, AND CARTRIDGES.

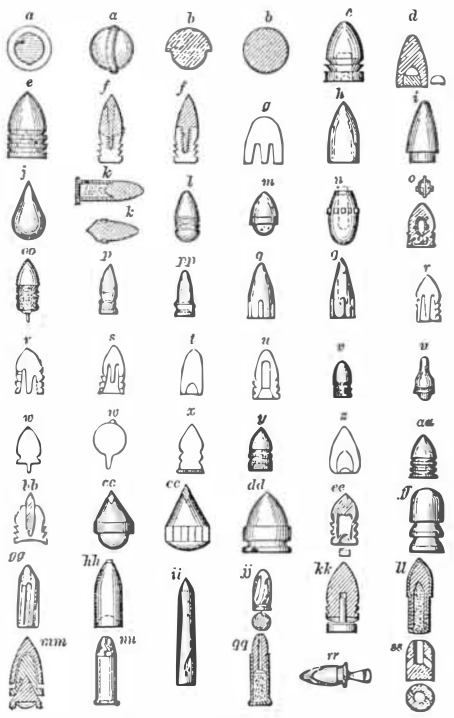
The extracts, from Mr. E. H. Knight's "Mechanical Dictionary,"* given below, comprise the most instructive illustrations and facts therein published on the subjects of projectiles and cartridges.

Fig. 1 represents a large number of improved bullets, beginning with the Brunswick, *a*, which was one of the earliest adaptations of the ordinary musket ball to the requirements of the rifle. This projectile was intended for a two-grooved barrel, and was provided with a simple circumferential belt. The Delevigne bullet, *b b*, involved the use of a sub-caliber powder chamber, and it rested, by an annular shoulder, upon a wooden *sabot*. It had a patch of greased serge. Minié and Thouvenel introduced an elongated bullet, with a cylindrical grooved body and a conical point. This had a greased paper patch, and was expanded to fill the grooves by being driven down upon a *tige* in the breech of the gun. This was adopted in the French service in 1846. Delevigne subsequently patented an elongated bullet with a recessed base, which he called the cylindro-ogival.

Minié produced, in 1857, the well known bullet, *c*, in which the *tige* was dispensed with, and the bullet expanded by the explosive force of the powder in the cup, which was inserted into a frustro-conical cavity in the base of the bullet. The English substituted a conoidal wooden plug in their Enfield rifle bullet, *d*.

In 1856, after a series of experiments by the Ordnance Department, an elongated bullet, *e*, with a cavity, was adopted for the United States army. Two varieties were made, precisely similar on the exterior, but differing in the size of the cavity; that for the rifle musket weighing 500 grains, and the one for the pistol carbine 450 grains. *f f* is the bullet of Thirouse, a French artillery officer. It is composed of lead backed by a *sabot* of wood, with three circular grooves near its base. The Nesler ball, *g*, was intended for a smooth bore.

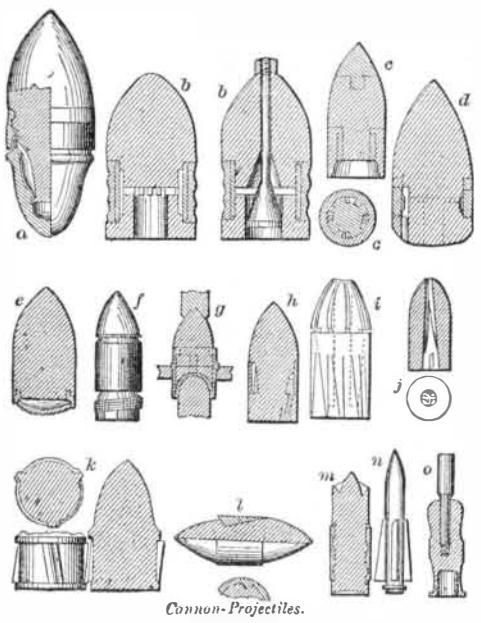
Fig. 1.



Bullets.

