

A History of Firearms: Examining Weapons of the Sixteenth Century and Their Development

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Abstract

The following is a discussion of firearms technology focusing on those technologies which were actually present during the sixteenth century. This investigation discusses those elements of firearms technology which made a particular impact on firearms technology during the sixteenth century investigating, and not limited to, the firing systems found on the firearms of the period. Other aspects of the weapons are also discussed where they had a significant impact on the weapons.

Table of Contents

Introduction	2
The Development of Firearms: A General Discussion.....	3
Gunpowder.....	12
Accuracy	14
Matchlock	17
Wheel-lock	18
Flintlock	21
Conclusion	27
Bibliography	29

Introduction

When firearms are thought of in the early modern period, there is a general thought of the musketeer with their long-barrelled weapon requiring a stand to hold the heavy weapon, with massed ranks supported by pikes to protect them. Another thought is inaccurate weapons just as likely to kill the wielder of the weapon as the person that they are firing at, or at another extreme, weapons of great craftsmanship engraved with ivory handles made for nobles; the actual truth concerning firearms and their firing systems lies somewhere in between these ideas.

The discussion which follows focuses on the firing mechanisms of firearms of the sixteenth century and their development. This will mean that it does touch on elements on either side of this period, but this is the focus. There will be brief discussion about gunpowder and how it was improved to service these weapons, along with technologies that were developed to assist in their accuracy.

While much of the discussion will be of a general nature there will also be parts where short arms, such as pistols are the focus. These are of most interest as they have an interesting history of development through the period. They were a later development and caused a change, minor in some places not so minor in others, in warfare as a result of their development. These weapons are more personal to the user as they relate to personal protection, and utilise the later systems to their fullest capacity, and would not have been possible with the earlier.

The three firing systems which are recognised are the matchlock, the wheel-lock and the flintlock. Each will be discussed in turn, their advantages and their failings included. These will show a process of development, international in nature toward the later weapons which were found on battlefields of land and sea around the world, and in personal conflicts in some instances as well. While there were more cosmetic differences in the matchlock and wheel-lock with some national differences it is in the flintlock where changes will be most noticed and three different systems, all present in the sixteenth century will be presented.

The investigation presented does not claim to cover all of the aspects of this broad topic, merely to highlight certain aspects which are of importance and to bring others to the light of examination. The hope of this examination is that the reader will gain a greater understanding of firearms of this period, and an appreciation of their polyglot nature and history. Most histories will present the process as rather direct, skipping some of the developments which are presented here. It is hoped that armed with these developments that the reader will have a greater appreciation of the firearms of this most interesting period of history.

The Development of Firearms: A General Discussion

The following is a general discussion of the development of firearms technology during the sixteenth century, with some discussion of the previous fifteenth where some of the technology finds its foundation. This is designed to introduce the general idea of firearms technology and how it changed over this period and to focus on particular aspects of these changes that occurred. There will be four sections presented, a general overview to begin with, followed by an examination of some particular technologies, followed by an examination of the pistol and then cavalry. This will raise some of the issues and technologies that will be examined in detail in the discussions which follow this one.

“The most striking features of the sixteenth century in the history of handguns are: the application to war purposes of the matchlock, if not its invention; the invention of the wheel-lock, and the snaphaunce; rifling barrels in spiral curves; the fixing of a standard calibre; the evolution of the pistol; its adoption as a cavalry weapon, and general improvements in small-arms.”¹

Many of the advances which have been mentioned above will be discussed in some detail throughout this discussion, some with some focus; others will be mentioned in different parts. The sixteenth century was a revolution in the production of firearms. From their primitive start in the fourteenth century, the firearm would mature to weapons which, even in the modern eye, would become weapons which would be more recognisable. Indeed by the end of the fifteenth century many advances would already be made, some of them unmistakably modern.

“by the end of the fifteenth century almost every type of firearm in existence today was envisaged or invented – at least in crude form – including the brief appearance of a breechloader!”²

The breech-loader will be discussed below along with the pistol, carbine and other advances which were made during this period and the following hundred years of innovation. Before this discussion begins, there must be a necessary side-track to address a commonly-held belief in the relationship between firearms and the use of armour. It is often thought, and said, that the presence of firearms on the field of battle resulted in the decline in the wearing of armour, this is not necessarily true.

“The influence of firearms on this decline [in the use of plate armour] has been much exaggerated, for there were other important contributory causes, into which I must not enter here.”³

There was still armour worn on the battle field with firearms and indeed there still is armour, of a sort, worn on the battlefield even today, as the most modern armies equip their troops with armoured vests to protect them, and most troops wear helmets to protect them as well. However, this is not the discussion so it will be left stated and pushed to one side.

¹ Coltman Clephan F.S.A., R. (1910) “The Military Handgun of the Sixteenth Century”, *Archaeological Journal*, 67:1, 109-150, DOI: 10.1080/00665983.1910.10853136, p.109

² Canby, C. (1963) *a history of weaponry* (3rd edition), Leisure Arts Ltd Publishers, London, p.64

³ Coltman Clephan (1910), p.119

Often, it will be claimed that one nation or another was at the forefront of production or innovation in a particular field. In the case of firearms in the sixteenth century innovation was international. Many different states were improving firearms independently, or at least interdependently, as one army met another one would use the technology of the other and improve it, as a result it is noted that, “most of the great improvements in small-arms in the sixteenth century, after Germany, are due to Spain. Good work of this kind was also done in England,”⁴ such international innovation results in a variety of changes to the same mechanisms, and different approaches to the same problem. Nowhere is this more evident than in the discussion of gunlocks.⁵

“for the varieties and combinations in gunlocks are simply endless. It is impossible to trace with any absolute certainty the country of origin of any of the main locks; for during the first half of the century under review, and even earlier, Spain, Flanders, Italy, Germany, and Switzerland were each eagerly on the look out for new departures in weapons of war, and any improvements in gunlocks were rapidly assimilated by the others;”⁶

Such variety will become most evident when the flintlock mechanism is discussed where there are different locks depending on the origin of the mechanism, there is at least two primarily recognised, the snaphaunce and miquelet, but national variations are also present. When an army clashes with another and notices that the weapons of another are more efficient, or work better in different conditions, note will be made, samples obtained and a variant of the same constructed; the result is a national variation. This can also be seen where nations came up with similar makes of firearm.

“The military handguns of Germany up to the end of the century, most of which had their counterparts among the weapons used in England, were the various kinds of harquebus; the langerohr, or lengthened soldnerbuchse; bockgewehre or multi-barrelled guns; kolben or short handguns of the pistol family with one or more barrels; short handguns for cavalry; and the faustrohr or reiter's pistol, with its diminutives in smaller pistols.”⁷

Where comparisons are made between the armouries of different nations there will be similarities noticed in their firearms. A weapon is most suited to a particular purpose, the particular purpose will be found by different nations, resulting in a similar weapon. This is the reason that similar weapons are found in the armouries in most instances, not because they were copied. The same result can be seen with other weapons as well, each nation has a different, but similar, form of two-handed sword. While the Germans are most famous for it because of the landsknecht, the English and Spanish certainly had a form of the weapon as did the Italians.

⁴ *ibid*, p.119

⁵ The gunlock, or lock, is the firing mechanism, or firing system which the weapon uses. A firearm comprises three parts, lock, described above; stock, the part the shooter holds; and barrel, the part the projectile travels down.

