EUROPEAN WEAPONS AND ARMOUR

From the Renaissance to the Industrial Revolution

EWART OAKESHOTT

F.S.A.

With line illustrations by the author

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For

SYBIL

without whom

this

would have been

impossible

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References in the text to *A of W* and *S in A of C* are to the author's earlier works, *The Archaeology of Weapons* and *The Sword in the Age of Chivalry*.

Weight and measurement are expressed in imperial terms, the closest metrical equivalents being given in parentheses, with the abbreviations mm for millimetre, cm for centimetre, m for metre (usually, however, spelt out in full), g for gramme (again, usually spelt out in full), and kg for kilogramme.

Conventional abbreviations, such as p for page, Fig. for Figure, *q.v.* for *quod vide*, and so on, are employed throughout, and are not glossed here.

Note

There is one further point that should be mentioned. In order to emphasise the cross-fertilisation between European states and cities in the manufacture and trading of arms and armour, foreign names, such as *flamberge* or *schiavona*, are given in italic type. A fair proportion of these names are German and according to correct German usage should have a capital letter (for example, *Landsknecht*). However, as the terms are used frequently in this book, and appear alongside French, Italian and Spanish names, they have been treated as if integrated into English, and appear without capitals.

Author's Acknowledgments

So many people have given encouragement and support to my research during the past thirty-five years, and to my efforts to prepare this book in the last ten of them, that to name them all would be impossible. My formal thanks to certain museums for the use of photographs are given at the end of this book, but to the officials whose main concern is with arms in these museums, and to many others, who have all helped to forward my work, thanks of a less impersonal nature are due. There are many private individuals too, collectors and amateurs of arms who have generously made pieces in their collections available to me for study or for inclusion here among the illustrations. They prefer to remain anonymous, but I would like to think they know how much I appreciate their interest.

However, in any Acknowledgment of this kind it cannot be amiss to name those who are one's friends as well as one's mentors. Mr A. V. B. Norman, BA, FSA, Master of the Armouries at the Tower of London, and Mr Claude Blair, MA, FSA, of the Victoria and Albert Museum, have for decades guided my sometimes errant enthusiasms along the path of academic rectitude, as well as giving unstintingly of their profound knowledge and experience of the subject of arms and all others relating to it. So too have Mr William Reid of the National Army Museum and Mr J. Scott, MA, SMA, FSA Scot., of the Art Gallery and Museum, Glasgow. But my first introduction to them and to the late Sir James Mann, I owe to Mr H. Russell Robinson of the Armouries at the Tower of London. When on a winter morning of 1946 we fell into talk across a case full of gauntlets in the old Horse Armoury, I could never have imagined what wealth of knowledge and unending interest would grow from that meeting, or that I should be privileged to benefit as I have from his incomparable flair for the whole touch and taste and smell of the more practical approaches to the study of armour, as well as its academic aspects. His recent untimely death is a personal grief to many, but a loss beyond measure to the study of military archaeology.

It is with regret that I have also learned, since this book reached proof stage, of the sad deaths of Mr E. A. Christensen and Mr Harold Peterson whose collections are cited in these pages.

I owe, too, far more than a few words can express to Mr R. T. Gwynn, Mr Howard Blackmore, FSA, FGA, Mr Evan Perry and Mr David Jeffcoat. To the firm of Peter Dale Ltd, I owe formal thanks for the readiness with which, on request, they have caused countless swords to be photographed for inclusion here, and less formal and most sincere ones to Mr Peter Dale, Mr Derek Spalding and Mr Robin Dale, for their generosity in giving me access to all the high-quality armour and arms continually passing through their hands.

AUTHOR'S ACKNOWLEDGMENTS

I do not use a typewriter. Every word has gone down on paper in a vile, tiny, cramped handwriting; and the original version of this book was some 10,000 words longer than it is now. All of it has been typed for me with patience and good humour beyond belief by Mrs Kay Rees. What can an author say about such things? And then the whole typescript, cut, amended and extended by interpolations on odd pieces of paper, was put into order by Miss Jenny Overton and her colleagues at Lutterworth Press, creating sanity out of a Pandemonium of line drawings, and for the third time in eighteen years producing a book from my labours. So to say that I thank them is feeble, but it is all I can do.

Ewart Oakeshott

Cwmystwyth, 1977

PREFACE

The aim of this book is to present a sketch—space forbids its being more than that—of the development of weapons, from the end of the fifteenth century until the end of the eighteenth, in much the same way as in a previous volume, *The Archaeology of Weapons*, I attempted to present the story of military hardware from the Bronze Age to the Renaissance. So this, though in a different form, is really no more than a continuation of that attempt, taking it from the Renaissance towards the present day. However, as we get nearer to our own time the material becomes harder to present. On the one hand, wars become more complex and arms show greater variation in style and purpose according to nationality, even to regional locality, and fashion alters their forms much oftener than it did in earlier centuries. Many more arms are produced too, and an infinitely greater number has survived. On the other hand, as the centuries pass we find that there are fewer and fewer *types* of weapons in use: the mace, the axe, the hammer, the pike, the halberd and bill, the bow and crossbow, even the dagger, go out of use in Europe until by the middle of the seventeenth century the only weapons left to describe are the gun and the sword—though, of course, daggers and knives were still used to some extent, as were bows and crossbows (for hunting mainly, though the Scots carried bows at the battle of Tippermuir in 1644). In the same way, armour, growing to a peak of perfection in the first half of the sixteenth century, declines in quality and effectiveness (in direct ratio to the increase in the quality and effectiveness of firearms) until by 1650 it is well on its way to the museum.

But if the field is narrowed to the study of the sword and the gun, the task is not made any easier. The mutations and variations of sword types steadily grow until by the start of the nineteenth century the task of classification and analysis would call for a specialised work with one volume for each nation in Europe and one for America. Fortunately when it comes to the study of firearms the job is done, for the huge mass of material has been accurately presented in meticulous detail by many specialist authorities of the first rank; it is not in my brief.

To the reader's first glance it may seem that this book is very much biased in favour of the sword. It has to be, for the reasons given above and because so far only comparatively scant attention has been given to the study of swords.

Owing to inescapable limitations, I have to present my sketch in as clear and direct a manner as possible. The emphasis has to be upon clarity, so there will be many illustrations

but few footnotes. I write for the student of arms whose interest is not academic but practical, be he writer, actor, collector, artist or—perhaps best of all—mere amateur. What I mean by a mere amateur (and what would instantly have been understood by it half a century ago) is one whose interest is inspired not by the purity of scholarship or by academic professionalism, but by love. If anything should be found in the following pages to appease the scholar or satisfy the academic, so much the better; but it should be made plain before I set out upon such a hazardous enterprise as this attempt, with so vast a mass of material crammed into so small a compass of paper and ink, that there will be shortcomings. To avoid them I should need three more volumes, not one. These inevitable *lacunae* may offend the scholar but will not, I believe, affect the amateur for whom I write. My choice is clear: if I sacrifice clarity for pedantry, illustration for footnotes, I shall produce a book whose fate will be to moulder in quiet, undisturbed respectability on library shelves. It is not for this that I have undertaken a lifetime of research.

INTRODUCTION

With the last decade of the fifteenth century, military history enters a new epoch. One cannot say that any particular date or decade marks the end of the Middle Ages or the beginning of the Renaissance, for in some parts of Europe society remained firmly medieval until well into the sixteenth century, while in Italy the Renaissance began before the end of the fourteenth. When it comes to the art of war and the history of arms, however, we can be positive: the decade 1490—1500 marks a definite turning-point and ushers in the era of musket and pike in much the same way at the Visigoths' crossing of the Danube in AD 376 and the battle of Adrianople in AD 378 ushered in the era of the armoured knight. The latter lasted more than a thousand years, whereas musket and pike only dominated the fields of war for two centuries, for the introduction of the socket bayonet in the 1690s brought it to an end when the musketeer became his own pikeman. Thus began the supremacy of bayonet and cannon, in its turn to be swept away in 1914—1918.

