WASC 2268

History of Ammunition

General

The history of ammunition is a subject worthy of a volume of its own, but for the benefit of the reader, a resume' is given of the factors that have emerged during the course of the last 600 years, and have contributed to the high standard of ammunition as we know it today.

Nothing certain is known as to the time or place of the discovery of the first explosive, but it was probably a form of gunpowder, which depended for its action upon the use of saltpetre, a material which does not seem to have been known before the tenth century, and can only be traced as an article of commerce, back to about A.D.1200. Without saltpetre as an ingredient, it is unlikely that the alleged explosives attributed to earlier times, such as "Greek Fire", used in the defence of Constantinople from A.D. 670 onwards, can have been more than highly combustible substances used for incendiary purposes.

Propellants

(i) Gunpowder

Gunpowder is the oldest known propellant, its origin having been lost in the mist of antiquity, as also has the name of its inventor and the country of its origin.

What however is certain, is that it was known to Berthold Schwartz and to Roger Bacon at the beginning of the thirteenth century, and that it was the first propellant used in cannon, and remained unrivalled for over five hundred years.

Gunpowder consists of an intimate mixture of potassium nitrate (Saltpetre), charcoal and sulphur, which in the early days were mixed in an arbitrary manner, the proportion of each being entirely at the discretion of the maker concerned.

A passage which is claimed to contain the earliest description of gunpowder has been deciphered in a cryptic work of Roger Bacon probably written in 1249, giving the proportions of 41.2 parts of saltpetre, 29.4 parts charcoal and 29.4 parts of sulphur. During the centuries that followed, the proportions varied considerably, until they were standardised in 1781, as 75 parts saltpetre, 15 parts charcoal and 15 parts sulphur.

The discovery that gunpowder could be used to propel a projectile is considered to have occurred about 1300-1320.

Firearms were apparently used by the Moors at the Siege of Alicante in 1331, and cannon by the Germans at Cividale in the same year.

The main drawback with gunpowder has always been its liability to absorb moisture, due to the hygroscopic nature of saltpetre, the powder was often found to be damp and useless when required in an emergency, rendering artillery incapable of inflicting the slightest damage on the enemy's troops.

The Navy were always the chief sufferers in this respect, owing to the general humidity of the atmosphere at sea and for this reason carried nothing but corned powder after the middle of the 17th century. This does not appear to have solved the whole of the trouble, for in an action fought off Grenada in July, 1779, the English shot could not reach the French men-of-war as the powder in the barrels had coalesced into large lumps in the midst of which were visible segregations of

[illegible] period, originally prepared in a very fine state of division known as serpentine, suffered from the following disadvantages:-

(a) It was extremely sensitive to moisture.

(b) It had a tendency to separate out into component parts during transit.

(c) It left a large residue after firing.

(d) It required very careful ramming.

(e) It burnt very slowly and over-ramming caused combustion without explosion.

(f) It always gave rise to quantities of fine explosive dust.

Many methods were introduced during the 15th and 16th centuries to overcome these defects but none proved completely satisfactory and corned powder which had been used for small arms in England before 1560 succeeded serpentine. It had, however, two qualities which operated against its general use at this period; its cost was excessive and its power too great for the early cannon. It was not, therefore, generally used for the artillery until the latter end of the 16th century, when the engineer had caught up with the chemist and designed a gun strong enough to withstand the higher pressures involved.

The following advantages were claimed for corned powder:-

(a) It was much less susceptible to damp, especially when glazed.

(b) It deposited less residue after firing.

(c) It did not resolve itself into different strata during transport.

(d) It required less careful ramming.

(e) Owing to the size of its grains, and consequently greater surface and air-spacing, it was consumed so rapidly that there was little or no escape of the gas through the vent, consequently, weight for weight it had $33\frac{1}{3}$ per cent more power.

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Until the middle of the 19th century, the only available method of procuring saltpetre was by extraction from natural deposits.

In Europe, few localities existed in which this salt could accumulate to such an extent as to render its manufacture and purification profitable, except in such places as underground cellars, caves and stables. The Orient was therefore the main source of supply and its salesmen charged accordingly.

The European governments, realising the rapacity of the Eastern merchants, sought to conserve all possible sources of supply within their own dominions, and appointed Commissioners with right of entry to stables, cellars, etc., to gather their provender.

In England, Queen Elizabeth I, granted a monopoly in 1558 for gathering and working saltpetre to Richards Hills and George and John Evelyn for a period of eleven years.

At the beginning of the 17th century, the East India Company commenced importing saltpetre into England. The Company erected powder mills in Surrey, and when its charter was renewed in 1693, it agreed to supply 500 tons each year to the Ordnance. From this period, therefore, the supply became more regular and the manufacture of English gunpowder was placed on a firm footing.

The utility of gunpowder was quickly realised soon after the introduction of cannon, and merchants were quick to realise the lucrative nature of its manufacture and commerce. There was a powder mill at Augsberg in 1340, one at Spandau in 1344, and another at Liegnitz in 1348, while it was often made in private dwelling houses at that period.

Although in 1338, gunpowder is mentioned amongst the stores at the Tower, and in 1641, a "powder-house" was installed at that fortress its manufacture did not take place in this country until the reign of Queen Elizabeth. Supplies prior to this period had been imported from Europe, but owing to the threatening attitude of Spain at this time, the Government issued patents for the manufacture of gunpowder as a monopoly and the Evelyn brothers who held the monopoly of saltpetre appear to have been the first to produce powder on any scale in this country.