⁶ Coltman Clephan (1910), p.122

⁷ *Ibid*. p.144

Technology

Shifting toward the technology which was developed during the period in question, being the fifteenth and sixteenth century, that they were most in use during the sixteenth century, there are examples of technologies thought to belong to later centuries, which are evident in this period. The first is cartridges, a convenient method of having a measured amount of powder and shot to speed the loading process.

“Cartridges began to come into use in the second half of the century. At first they were of powder only, but ball was added towards the end. An apparatus for making them, dating from about 1590, may be seen at Dresden.”⁸

While the all-encompassing metallic cartridge so familiar today and incorrectly named as a “bullet”⁹ was developed centuries later, its beginnings lay here. These cartridges removed the requirement for the shooter to measure powder into the barrel, as the powder was already measured. With the addition of the ball added, there was no need to find one of these to load either, speeding the process again. This is a technology first thought to be only present much later, much like the breech-loader.

“Breech-loading handguns were in use so far back as the middle of the fifteenth century, if not before, and that they were not uncommon in the first half of the century following”¹⁰

Most weapons of the period were loaded from the muzzle, the end that pointed toward the target. The breech-loader, loaded at the end closest to the shooter.¹¹ One version of this principle was applied to handguns; the mechanism required the barrel to be removed, something not suitable for a longer weapon. Another mechanism worked like the modern-day shotgun where the weapon was opened by “breaking” it at the breech to load it. Again, such weapons were thought to be only used in much later periods.

The carbine is a shortened rifle, and is relatively common in the modern world. Indeed a carbine is one of the standard issue weapons for the modern American military for certain units.¹² This weapon has its origins in the sixteenth century rather than a later period. In many cases it was simply a shortened rifle or a lengthened pistol. The origin of the word is disputed.

“The derivation of the word carabin, carabine or caraben, the sixteenth century name for the short handgun which developed into the carbine of later times, is disputed: some writers maintain that it came from the weapons having been used on ships called carabs, others that it was derived from a Spanish corps of horse, called carabins, which carried a short handgun and

⁸ *ibid*, p.134

⁹ The “bullet” is actually the projectile which is fired not the entire item.

¹⁰ Coltman Clephan (1910), p.111

¹¹ The muzzle is the end pointed toward the target, and the breech is the end of the barrel which is closest to the shooter, and the lock.

¹² The M4 carbine is a standard issue weapon of the US military, which is a shortened version of the M16 rifle.

gave its name to it; others again that it came from the weapon having been first used by Calabrian troops.”¹³

It is not unusual for a word to have a disputed origin, indeed the word rapier is still debated as to its origin with quite a few nations claiming its origin, and it is not the only weapon with the same dubious honour. Like many things the origin of the word is related to where the weapon came from, “the name of the handgun “carabin” was derived from that of the troops using the weapon, and that the piece had its origin in Spain.”¹⁴ The pistol is another weapon which suffers from a similar issue with its name, but it clearly has its origins in the later Renaissance period, and well within the purview of this discussion.

Pistol

Of all the firearms which are used and seen, the pistol is the one which is the most common. In modern terms, it is the most visible as it is seen on the hips of law enforcement, security guards, military personnel and others. It conjures thoughts of concealability and personal protection by its form and authority by its mere presence. The pistol was not the first weapon to be developed, it was the long-arms¹⁵ that were developed first, suitable for battlefield use, it was only later that the shorter weapons were developed. To begin with, it is useful to have an idea about where the word “pistol” came from, to get an idea about the international impact of the weapon.

“Claude Fauchet, writing in *Origines des Chevaliers, etc.* would derive the word pistol from the weapon having been first made at Pistoia, or that it took its name from the coin called *pistole*, the diameter of which is said to have corresponded with that of the bore of the weapon. Others would derive the name from the Spanish word *pistoia*, signifying a driver or a spout; or from the Italian equivalent for dagger, *pistolese*.”¹⁶

There are two languages involved in the definition, Italian and Spanish, and four different reasons for the name given to the weapon. This gives multiple origins for the word origin for the weapon, what is known for sure is that the word pistol became known for a weapon which was short and conveniently fit in the hand, and was able to be fired with a single hand, thus did not require a second hand to steady the barrel, as is required in longer weapons.

Weapons start quite heavy and then through advances in technology, usually through developments in the construction of the weapon, they become lighter. It was the same for the pistol of the sixteenth century, “As the century advances the tendency of the calibres of handguns is to lessen, and the weapons to become lighter.”¹⁷ The two work hand in hand. As the calibre¹⁸ is lessened, the weight of the weapon can be lessened, because in part, the weight of the weapon is used to control the recoil of the weapon firing. A larger calibre requires a heavier weapon so

¹³ Coltman Clephan (1910), p.142

¹⁴ *ibid*, p.144

¹⁵ In discussion of firearms there are long-arms referring to rifles, carbines and the kind, and short-arms referring to pistols

¹⁶ Coltman Clephan (1910), p.147

¹⁷ *ibid*, p.145

¹⁸ The calibre is the size of the shot and also consequently the size of the internal diameter of the barrel.

that the person using the weapon is less affected by the recoil¹⁹ of the weapon and also so the weapon itself is less affected by the recoil. A lighter weapon may simply fall apart if a heavier calibre is used.

The irony is that the origins of the pistol are found with the Germans, not with the Italians or the Spanish, those who were to eventually give the common name for the weapon. It was the Germans who decided that a smaller weapon was required to match the larger weapons that were present and this happened quite early, in the fifteenth century.

“The early history of the pistol is now all that remains to be dealt with. A small handgun, an early faustrohr or fustrohr, is figured in Codex Germ. 734, a manuscript at Munich, dating about 1460,”²⁰

The Germans were at the heart of firearms manufacture and development all the way from the fifteenth through the sixteenth centuries, as is evident through these discussions, and in different areas of firearms development. It is, as a result, not all that surprising that it was here that the beginnings of the pistol are found. It should be noted that this weapon the faustrohr is mentioned in various records throughout the period, and as a cavalry weapon. They also mention a somewhat international influence on its development with the influence of the French present.

“Mention of the faustrohr, with variations in the name, frequently occurs in German contemporary records of the fifteenth and sixteenth centuries, and before the middle of the latter, or even possibly early in its first quarter, the weapon had developed into the reiter's pistol, which continued to be called faustrohr right through the century, and even later. Towards the close of the century, French influence in Germany had brought about a change in the form of the weapon, and by 1630-1640, it had become generally known by the name of pistol in Germany, as had been the case in other countries for some time before. A pair of faustrohre, of the reign of the elector Maurice, 1541-1553, fitted with wheel-locks, are in the museum at Dresden. Such weapons were used long after the pistol proper had become common, and some of them are double-barrelled, and very long.”²¹

The reiter was a cavalryman and thus the faustrohr was in service to the cavalry. The name remained faustrohr all the way through the sixteenth century and only changed in the seventeenth century. The influence of the outside world on the naming conventions will be noted to be quite parochial; the English had different names for their pistols as will be noted later. The form of the pistol was quite varied as is noted, some are of some length and even had extra barrels, that they were primarily serving the needs of the cavalry has already been noted. What is also interesting is that for the increased amount of fire, a cavalryman might carry several pistols, “a German reiter, of the second half of the sixteenth century, armed with a brace of faustrohre.”²² The brace of pistols was made most famous by the pirates of

¹⁹ As stated by Newton, to every action there is an equal and opposite reaction, so too is the same with firearms. The recoil is the result of the firing of the projectile and the force of the powder firing transferred back through the stock to the shooter.