September 12 1494 is a date full of significance in the history of arms. On that day Charles VIII of France gave grudging and discourteous audience to Ludovico Sforza, Duke of Milan, in an intolerably hot hotel overcrowded with soldiers, *aides de camp*, councillors, priests and hangers-on. This was in the town of Asti in Savoy, the property of Charles's cousin, Louis d'Orléans, who had inherited it from his mother. For this reason it had been chosen as the mustering-place for a great army of invasion which France was about to loose upon Italy with the purpose of seizing the kingdom of Naples for the French crown. On that same day, far away at Cognac, a baby was born to Louise de Savoie, wife of the Comte d'Angoulême. Charles's invasion was to begin a war which would last for sixty-six years; and the baby was to inherit it. He grew up to become François de Valois, Duc d'Angoulême, and, at the age of twenty, François I, King of France. Once he was safely on the throne he threw himself with tremendous verve into the war, obsessively seeking the paths of glory, thereby ensuring that it lasted for the rest of his life and enabling himself to hand it on, in good going order, to his successors.

Up to the last decade of the fifteenth century, war had been an occupation in which feudal chivalry found its glory, and efficiency in it was the attribute of a class. After about 1490, this efficiency became the attribute of a profession, the subject of careful study and much experiment. The vigorous, questing, scientific spirit of the sixteenth century added

many new forms to the art of war which made medieval martial concepts seem more remote from modern warfare than were those of the great days of Rome.

The army mustering at Asti was the finest Europe had seen since the days of Imperial Rome—better financed, better organised, better armed and trained and fed than any army had been since Diocletian reorganised the legions in AD 289. It fairly crackled with enthusiasm, fiery and confident in its efficiency and strength and in the strategic plan which had brought it into being. The idea was excellent, curiously modern: an exuberant enterprise of aggression, carried out with a compact army of 40,000 men, a swift *blitzkrieg* down a prostrate Italy cowed with terror of the French arms, and an easy dashing victory at the end of it.

The meeting between Charles and Sforza provides intriguing contrasts: the King, heir to all the greatness of the noblest royal house in Europe, behaved with unmannerly boorishness, while Sforza, heir to a soldier of fortune whose forefathers had been peasants, bore himself with princely dignity and exquisite good taste. But Charles for all his kingship was a boor, and with such a force behind him could afford to treat like a lackey the second-generation ruler of a duchy which had the anatomy of a pancake, with no defensible frontiers. France itself was arrogant and brash in its newly-found mightiness (such a contrast to its abject condition only forty years before at the end of the Hundred Years War), while Italy, like Sforza, was rich in ancient culture as in material wealth, but lacked any real military power. France now needed Milan's support; Milan was terrified of the French, and so the support was given, and an enormous loan with it.

Charles owed his power to his father, Louis XI; God knew to what he owed his misshapen body and feeble mind, but in 1494 his big head was stuffed with romantic ideas of a crusade to free the Holy Land from the Turk, taking in the conquest of Naples *en route* for Jerusalem. *He* may have dreamed of Charlemagne and Godfrey de Bouillon and St Louis, but his advisers—political, military and religious—did nothing of the kind. Their interest was practical. Some fifty years earlier, in 1442, the kingdom of Naples and Sicily, which had been ruled for almost two hundred years by a cadet branch of the French royal house, had fallen into the power of Aragon; the merging of Aragon and Castile in 1469 had meant that it was now controlled by the far more dangerous power of a united Spain. Charles's advisers saw this glittering *chevauchée* for what it was (after all, they had created and organised it), a venture of political aggression designed to secure France against the growing nationhood of her neighbours. The practical and sensible aim of the invasion was the acquisition of power, with as much plunder thrown in for individuals as could be got. It was Europe's first essay in raw nationalism. Hence the army at Asti, bent on getting in the first blow and showing what France was capable of.

It certainly was impressive, however futile the Royal youth who was carried along with it like a leaf on a mountain stream. Its leaders were young men '*as full of spirit as the month of May, and gorgeous as the sun at Midsummer*' who were soon to show their mettle and blazon their names across the pages of history and romance in countless battles, sieges, onfalls and forays for half a century. They gathered in great state around Asti: the gleaming *gens d'armes* of the *Compagnies d'Ordonnance*, a permanent standing force of the finest cavalry in Europe; the columns of mercenary Swiss pikemen fresh from their triumphs over Charles *Le Téméraire*, 'the Rash', of Burgundy; and the train of artillery

built up in France over the last half-century and now without equal anywhere in the world. The very best war material available was poised to sweep through Italy and take Europe by the nose.

Europe, of course, retaliated, and Charles's dream of becoming a second Charlemagne turned into a nightmare which grew more appalling as the decades passed. His initial invasion succeeded, but no sooner was he master of Naples than all the states of Italy, whose timid neutrality had let him through, united behind him in passionate hostility and cut him off from his homeland. He had to bring what was left of his army—disease and desertion had almost halved it—racing back to fight its way past a great confederate host in the dry mountain valley of the Taro near the village of Fornovo on July 6 1495. The Italian army, composed mostly of the mercenary armies of the *Condottieri*, was decisively beaten though it out-numbered the French by two to one. But for two centuries the Italian style of war had been to avoid actual fighting; after all, the men-at-arms of a *condottiere* were his stock-in-trade, he was not going to risk losing them or getting them damaged, so if two armies were unfortunate enough actually to confront one another, they engaged in a chessboard series of manoeuvres and feints until one side agreed that it had been outmatched by the other. Not so on the Taro: the French meant business, and the Italians were horrified. Many of them fought bravely enough, but the greater part rode off the field in disgust at this unsporting behaviour on the part of an army which by all the rules of (Italian) war was beaten before its men drew blade.

So Charles got by—he bore himself well too, fighting valiantly when for a while he was cut off by a group of Italian knights: but it was a near-run thing.

He had not long to enjoy his success, such as it was; three years later he died in a silly domestic accident. He left no son, so his cousin, Louis d'Orléans, succeeded him as Louis XII, and thus inherited the Royal claim to Naples as well as his own family claim to Milan (he was the grandson of Valentina Visconti, heiress to the Duchy which a generation earlier had been taken over by the adventurer Francesco Sforza, father of the magnificent Ludovico). So the war was resumed with even greater vigour—Louis not only had a good claim to Milan, but was a good soldier as well. No support was asked of Sforza this time. The French crossed the Alps and simply annexed Milan. Ludovico tried to escape among the retiring columns of his defeated mercenaries, dressed as a humble pikeman, but someone gave him away, and Louis had him carted off and shut up in the castle of Loches, where he died nine years later.

Louis went on to capture Naples, but he did not hold it long; in 1502 his army of the south was beaten at Seminara by a Spanish force under Gonzalo de Córdoba. Now the war clarified into its true colours as a struggle between France and Spain for domination in Italy: it went on that way for two centuries (with a forty-year break in the middle when France went out of the game, preoccupied with her own civil wars). Louis XII lost Naples in 1503, and Milan ten years later. In 1515 he died; and François d'Angoulême, the child born with the war, succeeded him.

From the very start of his reign François I flung himself into the war with romantic zest. He took yet another army across the Alps—this time adventurously, by a little-known pass, which enabled him to catch his opponents on the farther side completely off-guard—and in a confused battle, much of it fought in dim moonlight, outside Milan, by

the village of Marignano (Melegnano) he won a decisive victory over the Milanese hireling Swiss. This was on September 13 1515.

The victory was not only decisive in regaining Milan, it was also decisive in convincing François that he was indeed what he had always wanted to be, a great war leader. His army had won him a splendid battle, but he personally had fought with great bravery and distinction, getting stunned twice, slightly wounded, and having the beautiful new German armour which he had put on that day for the first time battered and spoiled. Not just a warlord, then. A most gallant chevalier! The ideal of his own ambition, the accolade of knighthood conferred upon him after the battle by the finest knight of them all, the incomparable Bayard!

All this boded ill for Europe. From now until his death, François would pursue this will-of-the-wisp of personal glory, which ever after eluded him—indeed in 1525 it landed him a prisoner-of-war in a Spanish gaol after the most dreadful defeat his arms ever suffered.

But in spite of this, for twenty-two years more he persisted in sending army after army to destruction in Italy. He never gave up, and bequeathed the war which had started on the day he was born to his son, and to the whole of Europe for generation after generation, for every European war since then has stemmed from that.

