DEVELOPMENT OF [illegible]NDGUNS

NATIONAL COLLEGE OF ART AND DESIGN, DUBLIN

FACULTY OF DESIGN

DEPARTMENT OF INDUSTRIAL DESIGN

NAME : BRIAN BARRETT

THESIS TITLE : THE DEVELOPMENT OF HANDGUNS

ARPIL 1986

AUTHORS ACKNOWLEDGEMENTS

Special thanks to William Garner, my tutor for his guidance and support, to Cyril Wall of Dublin, for his advice and patient answers to my questions.

Finally, thanks to the staff of the inter-library loans in N.I.H.E., Limerick for their tact and perseverance towards my constant demands for research material and their efficiency in obtaining it.

CONTENTS

• *SHOOT-OUT: During yesterday's attempt to re-arrest Evelyn Glenholmes at British Home Stores in O'Connell Street, a plain clothes detective produces a revolver and begins shooting above the heads of the supporters of Ms Glenholmes as they rushed her into the shop. At least three shots were fired and in the ensuing chaos detectives ran for cover among them a detective (far left) with an automatic pistol Picture by JOHN CARLOS.*

"SUNDAY TRIBUNE" 23 MARCH 1986

In the picture, the AUTOMATIC PISTOL is a COLT M1911A1 (See Reference)
and the REVOLVER is a COLT TROOPER MARK III (See Reference)

REFERENCES

A Colt M1911A1 Automatic Pistol

Section Drawing

Field Stripping

Notes on Assembly

Instructions for loading and firing

B Colt Trooper Revolver Mark III

Exploded diagram drawing with parts list

C Beretta Model 34 Automatic Pistol

D Smith and Wesson .44 Magnum

E 7.62mm Russian Pistol

F Smith and Wesson Gold Seal Model (1907)

G Enfield Revolver No. 2

INTRODUCTION

There has always been a certain element of doubt about the handguns' precise function in military service : ostensibly issued as a weapon for personal protection, it has often appeared to be a social symbol. A pistol is a light fire-arm, designed to be fired by one hand without support. The origin of the word in uncertain, although it may derive from Pistoia, the Tuscan town where it is said to have been invented. Used for close range self-defence, so it had to be carried either in the hand, or in some form of holster ready for instant use. To be of combat value, however, the pistol must be robust and capable of discharging a bullet which will effectively disable the recipient, and it is now generally accepted that nothing smaller than 9mm or 0.38in bullets can do this. The twentieth century has seen the automatic pistol supersede the revolver, as a standard military weapon, although a number of nations still arm para-military or second line troops with revolvers. For a long time the argument was that six reliable shots were better than eight or nine doubtful ones, and in the early days of the automatic pistol and its ammunition development there was in this some truth.

Another criterion was the stopping power of the bullet, a heavy revolver firing a large bullet at relatively low velocity, certainly delivered a more telling blow than an automatic pistol firing a smaller bullet at a higher velocity. Many designers attempt to get round this by producing pistols firing at exceptionally high velocities, but a small fast bullet does not have the same "shocking" effect of a larger and slower one.

World War 1 was the testing ground for all the various theories which existed, about, what we accept as the era of modern handguns : every pistol of repute - and some disreputable ones - found their way to the Western Front. When the war was over, and the analysts sat down to discuss future handgun design, the general tendency was away from the heavy and powerful weapons for one simple reason : the difficulty of training hasty wartime draftees, to shoot them.

During the inter-war years few new designs of military pistols were introduced. The features which distinguish a twentieth centuary small arm from its earlier nineteenth century parallel are procedural, not principal, and consist basically of one chemical and three mechanical contruances which are :

(1) the use of non-fouling, high-pressure, smokeless nitro-cellulose powders which, between 1870 and 1900 finally replaced black powder after six centuries of being used;

(2) projectiles which adapt themselves to rifling grooves without an interposed patch of greased cloth or leather and without iron-rod and mallet ramming;

(3) self-contained, self-igniting loads of powder and projectiles;

(4) mechanisms for loading and igniting several such self-contained units in rapid succession with physical ease.

It was to be the last three of these, which shall be explained further in succeeding chapters, which the newly freed inventiveness of the age developed, applied and perfected between 1830 and 1870. At this point, it is well to examine a few broad definitions to enable the reader to clearly understand common expressions used in the description of handguns - in broad terms - how the various methods of operation function.

Definitions

(1) Smallarms system - consists of the gun and the round of ammunition which is fired from it.

(2) The Barrel - the chamber leads forward into the bore, which in the vast majority of modern weapons is rifled. The function of the barrel is therefore threefold : it guides the bullet in the required direction; it gives the bullet velocity by containing the expanding gases which force the bullet forward, and it impacts a rotatory stabilising effect by spinning the bullet.

(3) The Chamber and the Bolt - the chamber has to withstand a considerable pressure and an equally considerable amount of heat. For instance, in Fabrique Nationale's Fusil Automatique Leger (FAL), the chamber pressure is about 22 tons per square inch, and the gas temperature is in excess of 2500 degree celcius. It is therefore necessary to seal the rear of the chamber, which is done by using some form of bolt or breechlock. The breech unit is bored to permit passage of a firing pin or striker, the function of which is to give a sharp blow to the priming cap in the cartridge case, and so igniting the propellant inside.

(4) The Operating Cycle - this series of operations takes place every time a weapon is fired and the sequence may be performed either by hand or by an automatic mechanism. It is generally, referred to as the "operating cycle" and is summaried thus :

(a) chambering

(b) locking (supporting the base of the cartridge case)

firing

(d) unlocking (removing the support to the base of the cartridge case)

(e) extraction

(f) ejection

(g) cocking

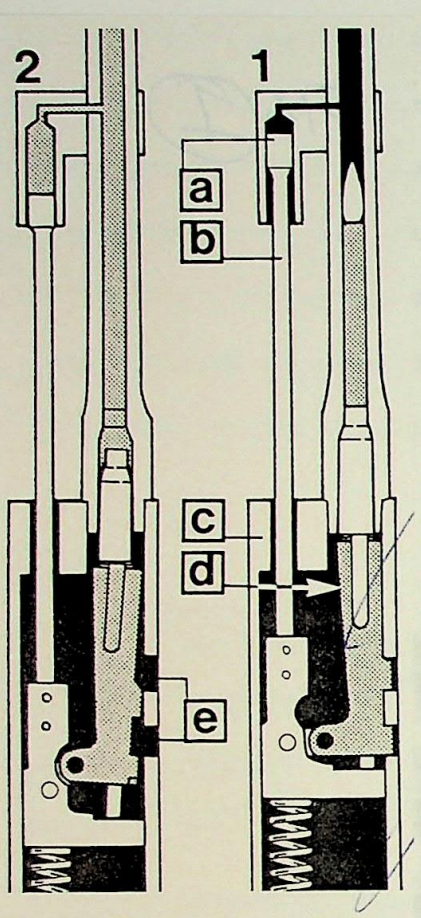
(h) feeding

These portions of the cycle need not necessarily take place in this order, cocking, for example, could occur before unlocking or before extraction, but all small arms have to go through the cycle regardless of its precise order (provided they are intended to use conventional metallic cartridges).