²⁰ Coltman Clephan (1910), p.145

²¹ *ibid*, p.146

²² *Ibid*, p.149

the eighteenth century, but as noted the idea of carrying more than one pistol, so that one could be fired, then another, then another, all in succession so a volume of fire could be maintained, was a thought present in earlier periods. While all of the pistols would have to be reloaded afterward, the present volume of fire would have been whittling.

“The striking feature of this list is the number of daggs in store, so soon after the commencement of the second half of the century; a circumstance, perhaps, tending to show that these weapons were then short handguns for cavalry, like the early *faustrohr*, a weapon discharged at arm's length, like the pistol; the prototype, in fact, of that weapon: and possibly the name "dagg" or "tacke" had descended to a variety of the pistol a couple of decades later. The "handgonne" or demi-hake merges into the pistol, and it is impossible to draw any very decided line between the two.”²³

Like the Germans, the English used different terms for pistols, “dagg” or “tacke” being the two most common terms. These represented weapons which were much the same as the *faustrohr* of the Germans, as noted. They were short weapons intended for use by cavalry. What will be noted is that there are other classifications of weapon which are present which also are merged into the same category of weapon by their size, shape and calibre, there being no definable difference amongst them. It is indicated that these weapons are discharged at arm's length, giving the shooter the position of the arm and looking straight down it to aim at the target. This method of firing the weapon was to persist until modern times where firing stances would change to adopt for different weapons, and purposes. Competition pistols at the Olympics are still fired in the same manner.

“The word pistol does not occur in any of the inventories taken at the Tower, Westminster or Greenwich in 1547, but dagges and tackes are mentioned. The terms dagge or dag and tacke are not merely other words for ordinary pistols; from which they must have differed in some way, for we meet with dagges and pistols scheduled together in inventories;”²⁴

The English persisted in using their words for pistol, like the Germans. They did not adopt the word pistol for referring to these short weapons. Even when the word was adopted the term dagg was still used and used at the same time as pistol to refer to the same sort of weapon, as is presented above. There is some evidence of differentiation in the term and weapon between a dagg and a pistol but it is uncertain as to what this particular differentiation is. What makes the issue even more confusing is that the term did not always apply to pistols.

“These names have sometimes been applied to daggers, but they certainly mean handguns of some sort: and it seems probable that one of them at least originally indicated a weapon in size something between a "handgonne" or demi-hake and a pistol, a large pistol in fact, like the early reiter's *faustrohr*, which has a stock formed very like that of a musket, and that the other may have been applied to its diminutive, the *faustling*, or to the small pistol, the

²³ *ibid*, p.122

²⁴ *ibid*, p.148

puffer; for we find entries in inventories of long, short and pocket dags; one in the Hengrave list, 1603,"²⁵

That a dagg could sometimes refer to dagger could confuse the situation, especially when searching through records in search of the weapons. The researcher would have to compare and contrast the use of the word and the placement in context to determine whether it is a firearm or a dagger which is being spoken about. The differentiation, mentioned before, is indicated here being that the weapon has a stock somewhat like a musket and is a somewhat large pistol, almost in the form of a carbine. The puffer will be discussed below as it is a particular type of pistol of a particular form.

To place the confusion all in context and to gain some clarity, especially as concerns the research of the weapon, when in context a dagg can be reference to a pistol. "In 1574, a dagge complete, that is with its accessories, cost 16s. 8d. the same price as did a pistol in 1599."²⁶ The similarity in price between the weapons is something of a foundation, especially when possible inflation is taken into account. Such terms as faustrohr, dagg and tacke are important as they allow the researcher to discover weapons using the terms of the period likewise the term puffer refers to a particular type of pistol.

"A *puffer*, a small pistol with a short barrel and sharply bent stock, ending in a long, heavy, round pommel; there is a pair at Dresden, of the year 1573, an engraving by C. B. Hopper, dated 15 31, shows what would appear to be a "puffer," a word with an English signification; but the drawing is too small to be of much use. A *drehling* is a revolver, and a *rohrlein* a small, short handgun."²⁷

The puffer is a particular type of pistol, small in size, with a short barrel, a bent stock and a heavy round ball for a pommel. These are evident in different collections and could be the foundation for the form of pistol found in the eighteenth century aboard naval vessels especially, where when fired were often turned on their end and used as a club of sorts. Such a ball would be used to off-set the recoil, allow the weapon to sit properly in the hand, and prevent it from slipping. This would be especially important on such a small weapon.

The *drehling* was mentioned above in the reference used to discuss the puffer, but there is something of note which needs to be made. The revolver is commonly thought to be an invention of the nineteenth century, starting with the pepper-boxes and culminating in the double-action revolvers, however there is evidence of its presence in a much earlier period.

"Niklas Zurkinden of Berne is stated to have invented the *drehling*, the prototype of the revolver, in 1584, and here we have a weapon with a drum bored with chambers, revolving on its axis, bringing each chamber in succession to the lock and the barrel. The career of this weapon was a short one, for it soon burst, owing to inaccuracies in the junctions."²⁸

²⁵ *ibid*, p.148

²⁶ *ibid*, p.148

²⁷ *ibid*, p.146

²⁸ *ibid*, p.150

The revolver which is presented here was plagued with mechanical issues and as a result, sometimes resulted in multiple chambers firing at once, often resulting in the weapon exploding in the shooter's hand. The point of mentioning this weapon is that many of the firearms advances which are attributed to later periods were present in earlier periods when firearms were beginning to make their mark, and these need to be noted and acknowledged, the revolver being only one of them.

Pistols of the sixteenth century were personal side-arms, much as they are now. The advances in technology, especially the wheel-lock and flintlock allowed them to flourish. The matchlock was simply not suitable to a weapon that was loaded and then stored due to the burning match that was necessary for this system. Noted advances were made in pistols and they found purpose in the hands of the cavalry who used them to their advantage. They were suited to this purpose being small and much easier to manage than the larger rifle. They were known by different names in different places for an extended period and there were different forms and this need to be acknowledged as does the advancements that were made. What is known for sure is that they were a standard side-arm of the cavalry.

Cavalry

While much of the focus of this investigation has been on firearms in general, it is useful to examine firearms of the period being used for a particular purpose, in this case in the hands of the cavalry. It was found that the full-length weapon, such as the musket and arquebus were too unwieldy for use on horseback, especially when combined with the matchlock system, so shorter weapons were devised for the cavalry's use. One of these weapons was the carbine, a cut-down version of the full-length rifle. One example of this weapon is the escopette, a French carbine, carried by heavy cavalry.

“the escopette was carried by heavy cavalry: the statement as to range must be accepted with some reserve. In the Musee d'Artillerie, Paris, is a short handgun of the middle of the fifteenth century,”²⁹

The carbine is a compromise between the length of the full-length rifle and the compactness of the pistol, however in its compact nature, much of the advantages of the rifle are lost, including range and accuracy. The same is found in modern carbines where it is found that they have a reduced range and accuracy at range. These are compact weapons intended for when the longer weapon is not suitable. The pistol was the more favoured weapon of the cavalry, being much shorter and much lighter; indeed, members of the cavalry often carried more than one. The tactic was to ride at pace, close to the enemy and discharge riding around to reload in the process.