Why in the face of repeated disaster the people of France were willing, and her kings eager, to persist in this futile adventure is one of the wonders of history. It made certain that almost ceaseless nationalistic wars would ravage Europe for four centuries, wars which by the seventeenth century had spread to the Americas, by the eighteenth to India, by the nineteenth to Africa, and by the twentieth were to engulf the entire globe.

Or was it really so? Those 'devastated' nations, 'bled white by war', produced unimaginable accumulations of wealth and prestige, and splendours of creative art. No, it is a gross misrepresentation to say that these wars ravaged all Europe—they ravaged little bits from time to time, much as a particular kind of wood-boring grub covers a dry piece of timber with a pattern of tortuous little channels, leaving large areas of the surface untouched. But it is certainly true that the wars grew more terrible as time passed, partly by reason of the constantly increasing efficiency of firearms, partly because greater numbers of people were involved. In the early sixteenth century an army of 50,000 men would be regarded as a big one; in the wars of Louis XIV, a century and a half later, we read of armies of up to 90,000 or 100,000; while in the Napoleonic wars, armies of up to 200,000 conscripted men are common. And of course in our own time tens of millions have been involved. The concept of total war now affects whole peoples, whereas four centuries ago (and in 1540 war could be just as 'total' as it was in 1940) comparatively insignificant numbers were directly affected and relatively small regional areas were devastated.

Whatever else the Italian wars of the early sixteenth century may have done, one thing is certain: they started the biggest boom in armaments that Europe had ever known. Never before had such quantities of arms and fine armour been needed; and just as the political weather of the war had been brewing all through the fifteenth century, so the arms trade—the great workshops of Milan and Brescia, Augsburg and Innsbruck, Nuremberg and Landshut—had been growing in manufacturing capacity, and by the time the demand came in the late 1490s, the business was ready for it. Never before had so many fine

craftsmen and artists been engaged in the making and decorating of arms, and they were there to match the exacting demands of all the youthful nobility of Europe.

Of course, great quantities of more ordinary arms, munition stuff, were made as well, but at this period—and consider what a period it is in the history of art and culture!—there seems to have been a spirit abroad among the warriors which demanded the best. Even the most down-at-heel *landsknecht* demanded the handsomest arms he could lay his hands on—often literally, for he would be a poor soldier indeed if after surviving an engagement or two he had not managed to acquire something of quality. And, of course, very many serving infantrymen were in fact gentlemen of blood and coat-armour, younger sons, social misfits, criminals and well-born drop-outs who found in the infantry units a chance of employment, enjoyment and possible advancement.

So, huge quantities of fine arms were produced between about 1490 and 1550, and plenty of them survive in good condition; and when we consider them, we must be struck by the excellent quality of even the plainest piece, whether it be defensive armour or offensive weapon. Never had armour been so efficient, so handsome in form or so fine in decoration as at this period; and after it, the quality declined. As for arms, the sword was still the queen of weapons as it had been since the Bronze Age: endowed with an ancient mystique and much religious symbolism, both pagan and Christian. It was by far the most useful fighting weapon too, and as such retained its pride of place until the middle of the nineteenth century, after which its practical uses waned. Its mystique, however, remained; and still remains vestigially to this day.

New methods of using the sword which had developed in about 1475—1500 had brought new complexities to its hilt; never before had these weapons been so effective in use, so elegant in appearance and so fine in workmanship. Certainly with their more complex guards they lacked the clean austere beauty of proportion which dignified their medieval predecessors, but even so they were aesthetically as pleasing, if in a different way. The period from about 1500 to about 1620 was the greatest for the sword as a weapon for Everyman: no longer was its use a privilege confined to the knightly class. During this time the most beautiful of swords were possessed by men whose social position would not have permitted them such ownership during the Middle Ages.

The basic styles developed between 1480 and 1520 remained in use until the 1630s, when all kinds of new transitional and experimental types appeared: these experiments were a manifestation of the questing scientific spirit of that century, in transition from the medieval to the modern world. Between about 1675 and 1700, these weapons began to give way to the more or less standardised form of the so-called 'smallsword', the most elegant and deadly hand-weapon ever devised by Man. It is a strange paradox that these swords, so much more efficient as killing instruments than any other type ever made, were rarely used for fighting (in spite of the countless duels recounted by the romantic novelists) and were carried more as exquisite pieces of masculine jewellery than as weapons of offence.

With the triumph of the smallsword as the weapon *par excellence* of the non-military gentleman, a clear break was made between swords meant for town-wear and swords meant for war. Now began the development of national and regional types of heavy cavalry sword, of light cavalry sabres, of infantry swords—the list is endless and the material overwhelming, but during the eighteenth century the nations of Europe began to produce

standard patterns of sword for all purposes; this attempt at standardisation (and its corollary, mass production) was only sporadic until the very end of the century. After this, classification becomes possible once more, and swords as handsome and well-made as those of the sixteenth century begin again to be produced.

* * * * *

The period in the history of arms with which this book begins comes at the start of a great upsurge of European art—not just a matter of the production of great works by great artists, but an expression of appreciation by the ordinary people. In the taverns of Rome or Florence the merits of the artists of the day were discussed as today the merits or shortcomings of football clubs and baseball teams may be argued in the pubs of Barnsley or the bars of the Bowery.

At the very summit of the appreciation of art during this period, when it was flourishing like the flowers in May, stood that enigmatic potentate, Maximilian, successor of the great Dukes of Burgundy and ruler of the Holy Roman Empire, in theory the chief among all the monarchs of Europe, though in real fact an impoverished, perpetually overdrawn, desperately unlucky, engaging and frivolous nobleman, with superb good taste and an enthusiasm for art which led him into boundless extravagances. But what we, the amateurs of arms of the twentieth century, owe to this taste, this passion for quality (which he bequeathed to his successors and rivals), is as boundless, for though he encouraged artists of every kind, it was to the armourer and the weaponsmith that he seems to have given his heart. He once said, 'A man who isn't remembered while he's alive won't be remembered after he's dead; he'll be forgotten as soon as the bells toll.' On that precept he certainly acted, for few of his contemporaries left such monuments, both great and small, behind them, or have been better remembered. His constant political disasters have not affected his fame as a patron of the arts. 'What greater thing can a prince own,' he used often to say, 'than the armour which protects his body in battle?' To this passion of his we owe not only the experimental engineering of master-armourers like the Helmschmieds or Seusenhofers, but also that wonderful sculptural quality we so admire in the armour they made, produced in response to his insistence upon excellence of form.

At the same time, his delight in the 'minor arts' of the etcher and the engraver, his encouragement of their practitioners, and his vision of the glories which would stem from their alliance with the armourer and the swordsmith, gave us the lovely decorated armours which survive, so many and yet, when we think of the numbers actually built, so pitifully few, in the great armour collections of the world.

The true warrior always went to a fight as to a festival, and attired himself accordingly. When Maximilian and his contemporaries and successors went on campaign, very often they would have armours or garnitures made specially for the occasion. In the same way they, and the lesser nobles of their Courts, would commission armour and arms for the tournaments and festivities attendant upon such functions as meetings of the Imperial Diet or great dynastic weddings. Their war armour was as fine, and as elegantly decorated, as that which was made mainly for 'parade', but princes, like the warriors they led, made a festival of battle. Nor were they like the Duke of Plaza Toro who led his regiment from

behind—he found it less exciting—no, like François I at Marignano, they put their beautiful armours at risk by getting into the thick of it.

The art of the armourer and the weaponsmith was greatly affected by changes in fashion: fashion in costume, fashion in architecture, fashion in the minor decorative arts. There was much overlapping of styles as outworn modes yielded to new, particularly in architecture (Henry VII's Chapel at Westminster, for instance, was built in the 1530s in a purely Gothic style), and everyday items, such as furniture, wall-hangings, and household goods, continued to be used long after they had become outmoded—continued, even, to be *made* in outmoded styles, for change spreads slowly, and while Italy, for instance, was by 1450 in the full tide of the classical Renaissance, the nations of the North were still living in a world entirely Gothic, and the inhabitants of the Western Isles and Ireland, in surroundings unaltered since Hadrian's Wall was new. But when it comes to arms, we are in the realms of fashion: changes in style applied as much to the armour worn and the weapons carried as they did to the clothes a man put on and the accessories chosen to set them off.