(5) Gas Operation - the gas powered operation mechanism can take many forms, but the most commonly used device consists of a simple gas cylinder and a piston which is driven backwards to transfer its energy to the bolt by direct impact (Figure 1).

(6) Blowback Operation - the blowback operation of a small arm can be defined as "a method of operation in which the energy required to carry out the cycle of operations is supplied to the bolt by the backward movement of the cartridge case, caused by the gas pressure.

(7) Recoil Operation _ In the recoil system provision is made for locking the bolt to the barrel and these parts are mounted in the gun body, so that they can slide to the rear.

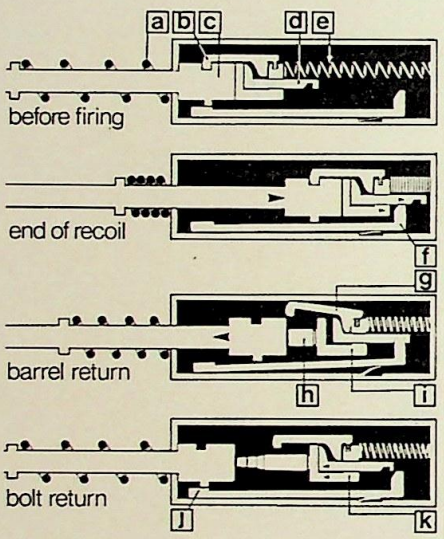


a gas piston
b operating rod
c receiver
d bolt
e locking shoulders

1 bullet travelling towards gas port
2 bullet past gas port

GAS OPERATION - Figure 1

The gun is fired with the bolt locked to the barrel, and these parts remain locked together as they are thrust back by the pressure resulting from the explosion of the powdered gases. In some guns the energy derived from this motion is used to perform the entire cycle of operations, in others the energy derived from recoil may only perform certain functions in the cycle or may merely supplement the energy derived from another system of automatic operation (Figure 2) which a typical long recoil operation.



a barrel spring
b bolt lock
c bolt
d unlocking device
e bolt spring
f bolt latch
g lock open
h spent case being extracted
i bolt latched
j latch lugs engaged
k bolt unlatched

RECOIL OPERATION - Figure 2

(8) Breechlocking - is the function of the mechanism which supports the cartridge case on firing. The object is to ensure that the cartridge case is positively supported by a locked mechanism until the gas pressure has fallen to a safe level (in automatic weapons) or until it is desired to remove the case in a manually operated mechanism. There are too many different kinds of locking mechanism in use, to be covered so most systems will almost closely relate to one of the following :

(a) rotating bolts

(b) tilting breechblocks

(c) lug systems

(d) toggle systems

(e) non-ramming breechblocks

(f) revolver systems

CHAPTER 1

Military Requirements

The laymans view of small arms and ammunition is often a romantic notion of the capabilities of fabled guns, in the hands of legendary characters in history who used "weapons" to gain their recognition sometimes it may also be an awareness of those weapons used by guerrillas or, it may be something vaguely called a "rifle" which is carried by a soldier.

The calibre of ammunition used is very important. After all, it is the ammunition which does the damage, and is the "raison d'etre" of the small arm. In the case of small arms and handguns in general, the projectiles primary purpose is to incapacitate personnel. Small arms are vital for many tasks, and for many reasons. When all else has failed it is up to the infantryman to winkle out a really determined defender - the enemy - and whatever other aids he has, he would not attempt such a task without effective small arms.

This statement can be backed up because the feel of a small arm in a soldiers hand is a terrific boast for his morale if he is in

this situation. He has something with which to hit back, however ineffectual it may be against some targets. If he did not have this means to fire back when under pressure, he would be far more likely on many occasions to get his head down or to run.

The small arm is also a last ditch in defence. If the enemy has broken through to rear areas and soldiers of the administrative tail have to engage them in combat, as has so often happened, they need their small arms. Small arms are employed in all phases of war, all types of conflict, and every variety of terrain. Whatever his employment on the battlefield - tank crew, artilleryman, driver, fitter - the soldier has a small arm. The most numerous corps, the infantry, count the small arm as their basic weapon. The weapon's characteristics must cater for all the likely situations in which soldiers might find themselves. If they work in confined spaces, they need small, handy weapons. If their main task requires free hands the weapon must be slung or holstered, but in such a way as to be readily available.

Given rain or snow, high temperatures or low, the weapon must function faultlessly. Though their training on small arms may be minimal, the simplicity and handiness of the weapon should be such that it is effective in their hands. Despite all these demands, the sheer numbers of weapons involved dictates that they should not be too expensive. When small arm tasks are defined,

no single one of the many types, will fill them all or even a large part of them.

There are many good reasons, however, for trying to reduce the variety of guns to only a few. These reasons include logistic considerations such as fewer varieties of ammunition; less spares to carry, inter-changeability of parts; training time can be reduced; and the cost of a big buy of one type of weapon is cheaper than many small buys of a variety. The trend is therefore towards the development of a family of weapons which meets the military requirement and involves as few types and calibres as possible.

If there is a need for a particular new design of a small arms weapon for an army, the designer uses certain characteristics in an order of priority to produce a weapon that satisfies the soldier. These characteristics are likely to include range, penetration, wounding effect, accuracy, consistency, rate of fire, reliability, weight and the overall length of the weapon.