“De la Noue, writing in 1587, says that pistols are not effective at more than three paces. Bodies of horsemen armed with these weapons, trotted up to the attack by ranks; they delivered their fire, and then wheeled outward by half troops, for the next rank to come forward in their places. Captain Crusoe states that fifteen motions are involved in firing. The pistol was often combined with other weapons, used both for battle and the chase;”³⁰

²⁹ ibid, p.144

³⁰ ibid, p.149

In discussing the other weapons carried, the sword still found favour with the cavalry, and even after it was abandoned on the battlefield by the infantry, it still remained in favour in the hands of the cavalry as a weapon to be used once firearms were spent or for close-quarter work. To this note it must be added that the firearm did not see the sword off the battlefield for quite a few hundred years, at least as far as the cavalry was concerned. Returning to the pistol and the tactic used by the cavalry, "professional Catholic horsemen practised the difficult "caracole," line after line firing their pistols, then wheeling to the rear to reload."³¹ Being able to fire off a shot at an enemy and then wheeling to the rear to reload meant that the cavalry could keep up a steady stream of fire so long as there were sufficient members of the unit present. There also must be noted the amount of skill required to perform this operation, such individuals required to be professionals.

When the term dragoons is mentioned, there is an image of eighteenth century battlefields and splendid uniforms which comes to mind. These units were much vaunted in this period and much recognised and given much honour, indeed many a soldier wished to be a part of a unit of dragoons, but their origins are much earlier. "The dragoons would appear to have had their origin towards the end of the sixteenth century, if not before."³² these were mounted infantry, dismounting to fight as infantry, but were eventually used primarily as cavalry in the eighteenth century using swords, trained to use the sword from horseback.

The cavalry is a most useful set of units to investigate when investigating the short-arms of the Renaissance period especially, as it is here that the pistol found its most use on the battlefield. Such weapons found their way into the hands of officers of many different units, and into the hands of those wealthy individuals who could afford them; many of the fine examples which are in museums come from nobles' collections.

³¹ Canby (1963), p.65

³² Coltman Clephan (1910), p.143

Gunpowder

The general history of gunpowder is relatively well-known it is popularly known to have been invented in China and used in fireworks for an extended period of time, and also used in some military technology. There is also evidence of some invention of the same powder in Germany sometime in the medieval period, whether the same recipe came across or it was by independent invention will likely never be known. This gunpowder is not the same as modern gunpowder it burns slower than the powder found in modern cartridges, and is known as “black powder”. A refining process occurred during the fifteenth century which turned the original black powder into a substance closer to the modern black powder.

“The primitive gunpowder, called “serpentine powder,” was a coarse meal; but in the fifteenth century the process of “corning” or forming the powder into grains was discovered. By varying the size of the grains, the strength, and hence the quantity, of powder used could be controlled,”³³

The measurement in “grains” is one which is still used today in the loading process of cartridges by individuals who create their own. Through this measurement a measured amount of powder can be used in a cartridge to create a certain amount of energy for a certain ballistic profile³⁴ of the projectile when it fires. The same process was able to be used with the refined powder when this refining process was used. Further powder could be set to different grades, finer powder for the faster burning powder of the priming pan,³⁵ and slower burning powder for the larger charge to push the projectile out of the barrel. The production of gunpowder became an important process and gunpowder was produced by various states, however more of the states produced them, especially when they became belligerents in a conflict.

“Up to well into the second half of the reign of Elizabeth, gunpowder had been chiefly imported from Spain, but when that country had assumed a threatening attitude towards England, the crown began to grant licences for its manufacture.”³⁶

Licences were necessary because of the explosive nature of the powder and there was more than one incident of gunpowder stores in London exploding and causing widespread damage.³⁷ Such licences were a measure to limit the number of individuals producing gunpowder and thus the number of stores of it. Eventually all of the stores ended up at the Tower of London, under the watchful eye of the Crown. Most put the history of gunpowder as a side-note but it is important to know changes in the nature of gunpowder to see that it was not all the same all of the time, much

³³ Chapel, 1st Lt.(Ret.) C. E. (1960) *The Complete Book of Gun Collecting*, Coward-McCann, Inc., New York, p.23

³⁴ The ballistic profile is the shape of the curve of the projectile moving through the air, they do not move in straight lines, they move in an arc from the barrel to the target.

³⁵ The priming pan was a small pan to the side of the barrel which held a small amount off powder, this was connected to the barrel and the primary charge by a small hole in the barrel.

³⁶ Coltman Clephan (1910), p.121

³⁷ These histories and the issues with the black powder can be found, if a researcher knows where to look.

like the weapons themselves and without the gunpowder the weapons would not have existed.

Accuracy

Black powder firearms of the Renaissance did not have the accuracy of modern firearms. While the shooter of the modern period with a purpose-built weapon, and training, can fire a projectile accurately out to hundreds of metres, even up and beyond a kilometre, the black powder firearm of the sixteenth century was far more limited to possibly a couple of hundred paces at its extreme. It was only much later in the century that the longer ranges were possible when weapons which were designed for the purpose, with technology added, could achieve any sort of accurate distance.

“In warfare, however, the use of handguns during the early centuries of their history was mainly confined to short, often very short, ranges, or they failed to produce any decisive effect: it was not until the advent of the musket that a range of 300 paces was attempted.”³⁸

Earlier weapons such as the arquebus,³⁹ for example, in comparison required massed fire to have any real effect, “the arquebus was not a very accurate weapon.”⁴⁰ This is the reason that arquebusiers were used in mass formations supported by pikes to defend them while they reloaded. They could not be relied upon to take out a single target with a single shot. Drills were used so the fire was concentrated against charges of the enemy. The accuracy of weapons was gradually increased through the use of technology. The two technologies which will be discussed below are rifling and sights, both of which added to the accuracy of the weapon. Both of these were gradually adopted, but it must be noted that even into the nineteenth century armies were still using smooth-bore,⁴¹ i.e. unrifled, muskets for their infantry, and massed fire formations.

Rifling

Rifling the grooves which are cut into the barrel of the weapon to allow the projectile to spin as it passes down the barrel stabilising the projectile in flight and increasing its accuracy, are what gives the rifle its name. This is a process designed to increase the accuracy of the weapon and appears in all most firearms where there is concern for a single projectile travelling down the barrel, so most shotguns are not rifled because they fire multiple projectiles which are intended to form a spread pattern. This is a process which occurred in weapons in the fifteenth century.

“the process of rifling barrels, by cutting long straight grooves lengthwise, dates from the closing years of the fifteenth century, if not earlier, but such parallel grooves would not lend any rotary motion to the projectile;”⁴²

What will be noted about these grooves is that they were straight and not the spiral grooves which are found in the modern firearm. The straight grooves may have given the projectile a little direction, but because there was no twist in them,

³⁸ Coltman Clephan (1910), p.114

³⁹ The arquebus is a matchlock weapon, a long-arm and the earliest form; as a category, it includes the musket and caliver under the same category. It was one of the first to be aided by a trigger, which will be discussed later.

⁴⁰ Canby (1963), p.64

⁴¹ The bore is the hollow part inside the barrel; this is measured for the calibre of the weapon.

⁴² Coltman Clephan (1910), p.134

there was no spinning of the projectile, so the projectile did not stabilise as much as it would have been liked. The process originated in Germany, and as it would happen as an accident, rather than by theory.

“It is to the artizans of Germany, that the rifle owes its origin, as at the close of the fifteenth century barrels with straight grooves were used by the citizens of Leipsic, at target practice, in 1498, and the invention of grooving or rifling fire-arms is generally supposed to be the result more of accident than theory.”⁴³

These grooves did increase accuracy but nowhere near the same degree as spiral grooves, as the projectile passing down a barrel with straight grooves does not spin, and thus does not stabilise as much as one which has spiral grooves. The principle of the spinning of the projectile was based on the arrow in flight which spins to stabilise itself due to how the fletches are put in place on the arrow, the same idea was intended for the grooves in the barrel of the firearm. It was in Germany, again, that it is found that spiral grooves were found first used.