In the period from about 1475 to 1500, the old styles were putting up their last stand against what Ruskin called 'the foul tide of the Renaissance', producing in that last twenty-five years the style of armour which Rubens, early in the seventeenth century, dubbed 'Gothic'. In men's garments and armour (very much the same thing), this resulted in those slender, exaggeratedly-pointed forms, a sort of *dernier cri* of the age-old fashion style based on the slim-fitting doublet and hose, with long-toed shoes and a mantle, either long or short. This style, varying only in detail, had served men in Europe since the Dark Ages. Then, round about 1495, for reasons which we shall never fully know, there came about a change so swift and so radical that it seems to be unique in the history of fashion. Within half a decade, all over Europe, the old style had gone, replaced by something absolutely and fundamentally different. The silhouette, for ten centuries elegantly slender, became stout, burly and rounded. The long, pointed shoe gave place to one with a broad, square toe: the tall, thimble-shaped hat was replaced by a flat, broad cap like a plate: almost every garment assumed a shape directly opposite to that which had preceded it. These changes were immediately reflected in the outline of armour, and the style of weapons conformed, much as today the accessories to women's clothes conform to the general trend of a fashion style.

And yet as late as 1520 men were still occasionally wearing out-of-date Gothic armour and using old-fashioned weapons; and more than this, such outmoded things were still being made and *sold*. It seems very strange. Many middle-aged men might not have been able to replace the armour and weapons of their youth merely at the dictate of Fashion, but it is hard to accept that makers of fine arms indulged in deliberate archaism, for this change was so positive that even in Germany and England the old Gothic forms were quite *démodé* by 1510. In Highland Scotland and Ireland, of course, as in the wilder parts of Wales, things were as they had always been, a century or so behind the current trend.

Why then was it that by 1530, when the 'new look' was not only well-rooted but had become overblown, arms should still be made and marketed in a style so utterly out of fashion? Who would buy them? They were the products of industry and trade, subject to market trends like everything else. But the study of arms concerns men, and is about things intensely personal to them. While a Renaissance gentleman might be content to go

on sitting in an old chair, with Gothic tapestries on his walls and a Gothic goblet in his hand—even to pay for the building of a chapel in a Gothic style—one would expect him to think twice before going out clad in an out-of-date costume, and four times before he would allow his arms, those most intensely personal symbols of his status and dignity, sanctified by heroic tradition, to be in a style suitable only for his poor relations.

And yet the personal element in arms should never be disregarded. They were made for, and used by, people—and many of those people, however cultured in some ways, were only semi-literate by modern standards, subject to much superstition, and readily influenced by religious or political slogans. The inscriptions, heraldic devices, mottoes and decorative subjects which adorn fine arms testify to the fact that their makers and owners were not twentieth-century scholars but sentimental, silly, ordinary people. This we tend to forget.

THE DEVELOPING POWER OF THE HANDGUN

'Would to God,' wrote Blaise de Montluc in 1523, 'that this unhappy weapon had never been invented, and that so many brave and valiant men had not died by the hands of those who are often cowards and shirkers who would never dare to look in the face of those whom they lay low with their wretched bullets. They are tools invented by the Devil to make it easier for us to kill each other.'

They are indeed, but so have missile weapons always been regarded. Not so very many years earlier, the great Bayard (who was himself killed by a bullet in 1524) had much the same to say about crossbowmen. He wanted to hang them all. They were cowards, he said, striking from safe distances with no respect for the old rules and courtesies of elegant combat. The same sentiments have been expressed by aristocratic warriors back into the dawn of military history—we find them in the Sagas, the Bible and the Iliad. The introduction of effective firearms into war must have been a traumatic experience for the knighthood of Europe. It had been possible to respect a bowman—even a crossbowman—for it was accepted that however safe the distance from which he might shoot, he was always ready to engage hand-to-hand; and anyway his arrow was a clean thing of wood and steel which flew, like the angels, by means of feathers. Besides, he needed great skill and a lifetime of training to master his weapon. But any clod could become a usable gunman after only a few hours of training, shooting pellets of dolorous lead out of his filthy little pipe with flash and thunder and brimstone stink. He was truly devilish; for many decades after his first introduction into the noble game of war it was believed that a demon bestrode each flying ball—did it not shriek and howl as it passed, to prove it? In 1439 in a battle, begun in the time-honoured *condottiere* manner of move and counter-move and no real fighting, between the mercenary forces of Bologna and Venice, the Bolognese used handgunmen and actually killed some Venetian men-at-arms. This was infuriating; the Venetians dispensed with the rule-book and went to it in earnest, defeated the Bolognese and massacred every gunman, for they said if people continued to use this devilish innovation, war would become really dangerous. Later in the century the *Condottiere* Vitellozzo Vitelli caused it to be given out that he, at least, would give no quarter to any soldier caught with a gun.

We can appreciate this point of view, though it is clear that the military mind of Europe had not yet come to terms with the fact that the power of armoured chivalry had already received its death-blow at the hands of Flemish burghers at Courtrai in 1302, of

Swiss peasants at Morgarten in 1315, and of English ones at Crécy in 1346, and in even worse disasters at Sempach in 1386 and Agincourt in 1415. Even after this, it seemed as if the armoured knight would have a new era of success opening before him. The armourers (particularly those of Milan) had devised armour which was very nearly proof against arrow or bolt; it was lighter and more flexible, harder and far handsomer than what had preceded it. The man-at-arms looked magnificent, and knew it. Clad from head to foot in darkly-gleaming iron, each piece of his harness a work of art in itself, though the visual effect of the whole was far greater than the sum of its parts, he must have felt like one of the very gods of war. Beautiful as Apollo, terrible as Mars, he was the master of any infantryman who might come against him. But he had not reckoned with the powers of Hell. In engagements small or large in Italy and Bohemia, he began to find that it only needed a demon-ridden little leaden ball to punch a ragged hole in his beautiful armour and lay him in the dust. No magnificent aspect, however godlike, could protect him; his chivalrous pride and courage were no proof against the lowly pellet; and the bang and the stink frightened his horse, which in normal circumstances feared nothing. Maybe there were occasional compensations, as when the little iron tube failed to contain the force of the charge and blew the face off the gunman; but it was poor consolation. Even to see a row of tatterdemalion corpses swing from the branches of a tree was little better.

However, the earliest appearances of handguns in the field had small effect upon military thinking, for the occasions of their use were few and confined to regions of Europe which by the nature of things were cut off from the mainstream of tactical development. Cannon, which had been used very successfully since about 1340 in battering and siege work, were not the same, did not pose the same problems. They had been tried in the field with very little success. Their day was to come, but in the 1420s it was over half a century away.

In the earlier Middle Ages in Europe, the art of war, and the hardware used to develop it, had varied little from Finland to Spain and from Wales to the Caucasus. With the accelerating decline of the unifying concept of 'Christendom' and the first stirrings of nationalism in the late fourteenth century, we find that wars were being fought all over Europe in complete isolation from one another, each body of combatants creating their own tactical ideas and developing their own weapons. The great wars between England and France, the non-events on the battlefields of Italy, the struggle of Aragon and Castile to clear the Arabs out of Spain, the endemic war between the Balkan lands and the Turks, the fight of the Swiss to enlarge their newly-freed Confederation at the expense of its neighbours, and the ferocious wars of those pre-Luther Protestants, the Hussite rebels of Bohemia: their participants produced divergent methods of dealing with their problems, and specialised weapons to put them into effect. When at the very end of the century Charles VIII's adventure began the first pan-European war, all these different weapons and tactical skills were brought together. It was inevitable that progress in the art of war had to be rapid and far-reaching.

Of the new weapons, two were of overriding importance; not now weapons for individual use, but for mass combat, they were to transform the whole scene, setting the stage for all the horrors of the twentieth century. The first was the handgun and the second was the pike. In this chapter I shall briefly trace the progress of the gun, from

'handgonne' to arquebus to musket; and in the next I shall attend to the pike and its predecessor and contemporary, the halberd, as well as all those other varied weapons which together are referred to as 'staff-weapons'.

EARLY HANDGUNS

The question of the date and place of the origins of gunpowder has no relevance here, neither does the development of artillery, for although artillery on the field of battle had become a common phenomenon by the end of the fifteenth century, there was nothing the individual soldier could do in the way of developing defences against it, he could only endure it or try to get out of its way; but, very early on, the handgun provided a fine new stimulus to the armour trade, driving its professionals to make even more improvements upon the defences they had devised to counter the problem of the English arrow. So for a hundred years, between about 1430 and 1530, the design and technical quality of armour continued to advance while the quantities called for increased.