CHAPTER 2

EVOLUTION OF HANDGUNS

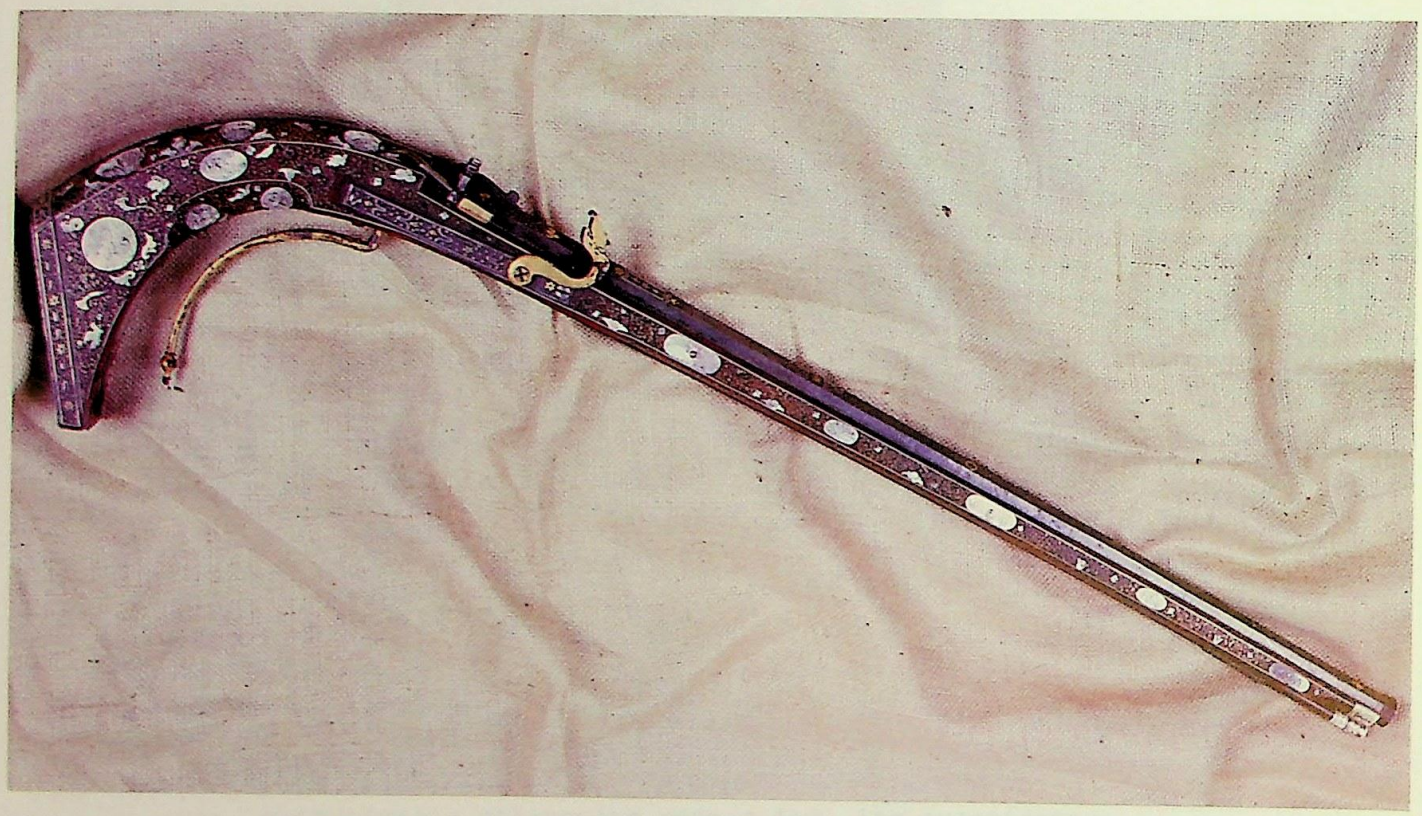
One of the earliest and most effective hand weapon was the bow, indeed so ruthlessly efficient that it was not overtaken by the gun until the eighteenth century. The origins of gunpowder will probably never generally be agreed upon. Though an incenduary composition was known to the Chinese around the year 1000, this was used only for fireworks. However, it was in Euorpe that true gunpowder was first described in the work of the English scholar, Roger Bacon, whose treaties "Liber Ignium", or "Book of Fires" burst on Europe around 1250. Most people of that time believed that the formula for gunpowder in the "Liber Ignium", was the invention of the devil. However, Roger Bacon, as a scholar and scientist knew it to be the work of man, and he understood perfectly the essential elements of gunpowder. The basic element was wood charcoal, which Bacon knew to control the burning speed of the powder for explosive or propulsive use. Even today the production of black powder still relies on the care taken in charcoal burning, one of man's earliest skills. The wood used is generally only of three kinds, Alder, Dogwood, or Beech. In fact, the composition of gunpowder and the process in which it is

manufactured, has not changed so much since then and the techniques used would be recognisable to any powdermaker of the last 500 years. All the work is done by hand and no automated gunpowder mill has ever succeeded because of the specialist techniques used in production.

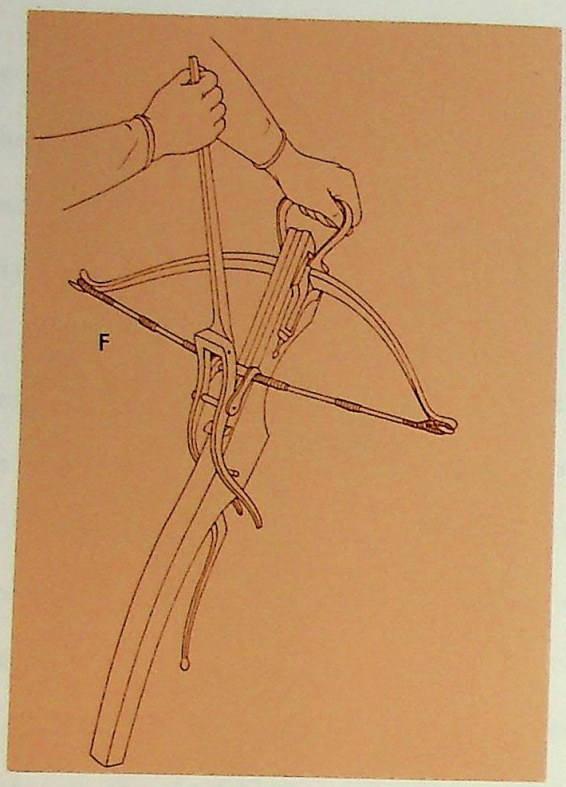
One of the earliest guns on record dates from about 1326, 75 years after Bacon's "Liber Ignium", though it is not known who invented the gun. The earliest reference seems to be to portable arms bearer in an Italian document of about 1281, but it is not until after 1330, that the records of the use of cannon become relatively frequent. The oldest known hand cannon comes from Sweden and dates from about 1350.

However from then until well into the fifteenth century the picture is dominated by large cannon and ord'nance which is a term used to describe big guns. Although bowmen fought side by side on the battlefield with gunners, the tide was turning slowly in favour of the latter. In the early development of guns, in the fifthteenth and sixteenth century, they can be described as tubes of various construction, fired by a burning match. The next step was to place the barrel within a wooden stock. When this became the normal mode, around the year 1400, the general configuration became very similar to modern guns. Firing a hand cannon was fairly simple. The missile was generally under rather

than over 3/4 of an inch in diameter. However, soon there were two preoccupations; one was the capacity to have more than one shot, so that there was something in reserve after the first discharge, and secondly, a need to find a mechanical means of placing the burning match in the priming powder. To what extent the matchlock derived from the crossbow can only be conjecture (Figure 3 and 4). The crossbow firing mechanism shows a striking similarity to the workings of the matchlocks mechanism.