“It is stated that Koster, of Nuremburg, in 1522, first suggested giving a spiral form to the grooves, and experience proved that much greater accuracy of shooting was the result.”⁴⁴

The spiral grooves which were added to these weapons in Nuremburg increased the accuracy, even compared to weapons found with straight grooves because the spiral caused the projectile to spin. The spinning motion of the projectile stabilised it in flight, increasing its accuracy. What is of true interest in regard to the rifling process is that the patent would come some 125 years after the first weapons had grooves applied to them. “The principle is said to have been applied in 1510, but the earliest patent granted at the patent office is dated 24th June, 1635”⁴⁵ Such is the nature that the patent was only granted once it was applied for and no doubt only once the principle was fully implemented, with spiral grooves improving accuracy more substantially. Of course, such technology would only become a standard practice in firearms in the late nineteenth century.

Sights

When sights are considered in regard to firearms in modern terms, they are considered almost a standard feature, from the telescopic sights found on many rifles, to the less complex standard rigid sights of other weapons. This device gives the shooter a degree of accuracy, knowing that they are pointing the barrel of the weapon directly at the target. It must be known that many weapons, especially in the early periods of the firearm, did not have such devices on them. In part, it was because the individual was too busy making sure that they were making sure that they were placing the match to the touch-hole properly. When this became mechanical with the “serpentine” mechanism on the matchlock, aiming was a possibility.

⁴³ Wilford, Col. E.C. (1861) Class Book for the School of Musketry Hythe: Prepared for the Use of Officers, W.S. Paine, Stationer, London, <https://www.gutenberg.org/files/60441/60441-h/60441-h.htm>, p.111

⁴⁴ *ibid*, p.112

⁴⁵ Coltman Clephan (1910), p.135

“as soon as he had only the trigger to deal with at the moment of firing, sights were placed on the barrel: this enabled him to take a surer aim, in a more accurate determination of the elevation and direction. Sights were first placed near the breech, later at the muzzle, later still we have both; and sometimes a small tube was placed on the barrel, as is the case with the Penhurst Place calivers and muskets,”⁴⁶

The caliver is a type of black powder weapon of the period, large calibre, indeed the only real difference in naming convention for many of these weapons was the calibre, thus the size of the projectile that they fired. The caliver was smaller than the musket, which was of a much larger calibre and much longer weapon, so long that it required a rest to hold up the end of the barrel while it was fired. To increase accuracy of these weapons, some would have bands of metal placed around the barrels, and also crude sights placed on them as well to aid in aiming.⁴⁷ Sights added to the accuracy of the weapon allowing the shooter to point the weapon in the correct direction and aim the weapon at the target properly, as more experience was gained with the weapon, a shooter could self-adjust for distance, but the sights were nothing like the ones we find on modern weapons, much cruder in shape and form, adding a fraction to the accuracy.

⁴⁶ *ibid*, p.113

⁴⁷ Thompson, L. (1980) *Guns in Colour*, Cathay Books, London, p.11

Matchlock

“The military handgun of the beginning of the sixteenth century, though still a rough weapon from our point of view, had made great strides towards comparative efficiency, and the various stages reached throughout the century preceding are set forth in my first paper. It had no fixed sights, and was fitted with a "serpentine," which, by the direct action of a finger, brought the burning match held in its jaws into contact with the priming in the pan.”⁴⁸

The first mechanical firing system to be used on the firearm was the matchlock. It essentially required a lighted match being touched to a pan which fed to the primary charge which was in the chamber which combusted and fired the projectile. In the earliest forms of this system the match was applied manually by the shooter, which required the individual to line the barrel with the target then place the match to the priming powder in the pan so the weapon could fire. The “serpentine” was a trigger mechanism which mechanically performed the same action allowing the shooter to focus on aiming the weapon at the target, increasing the accuracy of the weapon. It was at this point in time that it was worth adding sights to the weapon as the shooter, not distracted by the placing of the match to the priming pan, could aim the weapon at the target.

“as soon as he had only the trigger to deal with at the moment of firing, sights were placed on the barrel: this enabled him to take a surer aim, in a more accurate determination of the elevation and direction. Sights were first placed near the breech, later at the muzzle, later still we have both; and sometimes a small tube was placed on the barrel, as is the case with the Penhurst Place calivers and muskets, hereinafter referred to.”⁴⁹

The addition of the “serpentine” and sights to the matchlock weapons increased their accuracy, but the weapons were still not as accurate as one might consider. Massed fire of these weapons was the preferred method of use on the battlefield, and while other mechanical firing systems were developed, the matchlock held sway due to its simplicity of design, and did so until the invention of the true flintlock in the seventeenth century, even so, during this period some armies still relied on matchlock weapons, and it was not until the eighteenth or even nineteenth century that the matchlock was truly phased out in the infantry of some armies. Such a system must thus be recognised as being contemporaneous in the sixteenth century and considered as one which was forgotten once others were invented or found favour.

⁴⁸ Coltman Clephan (1910), p.111

⁴⁹ *ibid.* p.113

Wheel-lock

“The ingenious and expensive wheellock mechanism, introduced in the 16th century to overcome ignition problems, was soon incorporated in numerous pistols and longarms. Sometimes these had rifled barrels which caused the missile to rotate in flight thereby achieving greater accuracy.”⁵⁰

The wheel-lock, wheel lock, wheellock, or firelock,⁵¹ was the mechanical system of ignition which was developed after the matchlock. This was a more advanced form of ignition than the matchlock and involved a much more complicated mechanism and involved the participation of a locksmith as well as the gunsmith for its assembly to the complete weapon. In comparison to the matchlock, it was an improvement in different areas, but also had problems of its own.

“Sparks to fire the charge were produced by pressing a piece of mineral, usually pyrites, against the rotating, roughened edge of a steel wheel.”⁵²
(Wilkinson, 1968)

This is much like the modern cigarette lighter with a wheel being pressed against a mineral to form sparks. The sparks fell into the priming pan just as the match would in the matchlock to set off the same powder charge to fire the weapon. This format will be found in all of the weapons of the period, with the systems all being aimed at methods of firing the powder in the priming pan.

“the wheellock, presumably developed from a design by Leonardo da Vinci, appeared in Nuremburg around 1520. ... But the mechanism was too complex and expensive to make, and the wheellock shoulder gun never gained much acceptance as a military weapon.”⁵³

There is evidence of a design for a wheel-lock mechanism, or at least the prototype designs of one, in the drawings of Leonardo da Vinci. This is where the origins of the system lie, or presumably do. Such designs were no doubt used in Italy, but did not gain much acceptance until they travelled abroad. It was in Germany that they were first made commercially successful.⁵⁴ Interestingly, the same weapon design was used first at the siege of Parma, but the weapon in this particular case had a multiple system installed with a wheel-lock mechanism and a matchlock mechanism installed in tandem to ensure that the weapon would fire.

“The wheel-lock was first used at the siege of Parma, 1521, and was brought to England 1530. It was however complicated and difficult to repair, for which reason it could not always be depended upon, as is proved by some fire-arms of this description at the Tower, which are made with a serpentine, as well as with a wheel, both acted upon by the same trigger.”⁵⁵

⁵⁰ Thompson (1980), p.4

⁵¹ Firelock is the term which is found in English documents of the period.