Cannon were actually being used during the 1320s, not very effectively. They were at that time regarded more as a bad joke than a terrible portent; the handgun followed very soon and seems to have been in use, if not widely, by the 1370s. A list of arms supplied by John Halton, Keeper of the Tower of London, to the Chamberlain of Berwick in 1371 includes

'iii cannones parvos vocatus handgonnes'

and an entry in the Wardrobe Accounts in 1375 lists expenditure for

'helvynge viii gunnorum et x hachettos de stauro antiquo ad modum pycoys'

That eight guns and ten hatchets should be hafted with parts of an old pole in the manner of pikes is significant, for it clearly indicates 'handgonnes', not cannon; but Chaucer's reference in The House of Fame—

'As swifte as pellet out of gonne
When fyre is through the poudre ronne'

—might refer to either. (The poem was probably written between 1374 and 1382.)

The earliest handguns were short tubes, forged in iron or cast in bronze or latten, between about eight inches and eighteen inches long (20 cm and 45 cm), fastened to 'helves' either by having the breech-ends formed as sockets which, like spear-heads, fitted over the ends of the hafts, or simply being bound to the ends of the helves by iron straps. There are many representations in art of such guns in use; some show the end of the helve resting on the ground while the gunman supports the thing with his right hand and applies the fire to a touch-hole in the breech-end of the tube with his left, while others (generally later) show a helve which is a bit shorter and held under the right armpit. Both kinds of gun are invariably shown pointing upwards at an angle of about 45° to the ground. There could have been little prospect of actually hitting a specific target by such means.

'Handgonnes' were fired off by the same method as large cannon, by the application of a light to a touch-hole in the breech of the barrel. Again the Wardrobe Accounts provide evidence of the various instruments needed for the firing of guns. Throughout the second

half of the fourteenth century and the first half of the fifteenth, we find entries for expenditure upon 'drivells' and 'tampions', 'touches' and 'fyrepannes'. The gunner loaded his piece by shovelling a charge of powder down the muzzle and ramming it home (if it was a cannon) or by pouring a small charge down the upturned barrel (if it was a handgun). In both cases the charge was followed by a 'tampion', a disc maybe of wood or leather or cloth or old parchment—anything to hold the powder in. Then the ball went down, rammed home with the 'drivell'. Ready now to give fire, the gunner pointed his piece in the general direction of his target and applied the 'touche' to the hole, and the ball screeched off on its way. Gunners firing a large cannon always had a 'fyrepanne', some sort of a brazier from which they could take a glowing coal in a long pair of tongs, or a red-hot wire or a small torch—a bit of oil-soaked rag or tow—in the end of a long stick. By about 1500 this had become the usual instrument, already known as a linstock:

> *'. . . and the nimble gunner*
> *With linstock now the devilish cannon touches,*
> (Alarum, and chambers go off, within)
> *And down goes all before them!'*

as we find in the Prologue to Act III of Shakespeare's *Henry V*. I remember forty or so years ago when I first read this play wondering why the gunner should be nimble. This betrayed not only an ignorance of Shakespeare's masterly use of language but of medieval gunnery as well. When fire was put to the touch-hole of a gun, the great fountain of flame which back-fired out of the hole called for very great nimbleness if the gunner were to avoid getting burned. The same method was used to fire the tiny charge in a handgun but the use of a 'fyrepanne' was clearly not appropriate to the mobile gunman. We do not know precisely what the 'touche' was, except that it was almost certainly some kind of cord which when lit would maintain a slow-burning, glowing end. In the many pictures showing handguns, we can see small thin objects in the gunmen's hands like bits of wire or string. This 'touche' was the forerunner of the later and far more efficient 'match', a flaxen cord impregnated with a solution of saltpetre and spirits of wine.

DEVELOPMENT OF THE STOCK

By the middle of the fifteenth century the crude early handgun had been succeeded by something a good deal better, for the pole-like stock had been improved by shortening it and making it to a flat oblong section, more like a modern gunstock. Later the barrel was made with three or four small lugs projecting downwards from its underside. In each lug was a hole, and in the hollow trough cut in the top of the stock were openings into which the lugs would fit; then holes were bored in the stock, crosswise, to correspond with the holes in the lugs on the barrel. Pegs were driven through these holes from side to side, and the barrel was not only held securely, it could easily be dismounted if the stock got broken. In some guns, probably a majority of those made, there was another, much bigger, lug forged under the barrel, more like a large hook, projecting downward about a third of the way along the gun from the muzzle. This was to hook over any support that offered (as a parapet or a stand or the branch of a tree would do), to steady the gun against

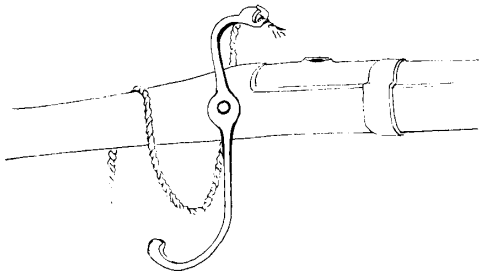


FIGURE 1 The primitive firing mechanism

the recoil. By the 1450s this recoil had become significant, owing to the very great improvements in gunbarrels and in gunpowder.

Many gunstocks now began to be made with a rudimentary butt, either a broadening-out of the end of the stock, cut off flat to rest against the shooter's chest, or a sharp downward curve. Because of this fashion of holding the gun against the chest (*la poitrine* in French) the handgun acquired the sobriquet of 'petronel'. Because of the hook below the barrel, in German-speaking lands it had begun to be called a *hakenbüchse*, 'hookgun', by the 1550s.

To improvements in the form of gunstocks came an enormous advance in the efficiency of the process of firing. While the shooter had to hold his touche in his hand, he could not steady or aim his gun. So a simple device was added: to the right-hand side of the stock, just behind the breech and touch-hole, a long Z-shaped arm was fixed upon a pivot. One end extended back along the underside of the stock where the shooter held it with his right hand; the other, shorter, end stood up above the top of the barrel. To the top of this extension of the arm (very soon to be called the 'cock' by reason of its cockerel-like shape) was fixed a clamp, into which the glowing end of the touche could be fixed (Fig. 1). When he wanted to shoot, the gunman simply squeezed the long end of the arm upward, thus bringing the short arm down upon the touch-hole.

Thus by 1450 or so we have the handgun, called variously 'petronel' or '*hakenbüchse*'. But no Frenchman could, or would, pronounce so German a word as *hakenbüchse* correctly. Its mutation seems to have been as instant as it was complete. By 1470 we find the French firmly saying 'arquebus'. Being of Germanic stock, the English were not so drastic; they merely altered it to 'hackbut'. As we follow the progress of weapons from age to age, we shall find the name 'arquebus' coming more and more to apply to the ordinary handgun, and 'petronel' to a shorter version of it (not a pistol—that had yet to make its debut) used by horsemen, while the names 'serpentine' and 'culverin' were applied to small cannon.