FRENCH PETRONEL MATCHLOCK (1600) - Figure 3



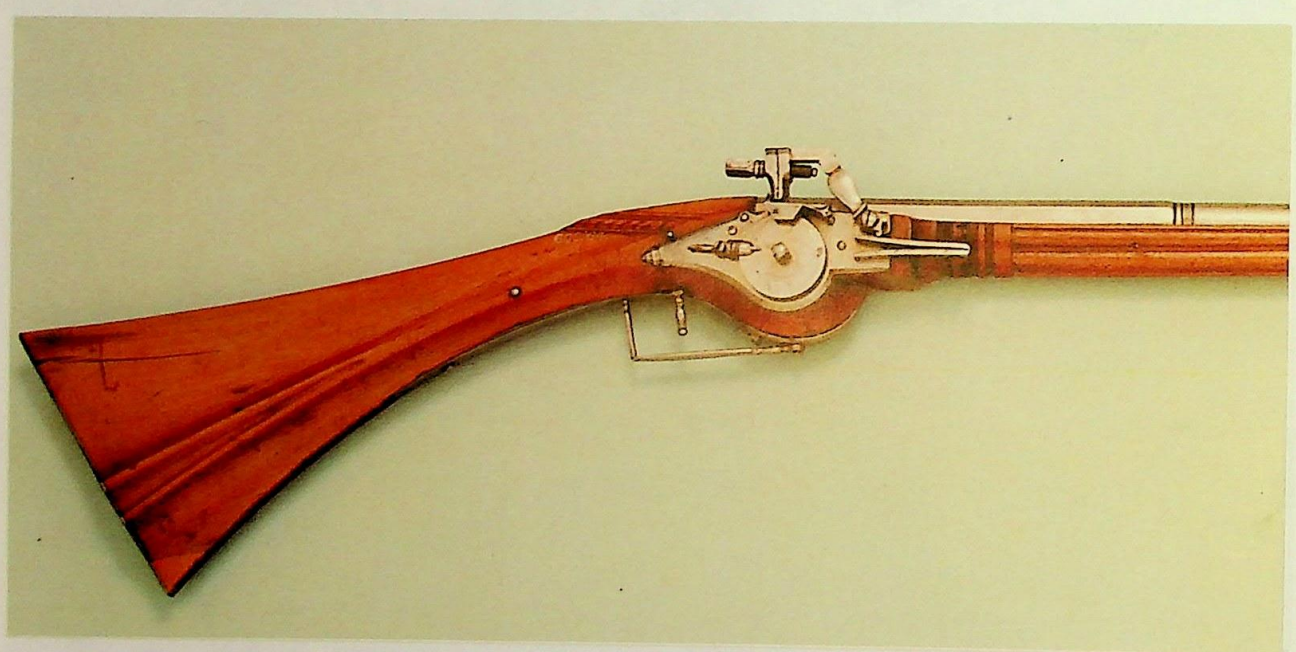
"THE GAFFLE" CROSSBOW (AROUND 1600) - Figure 4

But where ever it did come from, simultaneously in a number of places around Europe, it was soon generally adopted.

Basically, all the matchlock consisted of, was a serpentine that held the match, which could be caused to fall into the pan when the firer saw the correct aim, and chose the exact moment to fire. In sixteenth century Europe, the matchlock slowly became an aesthetically attractive possession, its functioning relatively trouble free. The matchlock was perfected by covering the pan, thus enabling the powder to be guarded from the weather and then placing a fence to protect the operator's eye.

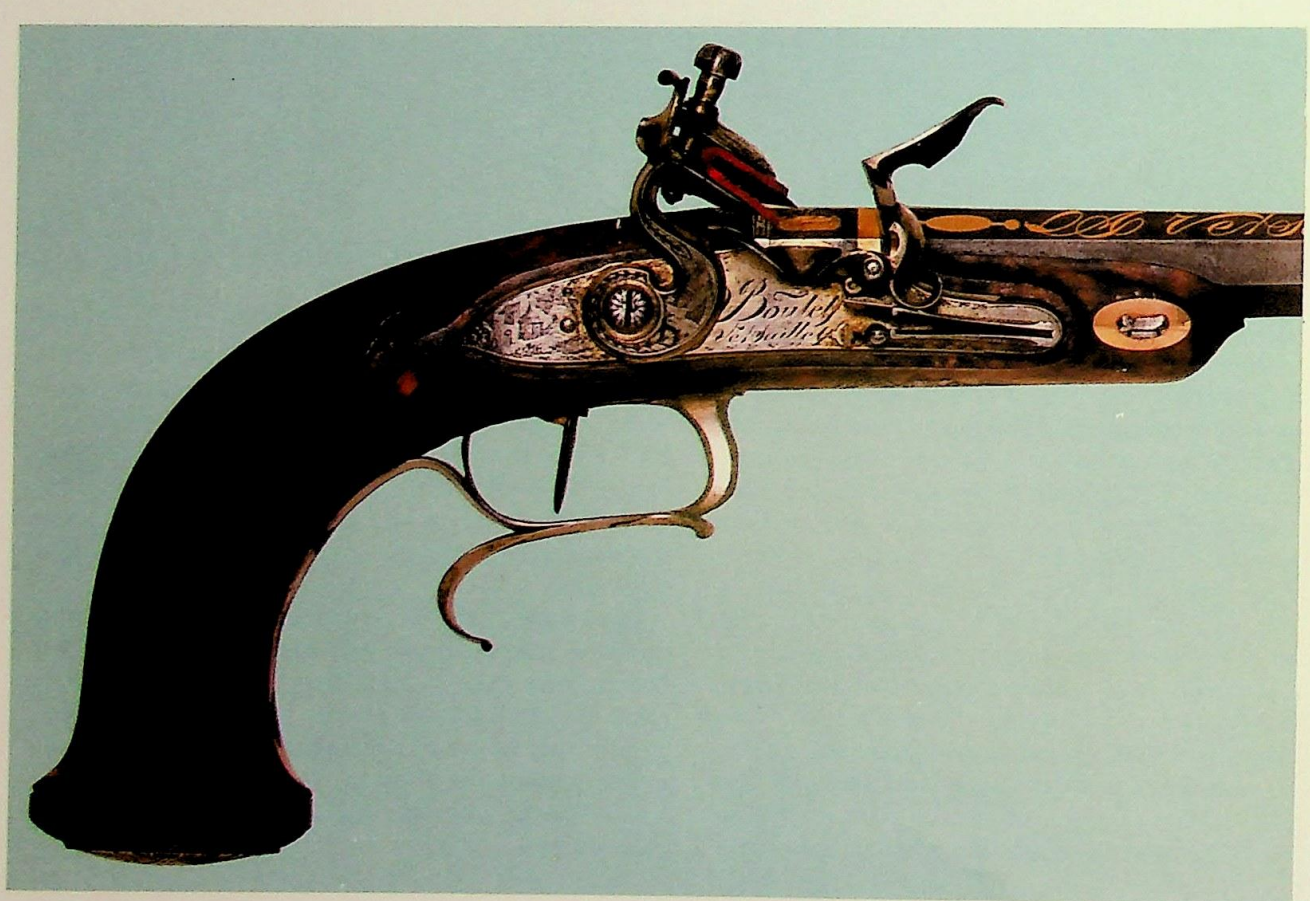
However, the matchlock as it stood was unsatisfactory for the soldier if he wished to fight in all weather conditions. What he needed was some form of a self-igniting lock. The answer was the wheelock (Figure 5).

Again the inventor of the wheelock is not really known. In Leornardo Da Vincis (Codex Atlanticus) notebook he has sketched this lock. The wheelock worked very well and was an efficient mechanism for firing a gun, but was expensive and unreliable. The wheelock principle was to attach a short chain to a V-shaped spring; its basis 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 the chain whose other end is fixed to a strong V-shaped spring.