⁵² Wikinson, F. (1968) Flintlock Pistols: An Illustrated Reference Guide to Flintlock Pistols from the 17th to the 19th Century, Stackpole Books, Harrisburg, p.9

⁵³ Canby (1963), p.65

⁵⁴ Chapel (1960), p.32

⁵⁵ Wilford (1861), p.90

The presence of the secondary system presents one of the flaws of the wheel-lock system, it was complicated and expensive, and it was prone to misfire. Like any system the wheel-lock had its issues. The matchlock was prone to weather as if the match got wet it would not burn and would prevent firing, there was also that the burning match presented the obvious location of the shooter, and it was not convenient for discretion due to the same burning match. These flaws were found in many of the early firing mechanisms. In the case of the wheel-lock the pyrites⁵⁶ which were used caused misfire, "brittleness of the mineral [pyrite] was the cause of the lock so often missing fire. All gunlocks invented before the percussion-lock shared in this unreliability,"⁵⁷ improvements in more modern firing systems eliminated such issues, but not until the nineteenth century.⁵⁸ However in regard to the wheel-lock, it was known to be complicated and expensive, due to its nature.

"the mechanism was somewhat complex and involved a degree of skill and time that made it expensive to produce. As price tended to limit supply to those who could afford them, wheellock pistols were usually of good quality and were never manufactured in large quantities for issue to troops, apart from a few cavalry units."⁵⁹ (Wilkinson, 1968)

Even with the issues which were present in the wheel-lock's design, there were also advantages that it had over the matchlock especially. These points made it favourable and caused many of its issues to be forgotten and the weapon still to be produced and bought by individuals who sought the weapon for its advantages. In fact the system completely eliminated some of the issues that were present in the matchlock system.

"the wheel lock was complicated and expensive, but it was independent of weather conditions, it could be concealed on the person, it was more accurate when fired from horseback, there was no burning match to reveal the presence of the shooter to wild game or an enemy, and there was no delay in preparing to fire. These superiorities of the wheel lock made it the principal military and sporting weapon from the date of its invention to the middle of the seventeenth century."⁶⁰

While this weapon was too expensive and complex for general use by infantry units of armies, its compact nature and lack of burning match made it very suitable for cavalry units, to which it was issued. What must be noted about this particular point is that up until the later sixteenth and early seventeenth centuries, cavalry units were primarily made of upper class and noble individuals who could afford a more expensive weapon, so the cost of the wheel-lock was somewhat off-set. The

⁵⁶ Pyrites, or iron pyrite, also known as fool's gold.

⁵⁷ Coltman Clephan (1910), p.130

⁵⁸ The percussion-lock, developed in the nineteenth century, involved a percussion cap which was struck by a hammer which set off the charge; it was independent of weather and many of the failures of previous systems. Later, a similar formula was used to develop the primers which are found in modern cartridges.

⁵⁹ Wilkinson (1968), p.9

⁶⁰ Chapel (1960), p.33

development of the pistol, somewhat as a result of the wheel-lock system also gave this system a further advantage.

“Too complex for a mass weapon, the wheellock proved however to have a future as a one-handed gun invented about 1540 as the “Pistolet,” and later called the pistol. ... Towards the end of the century the pistol, a foot long, was standard equipment for European cavalry, two in holsters and one in the right boot.”⁶¹

The rifle being a long weapon was too cumbersome to be carried when riding a horse, and added in with the complexities and issues of the matchlock system, the weapon was unsuitable for cavalry units. The wheel-lock system was simpler to operate, had no burning match to concern the rider, weapons could be loaded and then placed in a holster, or boot, to be fired later, and a smaller weapon was an option. The wheel-lock found a perfect place for itself in service to cavalry units. Indeed it could be claimed it was due to the development of the shortened wheel-lock weapons that the cavalry came back into prominence.

“For this purpose the wheel-lock was found to be a very great improvement; and its adoption for the pistol brought the cavalry arm into great prominence and importance, and indeed, may be almost said to have created those companies of reiters and pistoliers which played such a great part in the military operations of their day.”⁶²

The wheel-lock was a system which was more complicated and expensive than the matchlock, but there were advantages present in this system, as have been presented. It existed contemporaneously with the matchlock and with some of the systems which followed it. It was eventually phased out due to the development and adoption of the later simpler, more reliable flintlock systems, but for a period it did find a purpose in the hands of sportsmen and the cavalry units of the military alike. Like the matchlock system, it is one which must be acknowledged for the contributions that it made and indeed, it could be claimed that this system provided the stepping stone to the flintlock systems which followed it, and, in some cases, were contemporaneous to it.

⁶¹ Canby (1963), p.65

⁶² Coltman Clephan (1910), p.126

Flintlock

When the flintlock is discussed images of an eighteenth century weapon comes to mind, images of ranks of soldiers marching in line and firing at once, or images of pirates with pistols, but this is only the later form of the flintlock. What will be presented here is a more general approach to the flintlock, to demonstrate that the concept of the flintlock actually existed much before these common images of the weapon. Three different firing systems will be presented, each which is slightly different to the others, and each which works on a similar principle, which allows them to be classified as flintlocks, “all the flintlocks have a common basis, for in all it is the action of striking a shaped piece of flint against steel that produces the sparks.”⁶³ The definition will be even broader as it will be a shaped piece of mineral striking steel that produces sparks, as will be seen in the pyrites lock and snaphaunce.

Not Generally Accepted

“Early 16th century references speak both of flintlocks and snaplocks but the distinction is not apparent. Even today there is some disagreement amongst experts as the exact definition of a flintlock – some include under this heading weapons which other collectors differentiate and call snaphaunce ... whilst others limit the expression to those locks with a particular mechanical feature.”⁶⁴

There are still arguments about what should and should not be classified as a flintlock and whether the earlier systems should be simply classified as proto-flintlocks or whether they should be considered as independent systems of their own accord. This all depends on how closely the individual wants to look at the mechanism. The general approach which has been taken with this investigation allows for more systems to be addressed under this heading grouping them together by the similar approach to generating a spark to fire the charge in the priming pan of the weapon. Each of the systems *is* different and this must be noted, hence the reason that each has its own section and is addressed separately, yet under the overall heading of flintlocks.

Pyrites Lock

Not much is said about the pyrites lock in discussions of firearms systems, indeed it is only discussed when a true focus is made upon the firearms systems of the early modern period, but it is one that needs to be noted. There are differences which need to be noted and recognised so that a full explanation of firing mechanisms of the period can be presented. The mechanism itself is relatively simple, but its historical location is somewhat wedged between other mechanisms and it is rarely discussed.

“the pyrites lock is discussed by advanced gun collectors as a traditional type somewhere between the wheel lock and the true flintlock, but its only resemblance to the wheel lock lies in the use of pyrites. It probably developed

⁶³ Wikinson (1968), p.10

⁶⁴ *ibid*, p.10

from the matchlock, which it closely copies in appearance and pattern with only two important exceptions.”⁶⁵

The pyrites lock was the first attempt at a system for generating a spark using a steel and mineral system, no doubt starting with mounting a piece of pyrite on the “serpentine” rather than a match on a matchlock system. Here is where the resemblance to this older system truly lies and the reason that it has such a long hammer holding the pyrites, that and the long, scraping contact that was required.

“The typical pyrites lock can be recognized by the fact that the cock is at the end of an extremely long hammer arm which is set far back, near the end of the lock plate, the object being to provide a long, scraping contact,”⁶⁶

The “serpentine” of the matchlock is of a similar shape and was in a similar position meaning that it is clear that the idea came from this system. The steel was placed in a position where the pyrites would strike it and be dragged down it to create the spark that was required. The shape of the hammer, or cock,⁶⁷ itself is also a feature which is of note which aided in the process.