IMPROVEMENTS IN FIRING MECHANISMS

The simple firing mechanism very soon became more sophisticated. The long Z-shaped arm was cut in two, and the upper end, the cock, was turned around, separated and pivoted to the side of the stock with a short crank fixed to the pivot end. The cut-off long

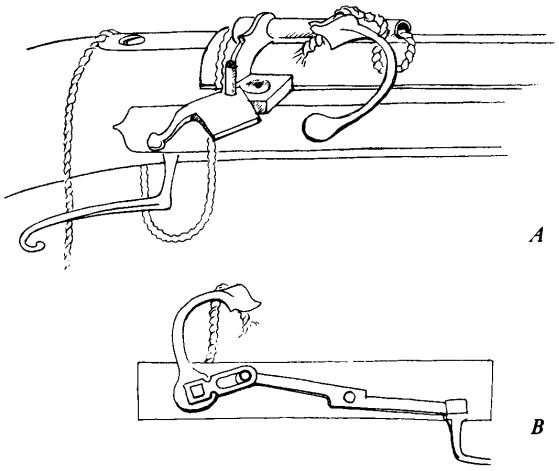


FIGURE 2 *The basic firing mechanism of the matchlock from about 1520 to about 1650, seen from the outside in Illustration A and from the inside in Illustration B*

end of the serpentine was fixed to a hole in this crank by a rivet, the whole thing moving freely. Now when the long end of the arm was squeezed up towards the underside of the stock, the cock came down against the touch-hole. Soon, in better models, the crank became a long lever, called the 'sear', pivoted in the middle and fixed at one end to the pivot of the cock and at the other to the 'tricker', as the long end of the old serpentine arm began to be called. Next a stiff spring was added below or above the sear which held the cock up, for safety, only allowing it to come to the touch-hole when the tricker was pulled up. Then an opening was cut in the side of the stock; the sear and tricker and spring were pivoted to the inside of a flat metal plate, with the cock on the outside, and the whole thing was screwed against the side of the stock, the opening accommodating the working parts. The touch-hole was moved from the top of the breech to the right-hand side, a pan with a hinged cover was provided for the touch-powder, and the tricker, still the old cut-off serpentine arm, was improved into a proper trigger. With this development there appeared a true gunlock (Fig. 2), one which was to remain in use practically unchanged until the end of the seventeenth century in Europe and until the late nineteenth in Asia.

IMPROVEMENTS IN GUNPOWDER

Another factor which influenced improvements in gunnery was the quality of gunpowder. In its earlier forms it was composed of saltpetre, sulphur and charcoal roughly in the proportions of 80, 13 and 7 parts, mixed and ground to a very light powder which had severe disadvantages. It was so light that the wind blew it away, so fine that it caked

easily and required great care, skill even, in loading it into the gun, for if it was rammed in too tightly, it would not explode but merely burned and fizzled ineffectually, but if too loose, it would only produce a feeble belch just powerful enough to trundle the ball out of the muzzle. It had to be just right. In transport, the joggling it received in its tubs caused the constituents to separate according to their specific gravities—sulphur at the bottom of the tub, saltpetre in the middle and charcoal on the top. So it all had to be mixed again before any gun could be fired. After firing four or five charges, every gun had to be scraped out, because the bore got clogged with a thick coky deposit.

Some time between about 1425 and 1450, an improvement was effected by the introduction of 'corned' powder. This was made by wetting the loose powder with a mixture of alcohol and water. One is lured down fascinating paths of speculation as to the empirical means by which this discovery was probably made, particularly when we learn that urine was considered to be a better mix than mere water—more, that a wine-drinker's urine was better than a beer-drinker's, and a wine-drinking bishop's best of all. This last must have been a rare and valuable commodity, though we do hear of its being bestowed upon princely arsenals as a mark of episcopal favour.

Corned powder was made by mixing the loose powder to a paste, allowing it almost (but not quite) to dry out and then compressing it into a hard cake. The cake was then broken into bits and ground up in a mortar. Speculation is endless: could this have been the origin of the mortar as a projectile-throwing weapon, when some unrecorded disaster befell a powderer's assistant? This corned powder was very much more forcible than the old stuff, with the result that the old style of cannon, made of staves of iron welded together side by side round a wooden core and reinforced with hoops, was too weak to contain it; even good cast cannon could not cope with the big charges that were needed, so for many decades more, until much better cannon could be made, the old loose powder was continued in use for artillery. But for the tiny charges (only about an ounce and a half, or 40 grammes) used in a handgun, corned powder was excellent.

HANDGUNS IN ACTION: THE HUSSITE WARS (1421—1434)

So with the development of corned powder, a manageable gunstock and an efficient firing mechanism, a workable handgun had come into being. By the period 1480 to 1500 it was pretty universally known as the arquebus, and would soon dominate the fields of war as once the armoured knight had done.

The first really serious encounters which medieval chivalry had with the handgun took place in Italy (where gun-making experiments were more prevalent) and in Bohemia—but especially in Bohemia.

In 1420 the Czechs had risen in arms against the Emperor Sigismund in a fury of outraged nationalism and reforming spiritual zeal. They were determined to drive the intruding Germans back beyond the Erz Gebirge mountains and to avenge their martyred prophet, John Huss. It would have been hopeless to set against the Germans the lances of the Czech nobles, for there were very few of them and they were politically divided; the undisciplined and unarmed masses of farmers and workers who were left to fight it out risked being trampled down by the armoured might of the feudal *noblesse*, so unless the problem could be solved there seemed to be little future for Czech patriotism. It was

solved in a most effective way by an experienced warrior, John Zizka of Trocnov, who had learned much of the art of war while campaigning with the Poles against the Teutonic knights of Prussia. He saw clearly enough that the only strength of the peasant forces lay in their fierce patriotism and religious zeal. Even in this there were hazards, for while half of the 'Hussites', as they called themselves, were reforming zealots, the other half were only quiet folk who hated the Germans. Zizka saw that until some tactical system was worked out and some sort of unifying discipline acquired by the rebels, nothing but a cautious defensive policy would do. So, towns were put into a state of defence and earthworks thrown up wherever necessary. In the first year of their revolt, 1420, the Czechs were helped enormously by the utterly ineffectual military capabilities of Sigismund's nobles, and the total absence of cohesion between the multitude of small regional units of which his forces were composed. The Germans were held at bay with very little trouble, for they made very little effort.

During the respite gained by this policy, Zizka was putting into effect ideas he had got while campaigning in the east of Europe, a system of tactics which could be developed and turned to account by an army of infantry forced to take the defensive against an enemy whose only strength lay in an overwhelming feudal *noblesse*. For more than a century there had been prevalent in Russia a method of coping with cavalry attacks by means of drawing up a quantity of carts and wagons into a square or a circle to form a defensive position. Specially-made pavises were carried in the wagons as well as chains and poles to fill the gaps between them when drawn up into the *gulaigorod*, 'moving town'.

Except that the defenders were armed with bows and crossbows instead of Colt revolvers and Winchester rifles, they fought like the pioneers in the American West, or the Boer settlers in South Africa, a century ago. It was of great antiquity, too, for the ancient Scythians had used it, as did the Goths—indeed all the wandering peoples of the Migration period and pretty nearly every army since.

But the Russians, and Zizka's Czechs after them, made a highly-specialised thing out of the *wagenburg*. Whereas the wandering barbarians made use of their baggage wagons as a defensive overnight camp, and medieval armies drew them up as a defence for the baggage itself, the Russians and Czechs used them as a weapon. True, they carried the army's supplies, but they constituted as well the elements of a moving fortress and were in fact archetypal Armoured Fighting Vehicles. The disadvantage was that once formed up, this fortress had to stay where it was, and could only be truly effective if the enemy could be persuaded to attack it. If he preferred to sit down and starve the defenders out, the *wagenburg* would become a trap. However, in this particular war, that never happened. The men who used it were good psychologists; they knew that their opponents would be feudal nobles who could be relied upon to learn nothing, even after the most fearful experiences—they would always attack, full of confidence and pride and contempt for a pedestrian enemy. The sort of thing which had happened in the West at Bannockburn, Morgarten, Crécy, Poitiers, Nájera, Aljubarrota, Sempach, Agincourt—the list is endless—would happen in the East.

So Zizka built up a wagon-train and went out to war with it in 1421, and defeated the Germans at Luditz and Kuttenberg. In each case, having found a good position he drew up his wagons, closing the side-gaps with chains and poles and pavises or anything else

handy, and arranging the wagons so that there was a large gap at the front of the *laager* and another at the back, each being blocked with easily-removable posts and chains so that when the enemy was beaten back, his own men could dash out to finish the thing off. They were divided into squads, ten or twenty men to a wagon according to its capacity. Half of each squad had staff weapons—pikes, spears, scythes, flails, anything; the other half had crossbows or handguns. He had some cannon too, mounted on special carts. When the German horse charged, the Hussites would wait until they were at point-blank range and then let drive all together with everything they had. The effect was shattering. At that range the balls smashed through plate armour as if it were paper, and the men no more than the horses could face the fearful flash and thunder of the discharge right in their faces. In this first campaign the Germans tried gallantly enough to penetrate the wall of wagons while the gunners were reloading, hacking at the spearmen in the gaps and trying to get at the gunmen through the woodwork of the wagons; but all the time the crossbowmen shot at them, and they could see the gunners getting ready to fire again. A second volley scattered them; then the Hussites snatched aside the chains and posts in the gaps and rushed out among the demoralised horsemen.