Of the other bullets in Fig. 1, some are celebrated on account of the ingenuity or success of their inventors, others as having been adopted by different governments. *h* is the American conoidal pointed bullet; *i* the Colt, with a rabbet for the cartridge capsule; *j* the American "picket," with a hemispherical base; *k k* Haycock's Canadian bullet, with a conoidal point and a conical base; *l* Mangeot's bullet, with a conoidal point, hemispherical base, and two circular grooves; *m* is the Prussian needle gun bullet; *n* the Norton elongated percussion rifle shell, fitted with wooden plug (1830); *o* Gardiner's explosive shell bullet, cast around a thin shell of copper attached to a mandrel, which is afterwards withdrawn, leaving a fuse hole in the rear, through which the charge is exploded in about one and a quarter seconds; *o o* is a Spanish bullet, containing a charge of powder and a fulminate. The use of exploding projectiles for small arms, such as the three last mentioned, is now generally condemned, and the nation employing them would be adjudged to be without the pale of civilized warfare. *p* is the Swiss federal bullet; *p p* the Swiss Wurtemberger bullet; *q* and *q* are views of Mr. Jacob's bullet and shell: *r* and *r* are views of the Peter's ball, having an interior *tige;* one view shows it distended and battened. *s* is the Belgian bullet; *t* Pritchell's; *u* Mangeot's; *v v* the Austrian; *w w* Deane and Adams' bullets with tails; *x* English bullet with wad; *y* Sardinian; *z* Beckwith's; *a a* steel-pointed bullet; *b b* the Charrin bullet, with zinc or steel point; *c c* and *c c* Tamissier's steel-pointed bullet, one view showing it intact, and the other after compression in the grooves of a rifle; *d d* is the Saxon bullet; *e e* the Baden modification of the Minié, with tinned iron cup; *f f* Wilkinson's; *g g* Whitworth's hexagonal bullet; *h h* Lancaster's; *i i* Metford's sub-caliber bullet, with spiral grooves on the shoulder to impart rotation; *j j* McMurtry's bullet with spiral grooves; *k k* Williams' bullet with a headed *tige* to expand a rounding disk at the base; *l l* Dibble's bullet with a recess for the powder; *m m* Shaler's triple bullet, the pieces of which are intended to diverge after leaving the muzzle; *n n* Madell's bullet, which is built up of interlocking portions, which part as they leave the capsule and muzzle; *q q* Shock's perforated bullet, with a *sabot* in the rear; *r r* Hope's bullet, with a bent tail to direct it in a curved path, and *s s* Matteson's bullet having spiral openings.

Fig. 2.

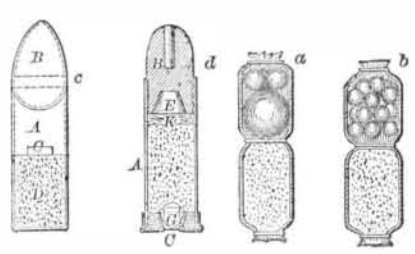


Cannon-Projectiles.

Fig. 2 shows a few of the numerous kinds of cannon projectiles which have been devised. *a* is the Hotchkiss. At the moment of firing, the wedge-shaped piece, shown in section, is driven forward, expanding a soft metal ring which fills the grooves. *b b* is the James. In this the gas passes through the aperture at the back, driving out a number of pins, which expand a fiberous mass surrounding the slot and encircled by a metallic ring, which is thus forced to enter the grooves. In the second view, this is effected without the aid of pins. *c c* are vertical and longitudinal sections of a similar projectile, having a detachable point; *d* is the head, in which the gas enters through holes around the base and expands a band. In the Shaler, *e*, the gas drives forward a metallic cup, flattening it and expanding the *sabot*. A band of copper wire in the Cochran, *f*, is expanded by forcing forward a cup against a surrounding cylinder. *g* is the Boekel. The illustration shows the annular soft metal packing, being attached to the projectile by a swage and dies, while the point is held on an anvil. A packing of wire webbing in the Atwater, *h*, is expanded by wedges driven forward by plungers at the base of the shot. The Woodbury, *i*, is spirally grooved, having a *sabot* for firing from a smooth bore gun. The Taggart, *j*, has a spirally flanged central aperture intended to cause the projectile to rotate on its axis by atmospheric action when fired from a smooth bore. *k*, the Sigourney, has projecting spiral ribs to take the grooves, and annular belts which fit the lands and direct the flight. The Currie, *l*, is conoidal at each end, and has a soft metal packing ring in an annular groove. *m* is a bolt, with chisel-edged points for cutting through iron plating. The annular groove between the cutting edges and the point is filled with soft metal, to prevent retardation. *n* is an elongated bullet, with spiral flanges to import rotary motion when fired from a smooth bore. *o* is an accelerating projectile. This has in front a plunger which, on striking an object, explodes (by percussion) a charge contained in a chamber, giving a new impetus to the projectile.

Plain, round ball, and buck and ball cartridges are now practically obsolete. These are done up in paper casings, and two forms of them are shown in *a* and *b*, Fig. 3. *c*, in the same figure, is the Prussian needle gun cartridge. In

Fig. 3.

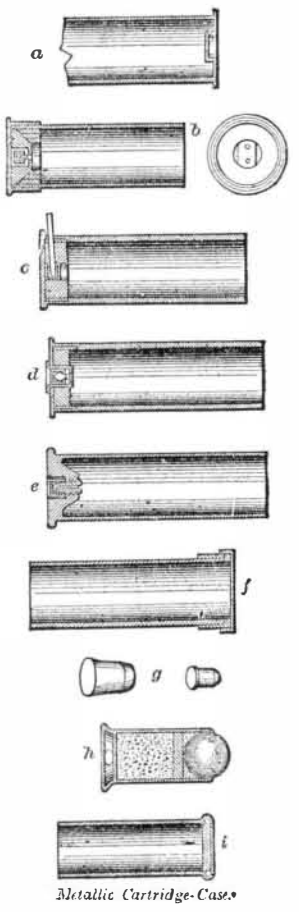


Cartridges.

this the outlet, B, has a *sabot*, A, separating it from the powder, D, and at its base a cavity, C, for fulminate. Snider's cartridge, *d*, is made up of a sheet brass cylinder, A, in which is inserted a bullet containing a plug of clay, E, in a recess. G is a *sabot*, in the cavity of which fulminate is placed.