A FRENCH WHEELOCK (1625) - Figure 5

The wheelock was accompanied by a spanner or key to enable operation but if the firer lost these impliments he was out of action. A wheelock was often fired as a matchbox because the mechanism had jammed - none the less it was undeniable that the wheelock was an advanced mechanism only 80 years after Leonardo Da Vincis drawings. However, only the wealthy sportsman and a few select troops enjoyed the advantages of the wheelcok, applied to pistols and rifles alike. On the other hand the majority of armies of Europe still fought with the matchlock until well into the seventeenth century. It was not until the emergence of the Snaphance and the flintlock did the common soldier enjoy the advantages of a self-igniting lock (Figure 6)



FRENCH FLINTLOCK DUELING PISTOL - Figure 6

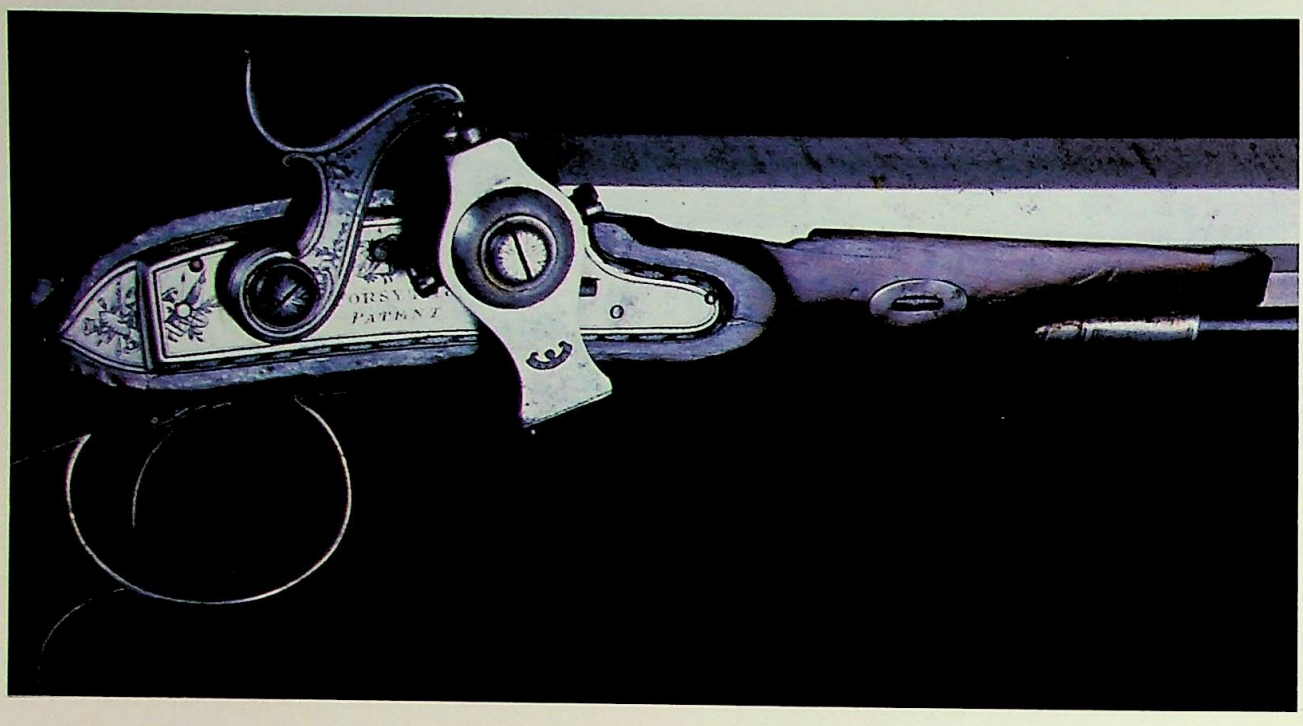
CHAPTER 3

FROM FLINTLOCKS TO PERCUSSION

Sometime around 1806, the Rev. Alexander Forsyth, of Belhelvie in Aberdeenshire, a keen gun sportsman and an amateur chemist, made a major breakthrough that was to advance gun technology. Forsyth was determined to improve the performance of the gun under sporting conditions which were often associated with cold and damp.

The idea struck him that all he needed to do to ignite the gunpowder was to use percussion to strike the powder. He came up with the percussion ignition system which made this possible (Figure 7). The percussion pistol with its "scent bottle" was a mechanism to store the powder safely, and deliver only a tiny charge to be ignited by a hammer blow near the touch-hole. Originally, Forsyth was working with hunting shot guns and the principle was quickly applied to the pistol. The "scent bottle" pistol required very fine workmanship and it was very expensive. It was an excellent solution for the wealthy sportsman, unfortunately, it was not a solution for the soldier.

The speed at which the lock could be primed and made ready, was impressive compared to existing flintlocks. The speed of



PERCUSSION PISTOL (1815) FORSYTH LOCK "SCENT BOTTLE" - Figure 7

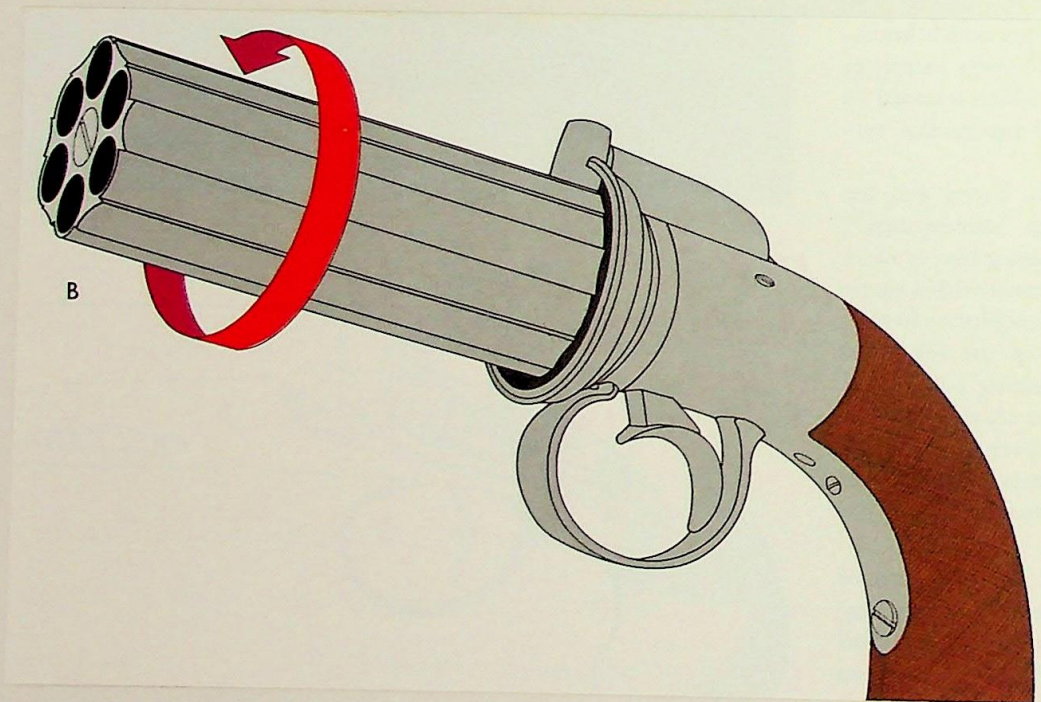
ignition was virtually simultaneous with the fall of the hammer. His pistols were available in London in 1807 and remained under patent till 1821. This prevented others in Britian from challenging him, but at the same time encouraged others to try every kind of alternative means of harnassing the percussion principle. The percussion cap was by far the most successful form of detenation. By the 1840's Forsyths invention was dominant. Only the sailors in the royal navy complained because they often stepped on the spent copper caps. The gun also had an advantage in that most flintlocks could easily be converted to the percussion system, with very little cost. After 250 years of use the flintlock was finally ecclipsed by percussion.