“Another distinguishing feature of the pyrites lock is the curve in the outline of the hammer which gives it part of the scraping effect against the steel; when the gun is fired, the cock lies almost parallel with the axis of the bore. Still another characteristic is the simplicity of the mechanism inside the lock.”⁶⁸

The simplicity of the system is based on the foundation of the matchlock, a simple system in itself. Like many systems it lies parallel to the axis of the bore to give the weapon a slimmer outline and ensure that it is less likely to snag. Even with the distinctive features, which will be found to be similar, but different to the snaphaunce and Miquelet lock, there are those who refuse to recognise it as a recognisable system. “Some arms historians refuse to recognize the pyrites lock as a distinct type and prefer to treat it as just one of many early snap-type devices.”⁶⁹ It has similarities with both the snaphaunce and Miquelet lock, though the similarities with the Miquelet are substantially fewer, however this is clearly an earlier development of this type of system, generally referred to as a flintlock, and even though the differences are relatively minor, they need to be recognised and appreciated to understand the development of the system as a whole.

Snaphaunce

“To most collectors this style of lock, with separate pan cover and steel, is known as the snaphaunce. It appears to be of German origin and the earliest surviving specimens all date from around the middle of the 16th century.”⁷⁰

⁶⁵ Chapel (1960), p.35

⁶⁶ *ibid*, p.35

⁶⁷ The cock, which holds the pyrite or flint, is also known as a hammer as it strikes the steel. The name is still present in modern firearms.

⁶⁸ Chapel (1960), p.35

⁶⁹ *ibid*, p.36

⁷⁰ Wikinson (1968), p.11

Most people consider the process of firearms to proceed from the matchlock, to wheel-lock, then to the flintlock. There is no consideration for firing systems which may have existed within or as a part of these areas. The snaphaunce is different from the flintlock, even though it carries some of the same characteristics, as is noted in the above. Both have mineral which strikes steel to create sparks to drop into a pan, but the pan cover is separate in the snaphaunce, making it different. "Following the pyrites lock, came the snaphaunce, the immediate predecessor of the true flintlock."⁷¹ The snaphaunce, like the pyrites lock is one of the mechanisms which is often forgotten but forms an important step in the development toward the flintlock, thus a discussion of this system, especially when considering systems of the sixteenth century is essential.

"The Netherlands lock consists of as many as fourteen different pieces, that of Spain numbering nine only. Both these countries claim the honour of the invention of the snaphaunce, and the name itself might be considered a point in favour of the Low Countries; but the lock was known in Germany at an early period of its history as *das Spanische schnappschloss*, though it was never widely used by the Germans. The lock was certainly adopted by Spain very early, if, as is most probable, it had not its origin there: pistols fitted with it were being made in Scotland in the third quarter of the century."⁷²

Where exactly the snaphaunce originated is of some debate amongst firearms historians. While it carries the Dutch name snaphaunce and the word for it originated there and is referred to as the Netherlands lock, there is some evidence that a similar lock was known in Germany, though not utilised, which was thought to have originated in Spain. The Miquelet lock is a definitively Spanish lock and is a subject for future discussion, but this is a different lock, and the snaphaunce could be seen as a predecessor to it, considering the evidence which is presented above. What is known is that it was used by the Dutch, and so the Dutch name stuck, it is also known that it made its appearance not long after the invention of the wheel-lock, but took a while to make an impression.

"The lock was probably invented between the years 1525 and 1535, not much later than the wheel-lock, and it is surprising that it took so long to make its way, more especially against the matchlock. The earliest English mention of it is, we think, in 1580, in connexion with the equipment of some troops for Ireland;"⁷³

The mechanism had the advantage over the matchlock in that it was not weather dependent, and it also did not have the burning match to be concerned with. It had the advantage over the wheel-lock in that it was a much simpler system, and was more reliable. Yet, it still took some time for it to make its mark on the world. The system is not particularly well-known even in the modern world. "As a distinct type, it began to disappear in some parts of the world with the coming of the fully developed flintlock."⁷⁴ The snaphaunce's short period of use is the likely reason that the mechanism is usually brushed over in histories of firearms.

⁷¹ Chapel (1960), p.36

⁷² Coltman Clephan (1910), p.132

⁷³ *ibid*, p.133

⁷⁴ Chapel (1960), p.37

“The next improvement upon the wheel-lock was the snaphaunce; a flat piece of steel, furrowed in imitation of the wheel, was placed on a steel post, which being screwed beyond the pan, was made moveable; the pan had a cover which required to be pushed off by the thumb, and the furrowed piece being then brought to stand over it, on pulling the trigger, the flint, which was substituted for pyrites, struck against it, and gave the spark.”⁷⁵

Flint was replaced by pyrites because the flint was too hard and the pyrites made the mechanism work better with the long, scraping blow that the snaphaunce gives when the mechanism is fired. The moveable pan is the distinctive feature of the snaphaunce and in the original models this was a manual operation, the shooter had to manually open the pan before firing the weapon. In later flintlocks this was not the case, the steel, called a battery or frizzen, and pan cover were made into a single piece⁷⁶, which is a feature of the Miquelet lock which is not considered a true flintlock either, and will be discussed later on. In later models changes were made. “The pan cover snaps open when the trigger is pulled and the cock snaps. The pan cover opens forward to expose the priming powder.”⁷⁷ This reduced the actions of the shooter allowing for a quicker action when firing the weapon.

In examination of the snaphaunce, and especially when examining firearms in general, there is a problem with an examination of weapons and their systems from a generalised point of view. It is from this approach that firing mechanisms such as the snaphaunce get lost, because they are similar to later systems such as the flintlock.

“The snaphaunce is a much simpler, cheaper and surer lock than the wheel-lock. It is impossible to draw any very decided line between it and the familiar flintlock, for both are constructed on the same principle, and the difference is superficial in character.”⁷⁸

There are differences between the snaphaunce and the flintlock. One uses flint and the other uses pyrites, one has a quick hard strike when the cock strikes the battery, the other is a long, scraping action. The shape of the systems when examining the various parts are different and there is the important element of the pan cover which is separate in the snaphaunce and integrated in the frizzen in the flintlock. Such characteristics are not superficial but define how the weapon works. The snaphaunce was an improvement on the matchlock and the wheel-lock, and was the stepping stone which led to the flintlock. Indeed the mechanism of the flintlock can evidently be seen in the snaphaunce.

“Improvements continued with the snaphaunce mechanism (AD 1540) which comprised a flint-clasping arm sited opposite a hinged plate. ... This system was more reliable than the matchlock but simpler and cheaper than the wheellock. However, the snaphaunce was in turn soon replaced by the more

⁷⁵ Wilford (1861), p.91

⁷⁶ Chapel (1960), p.36

⁷⁷ *ibid*, p.36

⁷⁸ Coltman Clephan (1910), p.131

efficient flintlock in which the frizzen combined the functions of steel and pancover.”⁷⁹

The snaphaunce is not a flintlock, though it resembles it in many ways. There are differences between the two systems and these must be acknowledged. They are two different firing mechanisms and one led to the development of the other. Indeed if the Spanish Miquelet lock is examined further similarities with the flintlock will be found, yet it is not a flintlock in the classic sense either, and not only did it exist before the flintlock it remained contemporaneous with it.