After this first campaign the Germans would never face more than one volley, if they could be persuaded to attack the *wagenburg* at all. Soon it was not even necessary for the Czechs to shelter behind the wagons. They came out into the open against the Germans, who still refused to face them. They became so exalted with the extraordinary moral effects of their tactics that they carried out many slow, lumbering *blitzkriege*, sending out 'armoured columns' deep into German territory, the long dreadful wagon-trains plodding at some two miles an hour across Bavaria or Hungary or Silesia without hindrance, leaving trails of desolation behind them, and returning, year after year, laden with the spoils of eastern Europe. All this was achieved, as the remarkable successes of the English longbow had been achieved, by the skilful use by one side of an effective, demoralising missile weapon used in a well-chosen defensive position, and by the lack on the other side of any trace of common sense or tactical ability to balance a demented passion of pride and absurd heroism. The Germans could have over-run the Hussites any time they wanted if they had not been so frightened of them. When the long war was brought to a close in 1434, it was not done by the Germans; the two Czech factions finally turned upon each other and met in battle at Lipan on May 30 1434. The zealots (Taborites, they called themselves) fought in the time-honoured way in the *wagenburg*. The moderates (called Calixtines) played the attacking role, and got the treatment they had so often meted out to the Germans. Like the Germans, they fell back—and out came the Taborites, just like old times. But they forgot they were chasing men who only the year before had been their own comrades, and who were made of sterner stuff than the German knights. Once the Taborites were well clear of the *wagenburg*, the Calixtines turned, regardless of handgun or crossbow, and destroyed them.

Thus a challenge to feudal chivalry was offered in the East every bit as deadly as the one the English had offered in the West; and the military leaders of Europe took as little notice of the one as of the other. While the making of war was still the privilege of a noble class, it would be made as that class wanted it, regardless of any opposition to the rules of elegant combat. By 1450 the armoured knight might be as obsolete as the charioteer, but

he was not going to admit it. Nor would he for another seventy-five years. It was not until the splendid *gens d'armes* of François I's *Compagnies* were mown down by the Spanish arquebusiers at Pavia in 1525 that he finally accepted the end of his long supremacy.

HUNTING GUNS

We are not concerned here with detailed examination of the ways in which technical development improved the gunlock. It was the matchlock arquebus of the sixteenth century which reduced the validity of defensive armour, and the matchlock musket of the seventeenth which brought about its final abandonment. It caused changes in weapons too, by reducing the number of types of weapon in use. When the prime arm of the infantryman was either musket or pike, such weapons as halberds, gisarmes, bills, axes, hammers and flails became obsolete.

No. The mechanical improvements to the gun were produced not by the pressures of war but by the exigencies of the chase. When it became obvious that a gun was a better game-shooting weapon than a bow, a reliable firing mechanism was needed. The cumbersome and unreliable processes of loading and firing matchlock guns were acceptable, within limits, for squads of soldiers shooting together; but it was no use trying to keep a match glowing while stalking game, even less use to rekindle it once the game was in range—about seventy-five yards (70 metres) for a matchlock gun in 1500. By the time the gun was ready, the birds would have flown, the deer or bear would be well on its way to cover. It was essential to have a gun which could be brought into the presence of one's quarry in a state of instant readiness to fire.

THE WHEEL-LOCK GUN

From the earliest days of *Homo Sapiens* it has been known that a piece of pyrites or flint struck against iron will produce sparks. All that was needed to fire a gun was to produce a mechanism which would cause a bit of pyrites to strike a piece of iron at a point where it could fire the priming powder. By applying a principle akin to clockwork to this primeval function, a remarkably efficient lock was produced late in the fifteenth century. There is no means of knowing where this came about, or exactly when; but in one of Leonardo da Vinci's notebooks (now called *Il Codex Atlantico*) are some sketches for parts of wheel-lock mechanisms and a drawing of a completed one and a tinder-lighter. Most of the sketches on one folio are of methods of attaching a short chain to a V-shaped spring, which is the essential mechanism of a wheel-lock. Recent research seems to show pretty clearly that these sketches (made perhaps around the turn of the fifteenth/sixteenth centuries) are the genesis of the design of this mechanism, and that Leonardo was its inventor.

The earliest literary references to wheel-locks are first, a reference in a book of accounts for the year 1507 of the steward of Cardinal Ippolito d'Este, Archbishop of Zagreb, which relates how a servant called Caspar the Bohemian, going on a pilgrimage to Germany, was commissioned to buy for the Archbishop 'a gun, of that kind which is fired by a stone' (*unam piscidem de illis qua incenduntur cum lapide*); and secondly, a story told by the Augsburg chronicler Wilhelm Rem in his *Cronaca Newer Geschichten* of 1512—1527: 'How Laux Pfister shot a whore in Constance.'

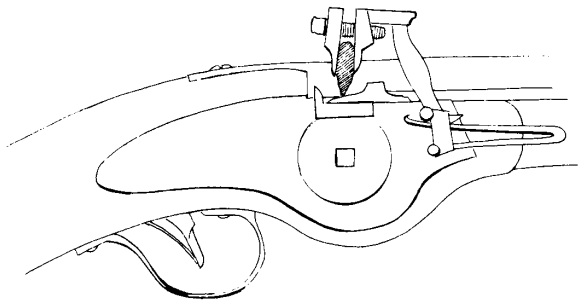
'In the year of Our Lord 1515, on the day of the Three Holy Kings [January 6] there was in Constance a young citizen of Augsburg who had engaged a handsome whore; and when she was with him in a little room he took up a loaded gun in his hand, the lock of which functioned in such a way that when the firing mechanism was pressed, it ignited itself [*so schlug es selb feur auff*]. He was playing about with this when he pressed the trigger and shot the whore. The bullet hit her chin and passed out through the back of her neck. So he had to compensate her and give her 40 florins, and another 20 florins per annum for life. He had to pay the doctor 37 florins too, as well as other costs amounting to some 30 or 40 florins.'

A costly evening's entertainment for Pfister (frustrating too) but it has given posterity another definite date by which wheel-locks were in use, for no other firing mechanism at that date ignited itself.

The principle upon which a wheel-lock works is simple; its basic element is a wheel or disc working on a spindle on the outside of the lockplate: to the spindle, on the inside, is fastened one end of a small chain whose other end is fixed to a strong V-shaped spring. The edge of the wheel is grooved and toothed, and it intrudes into the bottom of the flashpan through a slot. Just in front of the wheel is the cock; no longer, as in a matchlock, holding in its jaws a piece of match, but instead a piece of iron pyrites. The pan is covered by a sliding lid. To load, the wheel is wound up—the other end of its spindle is square and protrudes about an eighth of an inch (3 mm) clear of the outer face of the wheel, and it is wound with a key like a clock-key, or a spanner. This wraps the chain about a turn round the spindle against the pull of the spring. The priming powder is put into the pan and securely covered by the lid. When the trigger is pressed, the wheel spins, the lid of the pan moves away and the lock comes down, bringing the pyrites hard against the whizzing wheel, and a big spark is generated right in the middle of the priming, to send the flash through the touch-hole to the charge in the barrel. However simple the idea might be, a wheel-lock is a most complex piece of machinery, some having as many as fifty parts (Fig. 3).

It was soon found that this kind of lock could be fitted to very small guns, some no more than nine or ten inches long (23 to 25 cm). It has been said that the pistol was named

FIGURE 3 The wheel-lock, c. 1520—1620



after the Italian town of Pistoia, an early gun-making centre; but it has also been asserted that the name comes from a Czech word, *pist'ala*, meaning a small Bohemian handgun. But whatever its derivation, the pistol was the first gun that could be concealed upon the person and fired with one hand. It was very soon in widespread popular use for purposes of intimidation, armed robbery, murder and assassination. The advent of self-igniting guns, such as the one the luckless Augsburger played with, had from the start produced edicts against their use. In 1518 we find Maximilian I prohibiting the manufacture and use of such things throughout the Holy Roman Empire; in 1523 the city of Ferrara issued an ordinance forbidding the carrying of 'an especially dangerous kind of firearms, vulgarly called Stone-guns' without licence, upon pain of the public chopping-off of a hand. Other European cities followed suit, with as little effect. The wheel-lock gun had come to stay. Its use, however, was limited to those who could afford a big price for a gun, for it was very expensive. Even so, by the middle of the sixteenth century we find large bodies of horsemen armed with wheel-lock pistols. The little murderous 'pocket' pistols, some of which survive, were generally made entirely of steel (the most notable is one made for the Emperor Charles V in 1547) but the horseman's pistol was bigger and heavier, sometimes nearly three feet long (90 cm). A rider could carry three—one on his right boot-top or in his belt, and the others in holsters, one on each side of his saddle. Such a weapon also made a very serviceable club after it had been fired.