CHAPTER 4

THE PEPPERBOX PISTOL

By the late eighteenth century the handgun was merely a dueling pistol for affairs of honour or as protection when travelling. What was wanted now was multi-shot capacity to make sure the bearer was not unarmed after only firing just one shot. Various methods were tried to achieve this but none more successful than by rotation (revolving the barrels). The number varied, from gun to gun but six chambers were very common. At this time the only really safe way of having more than one shot available, was to duplicate or multiply the number of pistols carried. A pair was carried as commonly as a single gun, but with the arrival of the percussion lock the design problem of the revolver was some what simplified, and soon the pepperbox revolver was being made (1800) by all classes of makers. By the fourth decade of the nineteenth century, such pistols had become very common. Their resemblence to a domestic pepperpot when viewed from the muzzle earned them their name in the terminology of modern collectors (Figures 8 and 9).

ENGLISH PEPPERBOX PISTOL (.38in BORE) PARKHOUSE OF TAUNTON - Figure 8



A SIX BARRELED SELF COCKING PEPPERBOX ETHAN ELLEN - Figure 9

The pepperbox suffered from the disadvantage that the barrels of the larger bore guns were so heavy that few such were made, due to the weight, making operation difficult. The pepperbox barrels were not all the same length but they were still very heavy. However, they had the distinct advantage over the ordinary revolver in that if there was an accidental ignition of the other barrels, which often happened, there were not serious consequences for the firer. If an accidential ignition occurred in a revolver the bullets woud smash into the frame because they would not be in line with the barrel and the bullets, therefore, would have no way of escaping. However, in the pepperbox the bullets could escape without damaging the firer or gun because the bullets were always lined up with their own barrels and even if they were ignited accidentally they would still escape.

Loading a pepperbox or any other muzzle loading revolver was therefore a precise and time consuming business. In a sence the pepperbox was basically an early concept of a modern revolver design. There were two available ways of speeding things up, the powder and the bullet could be pre-packaged or the firer could preload a spare cylinder if he had one. In 1837, the Massachusetts gunmaker, Ethan Allen patented a pepperbox revolver with a double-action lock that made the fastest firing gun in the world at that time (Figure 9). For nearly a decade Allen's pepperbox's were more popular and better know than Colt's new

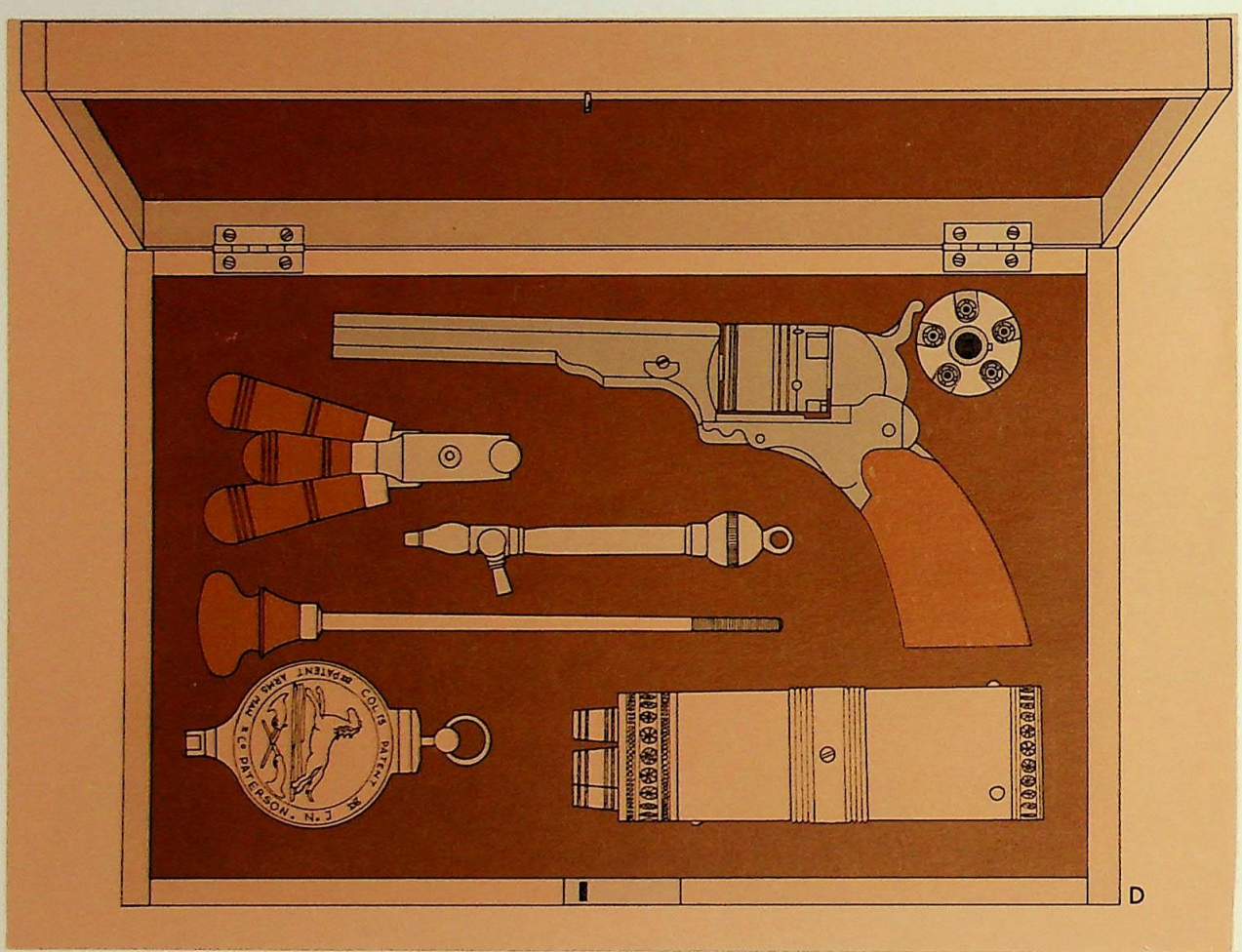
revolvers. However, the output of Samuel Colt's new factory at Hartford, Connecticut, U.S.A. pushed the pepperbox into second place during the 1850's. This was mainly due to the interchangeability of parts in Colt's designs against and the complexity of the pepperbox.