Miquelet

The Miquelet lock is the Spanish form of the flintlock. It appeared in the 16th century. The system is notable, not only due to its appearance during this period, but also due to its enduring nature. This was a system which lasted, unlike some others which were phased out, the Miquelet lock continued on in much the same form, until replaced by the percussion cap of the nineteenth century. Like many systems and weapons of the period, the Miquelet lock derived its name from those who used the weapon.

“Like the snaphaunce, the Spanish lock called the “miquelet” derived its name from its inventors, the Spanish or Portuguese marauders known as *miquelites* or *miquelitos*, who adopted this arm for much the same reason that the Dutch or German robbers chose the snaphaunce.”⁸⁰

The advantage of this system over the matchlock, like other similar systems, was there was no match burning meaning that it did not give the position of the user away, useful for marauders. This also allowed the weapon to be stored preloaded, unlike the matchlock, and unlike the wheel-lock the mechanism was simple and robust. In examination of the mechanism itself, it will be noted that this was a hard-wearing system intended for hard work, and designed to last.

“In Spain, early in the 16th century, there appeared the Miquelet lock which remained basically unaltered until the 19th century. This lock has a number of distinguishing features, such as the jaws which hold the flint – for these are normally rectangular or square and thicker than in other types of lock. Since the mainsprings were normally very powerful, extra grip when cocking was offered by a ring set above the jaws.”⁸¹

The jaws which hold the flint are one of the defining features of this type of lock. The jaws in other systems are much more slender. Likewise others had a screw in the top of theirs to hold the flint in place rather than one with a ring on it. This will be a feature of special note, as will be seen. The mainspring is also a feature which will appear as important, as it made the system different to others in its action. What was also different was the simplification of the system which aided in its longevity.

“The miquelet system ... combined the steel and pan cover into one part, as in the flintlock. It also had a safety device which allowed the cock to be held

⁷⁹ Thompson (1980), p.4

⁸⁰ Chapel (1960), p.37

⁸¹ Wikinson (1968), p.11

halfway towards the steel in the 'half-cock' position. The large screw on top of the cock, which kept the flint in position, could be turned by hand which meant that the owner need not carry any other tools. The extremely powerful mainspring was fixed to the outside of the lockplate instead of being housed internally as in the snaphaunce and the flintlock."⁸²

The combination of steel and pan cover into one part is a feature which is found on the later flintlock systems, which is a feature which aided in its longevity. Many of the features of later flintlock systems were already present in the Miquelet lock system. Another one of these noted above is the ability to place the hammer in the 'half-cock' position, preventing the weapon from accidentally firing if the trigger was depressed. It is from this position that we get the expression of someone "going off half-cocked" thus, not properly prepared.⁸³ The ring on top of the jaws is mentioned allowing the shooter to readjust or replace the flint without the need for tools, which was an advantage over other systems. From this perspective it is most interesting to note the differences in the mechanisms between the Miquelet and the snaphaunce.

"The miquelet has a heavy outside mainspring and cock, as distinguished from the snaphaunce lock with its mechanism inside the plate where it cannot be easily injured. In this, the miquelet is inferior to the Dutch gun; but the miquelet has the advantage of a hammer and pan cover in one piece, so that the pan is uncovered when the flint hits the frizzen. In contrast to the pyrites lock, the miquelet cock delivers a quick, powerful blow instead of a long scraping contact, and it uses flint."⁸⁴

The mainspring is large and strong in the Miquelet lock, and located on the outside, whereas in the snaphaunce, it is smaller and located on the inside of the weapon. This mainspring gave the cock the quick powerful blow which is described which is more like the flintlock which came later than its contemporary at the time, the snaphaunce. The pan cover and frizzen, the steel, are all in one piece, like in the later flintlock, and unlike in the snaphaunce in which they are separate pieces. Many of these differences to the snaphaunce would remain as features in the later flintlock firearm mechanism, and it is of little surprise that this firing system remained in service contemporary with the later developed flintlock system. With such features present, and persisting into the later flintlock, the Miquelet lock is the most advanced system of the sixteenth century. While it carries many of the same features as a latter day flintlock, it is still not the same.

⁸² Thompson (1980), p.17

⁸³ Many expressions about the using of firearms such as: cocking the weapon, drawing the cock back; 'half-cock' position, a preparatory, but not ready to fire position; all originate from the use of these early firearms and many of these expressions remain in our modern language.

⁸⁴ Chapel (1960), p.37

Conclusion

The purpose of the discussion has been to highlight, describe and explain the different firearms technologies which were present in the sixteenth century from a general perspective. There are many resources available for a more in depth investigation of this topic, including many of the sources found in the bibliography. Much of the detail that was not added to the discussion gives such detail, and a lot of jargon, that can confuse an individual who is not familiar with firearms. It was not included because it was not required as it does not aid the discussion. What jargon and terms are present are those which are necessary for understanding the essential elements of the discussion. The developmental process is the most important in the discussion. There are certain elements which were discovered.

Many advances which are taken for granted to have been a part of later periods actually belong to the early modern period, being the fifteenth and sixteenth centuries and not the later period and examples of these have been presented. The prime example of this is the beginnings of the flintlock, which was started in the form of the pyrites lock, a weapon based on the technology combined in the matchlock and wheel-lock and then progressed through the other forms as the century progressed. Many of the final elements of the flintlock can be found in the Miquelet lock which was developed and used widely in the sixteenth century and was not replaced by the later forms of the flintlock, it being suitable for service as it was. Such situations need to be acknowledged for what they were.

The firearm in its essential form is developed by end of the period, with different lengths and forms present, only the changes in the different firing mechanisms made a real difference. The only thing that was really missing was automatic weapons. Breech-loaders had made an appearance in some form, as had revolvers, two technologies which would be re-visited in later periods. The pistol, by the end of the period, was well established as was the carbine as standard weaponry designed for a particular purpose.

There was a discussion of the three main firing systems which were present along with some of the subgroups within these, especially within the flintlock, which are often glossed over. Each mechanism was described, the principle upon which it was based, how it came to be, and the issues that were present with this firing system. Each firing system which was developed attempted to solve the issues that were present in the previous firing system and this is the way that they should be approached. Each is worthy of consideration and study.

The matchlock was the first system, based on the simple application of a burning match to the priming charge in the priming pan. It was enhanced by the development of the "serpentine" which allowed the firer to then keep their eye on the target rather than being concerned with ensuring that the match struck the pan. This was a simple system that would remain and would not be replaced for infantry service until the flintlock was in service due to its simplicity.

The wheel-lock was the next step in the process and applied the idea of striking a spark from pyrites applied to spinning steel, much in the same way as the modern cigarette lighter. This was an improvement on the matchlock as it removed the necessity of the burning match. It allowed the easier development of shorter arms which could be stored loaded, and thus the pistol was a result of this developmental process. It was an excellent system, at the time, for those who could afford it.

The flintlock was the final developmental stage and took the idea of striking a spark from mineral striking steel to the next level and simplified the process. The

mineral would simply strike or scrape along the steel to produce the spark, rather than have it spinning. This simplified the mechanism and made it cheaper and easier to use, this is the system which would eventually replace all of the others. There are different subgroups of the flintlock which need to be noted, especially in their differences, all demonstrate different approaches to a similar problem.

The firearms of the sixteenth century are a set of weapons which need to be noted for their ingenious developmental process. From the simple application of fire to powder to the development of sparks from striking mineral to steel, each solved the process of igniting the priming charge in its different way. The technology which is involved in the invention and production of these weapons needs to be appreciated to understand these weapons and they need to be placed firmly in the historical location in which they were found. They were not as accurate or as efficient as modern weapons. However, for weapons of their day, they were at the forefront of weapons technology.

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