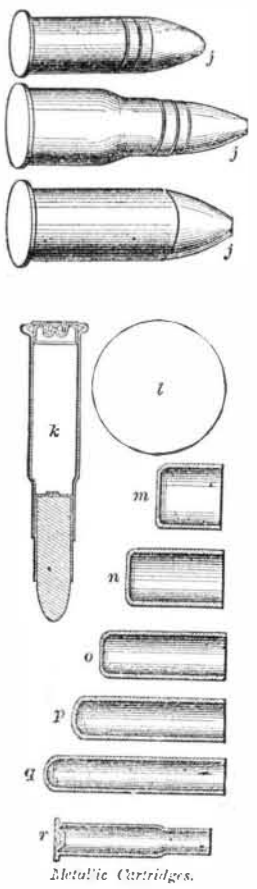
Metallic cartridges are divided into two classes, rim fire and center fire, the first having the fulminate arranged within a cavity around the interior of the flange, and the latter having it at the center of the head or base. In 1826, Cazalat patented the cartridge shown at *a*, Fig. 4, which has a receptacle with a waterproof cover for fulminate. *b* and *c* present two forms of the Lafaucheux cartridge, one of the earliest of its kind. In *b*, the cap is secured to an anvil block; in *c*, a plunger, struck by the hammer, explodes the fulminate in a base chamber. *d* and *e* are modifications of the same without the pin. In *f* there is an annulus at the base to contain fulminate. *g* is the Flobert cartridge, a charge of fulminate at the base of which does the duty at once of priming and propelling. *h* and *i* are Smith and Wesson's patents, 1854 and 1860. In the first of these, the fulminate is contained in a capsule at the base, and in the latter, in an annulus within the flange, surrounding the base of the cartridge and secured in place by a pasteboard disk. *j j j*, Fig. 5, show some other forms of metallic cartridge. *k* is the Berdan cartridge;

Fig. 4.



Metallic Cartridge-Cases.

Fig. 5.



Metallic Cartridges.

this has an exterior central recess in the bottom, to receive the cap, which is exploded upon an anvil. The mode now generally adopted for forming metallic cartridges is to punch the blank out from a sheet of brass and to draw it between successive rolls and punches until it assumes the required shape. The forms which the case assumes, during the different stages of the process, are shown in the views, *l* to *r*, Fig. 5.

Useful Recipes for the Shop, the Household, and the Farm.

In the Rhine district, grape vines are kept low and as near the soil as possible, so that the heat of the sun may be reflected back upon them from the ground; and the ripening is thus carried on through the night by the heat radiated from the earth.

A non-drying cement of great tenacity, useful to fastening plates of glass so as to exclude air, but which may be easily separated, is formed by adding freshly slaked lime to double its weight of india rubber, and heating to about 400° Fah., when the rubber will be converted into a glutinous mass.

To stop new boots squeaking, drive a peg in the middle of the sole.

To extract the silver from old watch cases and similar articles composed of alloys, dissolve in nitric acid and precipitate the chloride of silver with a solution of common salt. The silver is reduced to a pure state by mixing the chloride with an equal weight of bicarbonate of soda and smelting in a common sand crucible.

To bleach glue, soak in moderately strong acetic acid for two days, drain, place on a sieve, and wash well with cold water. Dry on a warm plate.

Diamond cement, for glass or china, is nothing more than isinglass boiled in water to the consistence of cream, with a small portion of rectified spirit added. It must be warmed when used.

It is said that dryrot in cellar timbers can be prevented by coating the wood with whitewash to which has been added enough copperas to give the mixture a pale yellow hue.

Mercurial steam gages can be kept clean by putting a little glycerin on the surface of the mercury. This serves as a lubricator of both glass and metal, and prevents their contact.

To guard belting against being gnawed by rats, anoint it with castor oil.

Old engravings, woodcuts, or printed matter, that have turned yellow, may be rendered white by first washing carefully in water containing a little hyposulphite of soda and then dipping for a minute in Javelle water. To prepare the latter, put 4 pounds bicarbonate of soda in a kettle over a fire; add one gallon of boiling water, and let it boil for 15 minutes. Then stir in one pound of pulverized chloride of lime. When cold, the liquid can be kept in a jug ready for use.

An excellent liquid glue is made by dissolving hard glue in nitric ether. The ether will take up only a certain amount of the glue, so that the solution cannot be made too thick. If a few bits of pure india rubber, cut into scraps the size of buckshot, be added, the mixture will, when dry, resist dampness to a considerable degree.

Some brands of albumen paper are subject to blisters when taken from the hypo solution. To prevent this, remove the prints, when fixed, from the hypo into a dish of salt water (a handful of salt to a gallon of water) before the regular washing, and allow them to remain therein for several minutes.

* Publishers, J. B. Ford & Co., New York city.