CHAPTER 5

COLT AND ADAMS REVOLVERS

Revolving pistols were perfected in 1835 by Samuel Colt, of Hartford, Connecticut. Colt corrected earlier faults in many revolver designs. He rebuilt the old system of a rotating cylinder by lining up the top chamber with a single fixed barrel - he placed the percussion nipples into spaced recesses at the end of the cylinder, so multiply ignition was impossible, perfecting the old principle of rotating the cylinder by the action of cocking. Thus Colt stands in relation to the revolver as Henry Ford to the automobile; he did not invent it, but adapted and redesigned an idea into an industrial success to such an extent that what had hither to been achieved at great expense with only moderately satisfactory results, was suddenly rendered highly functional, durable and rising to far-sighted engineering and manufacturing processes, produced remarkably cheap. Colt had barely reached his majority when he was granted patents in Britain (1835) and America (1836) in respect of a single-barrelled revolver, with a five-shot cylinder rotated and locked, in proper alignment for firing, when the hammer was drawn back to the full cock position. His patents covered the method of indexing and locking the cylinder so that each percussion

nipple was isolated from its neighbours, and other details. Colt began a sales campaign with his patented revolvers at Paterson, New Jersey, in 1836. One of Colt's first pistols made at his new factory at Paterson was the pocket model (Figure 10).



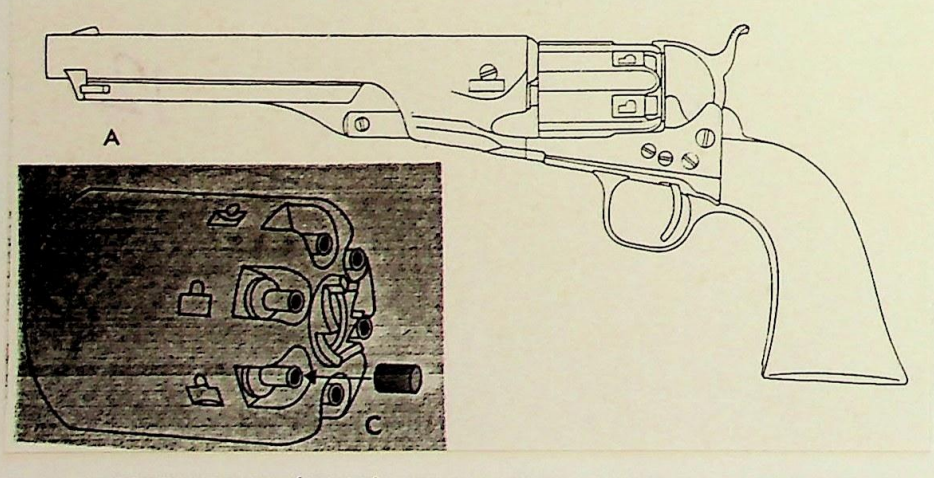
COLT POCKET MODEL "PATERSON" PISTOL (1839) - Figure 10

When the Great Exhibition took place in London in 1851 Colt had already dominated the market for the previous 15 years. Colt's main competition was from an Englishman, Robert Adams, who designed guns which had great stopping power, and which were vastly more durable than Colt's and could be fired faster owing to the double action. However, there were disadvantages in that cap gragments could stop the workings.

Furthermore, parts were not interchangeable. It is interesting to note that three hundred British patents, for firearms, were granted between 1817 and 1852. While in the next six years, the period of the Crimean War (1854-1856) twice that number were granted. During the Crimean war the British Board of Ord'nance, who were responsible for the buying of arms to the British army, became interested in the Adams revolver fitted with a double-action mechanism which could be cocked with either the thumb or the trigger. This idea had been patented by Frederick Beaumont who then went into business with Adams. In 1856, orders for the Beaumont-Adams pistol (Figure 11) manufactured by the London Armoury Company, which Adams had helped to found, were made by the Board of Ord'nance for the weapons. Despite claims that the Beaumont-Adams was a faster shooting weapon than its Colt counterparts, that it was stronger, and that its longer bullet gave it a greater stopping power may all have been true, but it still did not achieve the universal success of Colt's model.

BEAUMONT-ADAMS REVOLVER (1855) - Figure 11

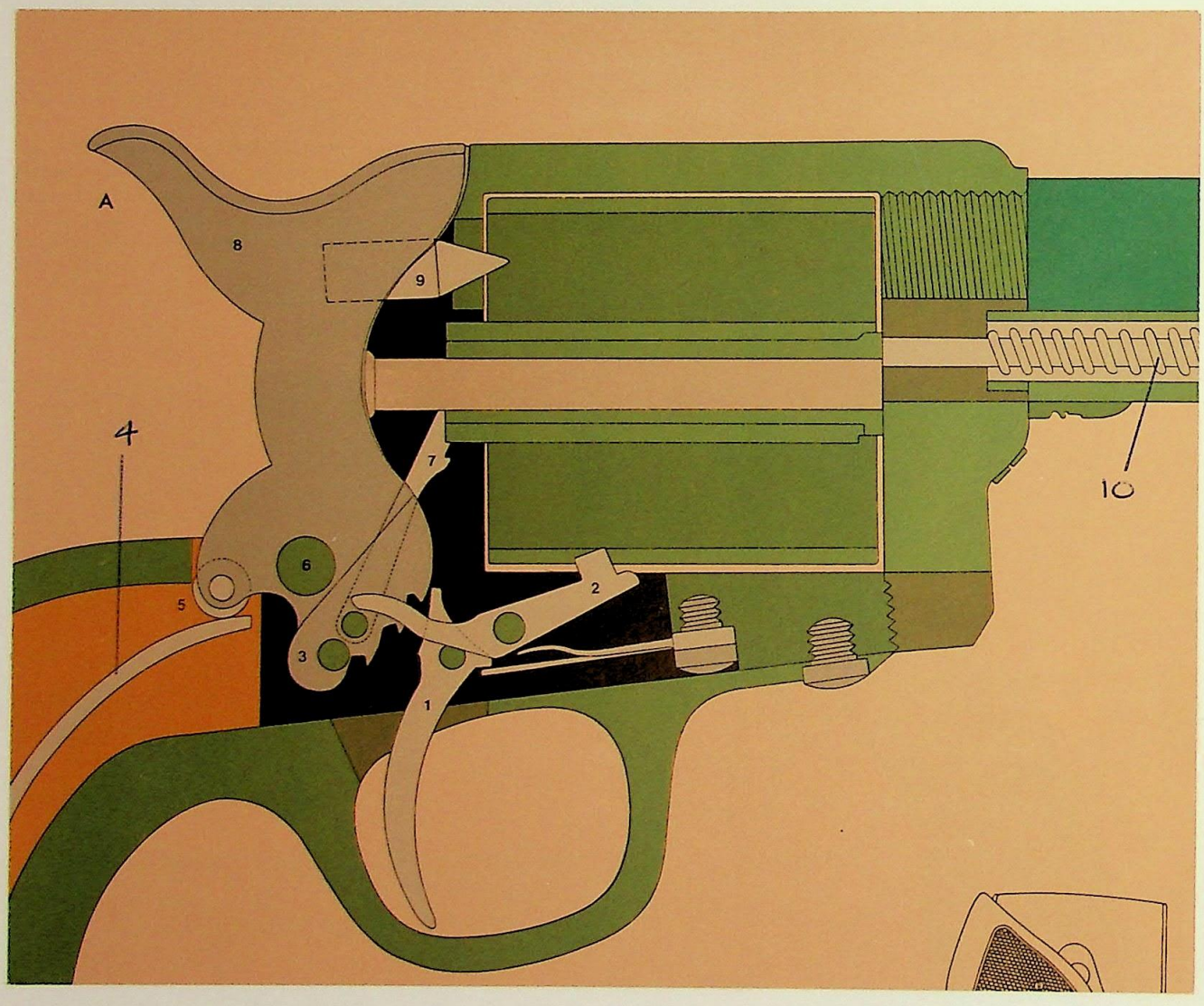
The splendid Colt Army model of 1860 (Figure 12) saw wartime duty in the American Civil War (1861-1865) in the union army and also the confederate army.