RIFLING

The use of rifling in gunbarrels began probably late in the fifteenth century, improving the power and accuracy of a gun, but it was no use for bird-shot (so smooth-bore guns continued in use as fowling-pieces), and it made loading difficult, too. The ball had to fit exactly and very tightly; the only way to achieve the proper result was to hammer the ball down into the barrel with an iron ramrod struck with a mallet so that the grooves were actually filled by the lead; this prevented the gas from seeping out of the grooves round the ball, with consequent loss of force. This was a lengthy and noisy performance, so found little favour with hunters, and was well-nigh impossible in battle conditions. The answer to that problem still lay in the future.

Not so far ahead lay the invention of a gunlock much simpler and cheaper to produce than the wheel-lock, and very nearly as efficient. The principle was the same, except that flint was more ordinarily used than pyrites, but its application was different. The flintlock had been invented well before the sixteenth century ended; in its earliest form it was simple and effective, but it was not until about the middle of the seventeenth century that its final form was perfected. From about 1650 until the 1850s in Europe (and almost to the present in parts of Asia and Africa) it was in use—not just by wealthy sportsmen or princely bodyguards but by the average bandit, highwayman, assassin or infantryman all over Europe and America.

The variations of mechanical detail which differentiate one of these locks from another are of infinite complexity and have no place here. Figure 4 may suffice to give the reader some idea of the basic construction of the flintlock mechanism. If a deeper study of these matters is sought, any or all of the admirable books listed at the end of this chapter will provide it.

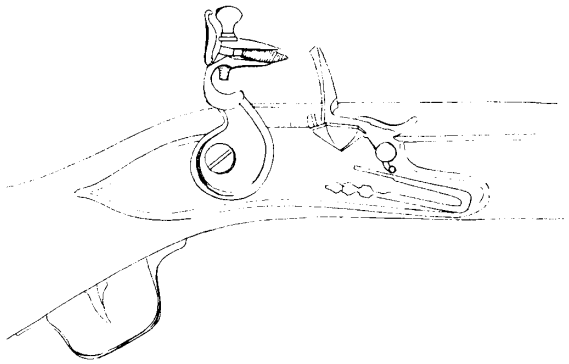


FIGURE 4 The basic construction of the flintlock mechanism

THE MATCHLOCK ARQUEBUS AND MUSKET

While all these new inventions were being exquisitely wrought and developed by the gunsmiths of Europe for the benefit of the wealthy, the armies went on using the old matchlock. Cumbersome, inefficient and dangerous it might be, but it was cheap. As the sixteenth century wore on, larger and larger grew the numbers of arquebusiers required by the armies. In a few places princely bodyguards might be armed with expensive wheel-locks, but the ordinary infantryman continued to run the risk of being blown up by his own bandolier—a broad leather shoulder-belt upon the front of which were hung a number of small cylindrical containers, each holding a charge of black powder; if a spark from the match touched off one of these, the whole series would explode with unfortunate results.

Late in the sixteenth century, the term 'arquebus' began to be more and more confined to the weapon of the murderer or the gentlemanly sportsman. The gun of the infantryman was called a 'caliver' by the end of that century and a 'musket' by the beginning of the next. The caliver was a rather longer gun than the arquebus, firing a heavier ball; otherwise it was much the same, and could be fired without its muzzle-end having to be supported in a forked rest. Not so its successor. This seems to have had a Spanish origin, for it was first called a *moschetto*, though why it should bear the Spanish name for a sparrowhawk is not clear. At first it was probably a wall-piece, for it was too long and too heavy—its barrel was some fifty to fifty-five inches in length (125 to 140 cm) and it weighed up to twenty pounds (9 kg)—to be held and fired unsupported like the caliver and the arquebus. But it was very effective; its long barrel gave it range and accuracy and its heavy ball would go through the best armour at 120 paces. By the first decade of the seventeenth century, it had become the weapon *par excellence* of the armies of Europe, all of which rapidly organised regiments of musketeers. Since the musketeer had not only to carry this great gun about, but also a long forked rest to support it with, as well as his bandolier of cartridges, his two powder flasks (a big one for the coarse propellant

powder and a little one for the finer priming), his bag of leaden balls, his pouch or box for the wads he needed to separate ball from powder in the barrel of his gun, his lengths of match (each some four feet [1 metre] long) *and* a sword and dagger, he must rank as the most heavily encumbered infantryman the armies of Europe have ever employed.

The process of loading and firing his piece among all this dangling paraphernalia involved very carefully worked out drill movements, which in imagination or in contemporary illustrations look almost impossible to perform. This drill is clearly shown in the admirable illustrations to a Dutch drill manual commissioned by Maurice, Prince of Orange, in about 1606 and published in The Hague in 1607; it is by one Jacob de Gheyn, entitled *The exercise of Armes for calivver, Muskettes and Pikes*, and it very clearly shows how all these arms are to be managed. If one drapes oneself with all a musketeer carried, takes a matchlock gun and its rest, and carefully follows de Gheyn's movements, it is surprising how practical in fact it is. The great danger, of course, comes from the burning match which the musketeer must carry, both ends aglow in case one goes out, between the fingers of his left hand. If he carelessly allows it to come against the charges of his bandolier, he blows up. In loading, he would pour one of these charges down his gun, following it with a wad which he tamped down with his ramrod. On top of the wad went a ball which he had been holding in his mouth (for instant readiness) along with half a dozen others. He then tamped another wad down on top, to prevent the ball's rolling away from the powder, replaced his ramrod in its socket below the stock of his musket, adjusted the forked rest so that it took the weight of the gun just forward of the lock, blew on his match, fastened it into the clamp at the end of the cock and was ready to fire if he had been able to survive the hazards attendant upon him while he loaded.

CARTRIDGES

Cartridges pre-loaded with powder and ball, the whole contained in a wrapper of stiff paper (hence the name 'cartridge paper'), had been in use since about 1550 (though Leonardo da Vinci refers to cartridges forty or more years earlier) but these were more for the benefit of wealthy owners of wheel-lock or flintlock guns. The ordinary musketeer (who incidentally was often of noble birth) had to be content for the most part with his bandolier and bullet-bag for many decades more, though occasionally he had the benefit of pre-packaged powder and ball. Did not that old war-dog Sir John Smyth write in 1590 of 'cartages with which musketeers charge theyr peeces both with Poudre and Ball at 1 tyme'?

By the middle of the seventeenth century, muskets were being made ten inches or so shorter than previously (about 25 cm) and consequently lighter and more manageable, and we hear no more of the caliver; and by the 1670s they had become smaller still.

Ordinary military guns of the sixteenth and seventeenth centuries had none of the elaborate decoration which graced the stocks and locks and even the barrels of most good-quality civilian firearms, both long-guns and pistols, making of them works of art in their own right, some of absolutely outstanding beauty. These guns combined the skills and craftsmanship of the specialists who wrought lock, stock and barrel, and the artists (goldsmiths and silversmiths, steel engravers, sculptors and inlayers of precious metals or bone or wood or ivory) who decorated them. The reader is again referred to the list of specialised books at the end of this chapter.

There is a wealth of written evidence of the power and effectiveness of firearms (as well as the diatribes against them) and much interesting material can be found in inventories, accounts, wills and the like. Even muster-rolls yield the occasional gem: in German rolls of the early sixteenth century we find evidence of the roaring trade done by quacks of all kinds who sold protective charms and amulets to soldiers, in entries such as: 'Herman Winkelbaum, Q.D.I.G. [*Quem Dicetur Impenetrabilis Glandibus*]' 'Who is said to be bullet-proof.'

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