Mills, therefore, began to spring up about the countryside. In 1555, there was one near Rotherhithe, and in 1561, others were to be found at Long Ditton, Leigh Place, near Godstone, Faversham and Waltham Abbey, the latter being taken over by the Government in 1787, finally becoming a Royal Ordnance Factory, for the manufacture of various explosives.

In 1865, ten different types of gunpowder were in use, according to the requirements of the various rifles and cannon then in use.

Charges for guns previous to the introduction of rifled ordnance were always made of a large grain black powder. Rifled guns, however, fired a far heavier shell, about three times the weight of a smooth bore gun of the same calibre, with the result that the pressures developed during firing became excessive and slower burning powder became imperative. R.L.F. powder introduced in 1860 under the name of A4, had a higher density and a larger grain and was used for the Armstrong guns.

These guns fired a charge of one quarter the weight of the shell, but as the size of rifled guns increased the problem of obtaining slower burning had to be seriously faced owing to the pressures developed by increased charges in forcing the shell to conform to the twist of the rifling. The main factors influencing the rate of burning are density, hardness, shape and size of grain, amount of glaze and moisture, and, not unnaturally, the easier factor to adjust, namely, the size of the grain was the first to be tried.

Experiments were carried out and eventually pellet powder was adopted in 1866 and later, in 1869 Pebble or 'P' powder was approved for all gun charges over 40 lbs. Many alterations took place around this period and "P^2" being larger in grain than its predecessor was approved for use for the largest R.M.L. guns such as the 12".

It now became realised that the rate of burning could not be controlled indefinitely by increasing the size of grain, and the regularity of burning depended on other considerations besides grain and density. Experiments lead to the adoption of moulded or prism powder for the heaviest R.M.L. guns and for B.L. guns of a somewhat smaller calibre.

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E.X.E. and prism brown, therefore, remained in use as propellants used for R.M.L. and B.L. guns until the introduction of cordite.

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This substance was used solely as a disruptive at this time, as its properties in this respect had been recognised since its inception. All attempts to use it as a propellant failed owing to its porosity, as under the high pressure developed in the bore of the gun, the interstices were penetrated by the hot gases, with the result that the whole charge was ignited practically instantaneously and the gun destroyed.

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These powders were, and still are highly successful as charges for sporting cartridges, but their action was too rapid for rifled weapons. In 1885, the introduction of small calibre magazine rifles made the problem of securing a suitable smokeless propellant urgent. Vieille in France produced the first good smokeless rifle powder in 1866, and designated it "Poudre B" after General Boulanger. Ballistite, invented by Nobel, followed in 1888 and other powders began to appear on the continent.

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During the 1914-18 war, owing to the shortage of acetone, other propellants such as N.C.T., N.C.Z., R.D.B., etc., were introduced as emergency powders but such substances had not the keeping qualities of cordite.

Between the first and second world wars, research was carried out with the aim of reducing the drying time of cordite by the introduction of (a) Solventless or S.C. Cordite, (b) W. Cordite, (c) Flashless powders.

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Work continued on further improvements during the Second Great War, particularly in improving the degree of flashlessness of the N.C. powders.

Thus cordite with its many improvements has stood the test of time and succeeded gunpowder as a propellant.

Cartridges

Cartridges were first introduced to diminish the pernicious effect of fouling the chamber of the gun. The original serpentine, especially if moist left such an amount of residue in the chamber and first few inches of the bore after firing off a few rounds, that reloading became a matter of some difficulty. Cartridges made of linen or paper bags are mentioned in 1560, but the probability is that they did not come into even partial use until the early part of the 17th century, when they were employed for rapid firing. From this time onwards their use became more and more general. Many materials have been tried in this connection, paper of all kinds, together with parchment, bladders, canvas, linen, merino, wildbore and bomazette. The two substances most commonly employed, however, until the introduction of flannel, were paper and parchment.

All cotton and linen materials had the disadvantage of never being completely consumed on discharge, a fact which necessitated the use of a wad hook and rendered the service of the guns dangerous and slow. Parchment, also had its drawback, it tended to shrivel up under the heat of combustion and choke the vent.

In 1778, Sir Charles Douglas suggested the use of flannel or serge to obviate these difficulties, and although it was not immediately adopted,

from: Book at Westcott.

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Thus cordite with its many improvements has stood the test of time and succeeded gunpowder as a propellant.

Cartridges

Cartridges were first introduced to diminish the pernicious effect of fouling the chamber of the gun. The original serpentine, especially if moist left such an amount of residue in the chamber and first few inches of the bore after firing off a few rounds, that reloading became a matter of some difficulty. Cartridges made of linen or paper bags are mentioned in 1560, but the probability is that they did not come into even partial use until the early part of the 17th century, when they were employed for rapid firing. From this time onwards their use became more and more general. Many materials have been tried in this connection, paper of all kinds, together with parchment, bladders, canvas, linen, merino, wildbore and bomazette. The two substances most commonly employed, however, until the introduction of flannel, were paper and parchment.

All cotton and linen materials had the disadvantage of never being completely consumed on discharge, a fact which necessitated the use of a wad hook and rendered the service of the guns dangerous and slow. Parchment, also had its drawback, it tended to shrivel up under the heat of combustion and choke the vent.

In 1778, Sir Charles Douglas suggested the use of flannel or serge to obviate these difficulties, and although it was not immediately adopted,

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