COLT MDOEL (1860) ARMY MODEL .44 - Figure 12

In Figure 13 a sectional view is shown of the Colt .45. The gun has a solid frame and its cylinder is loaded through a "gate".

(1) Trigger and screw
(2) Bolt and screw
(3) Hammer cam
(4) Main spring
(5) Hammer roll and rivet
(6) Hammer screw
(7) Hand spring
(8) Hammer
(9) Firing pin and rivet
(10) Ejector rod and spring

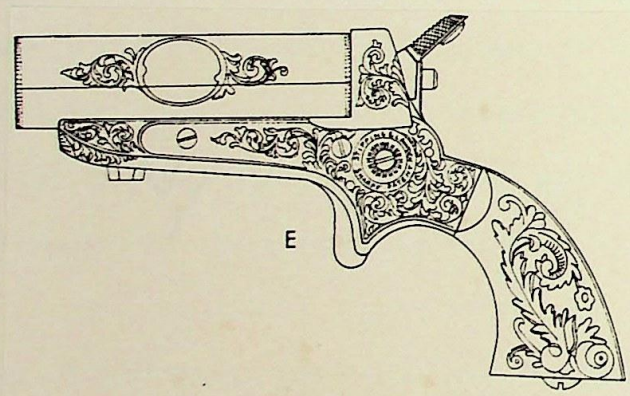


COLT .45 - Figure 13

CHAPTER 6

THE DERINGER POCKET PISTOL

Probably, the most famous pocket pistol of a time was designed by Henry Deringer, in his Philadelphia workshop. Figure 14 shows a four-barrelled Deringer patented by Christian Sharps in 1859.



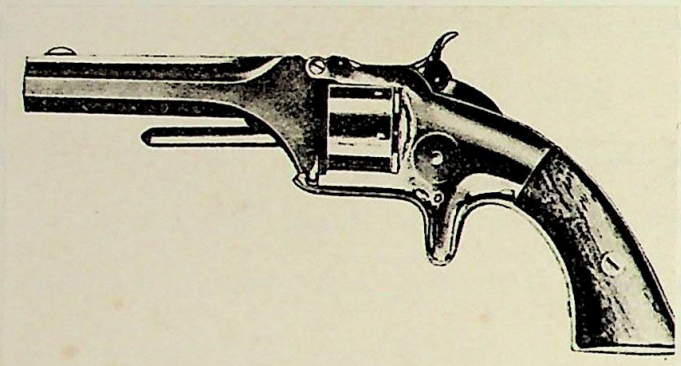
DERINGER POCKET PISTOL - Figure 14

A chisel-shaped striker runs through 90 degree each time the hammer is cocked thus striking each of the four rim-fire cartridges in turn. When it is fired, to load, the barrel group slides forward. These compact, large bored and rifled percussion pistols, which were short-range weapons designed for self defence, were widely copied. By the time John Wilkes Booth assassinated Abraham Lincoln, in 1865 with a Deringer, episodes of the incident were repeated time and time again in newspapers and novels. The Deringer was described as a pistol to "be carried in the waistcoat pocket, to shoot accurately and with great force". The small sizes and the power of the first Deringer pistols and their derivations were the main claims to popularity in the violent years which proceeded and followed America's Civil War. Different major manufacturers evolved a variety of single and multi-barrelled styles, of the first Deringer, which retained its popularity until it was superseded by the invention of small automatic pistols, and to some extent surviving the impact of cheap pocket revolvers.

The difficulty of ensuring a gas tight seal between the barrel and the revolving cylinder which contained the powder and bullet in "conventional" revolvers, such as colliers, were overcome in Deringer's pistols by using two or more revolving barrels, each of which could be brought into alignment with a single lock.

CHAPTER 7

SMITH AND WESSON (BREECHLOADING)



One of the first Smith & Wesson cartridge revolvers. Caliber .22 rimfi
A favorite officer's model in the Civil War.

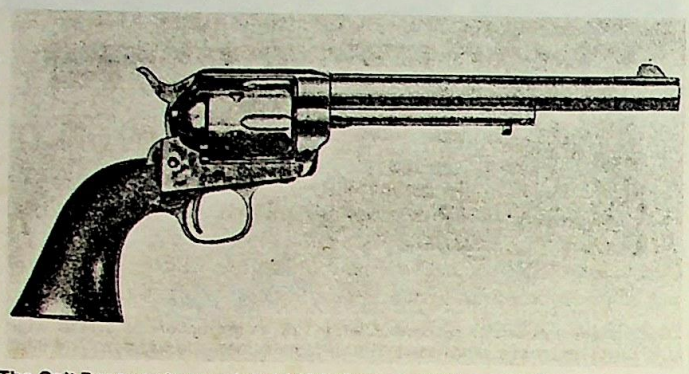
SMITH AND WESSON .22 RIMFIRE - Figure 15

The famous Smith and Wesson .22 rimfire pistol of 1857 was the first popular breech loader. And thus became one of the most important weapons in the development of the gun in the nineteenth century. Smith and Wesson achieved their success in two ways.

In 1855 they acquired the red and white patent for the bored through cylinder to permit the insertion of cartridges from the breech end. The pistol used .22 rimfire cartridges which were first produced in 1854. The .22 cartridges were important because they were light and very reliable compared to existing cartridges. A parallel development was the pin fire system which had the disadvantage that the cartridge could easily be set off accidently even when it was not in the weapon. The revolver with its hinged up barrel, removable cylinder, and single action firing lock became the most sought after side arm of both union and confederate officers during the American Civil War. The gun was a combination of compactness, light weight and rapidity of reloading. Smith and Wesson exercised a monopoly on the system, of inserting cartridges from the rear of the cylinder until patents expired in 1869, During this time, Colt attempted various hybrid systems in an endeavour to get around the Smith and Wesson controlled patents. None of the experiments succeeded to achieve rapid fire. Smith and Wesson only needed some form of loading gate, so that the rounds could be loaded into the chambers, and some means of pushing out the empty cases after they had been fired.

The Americans in general, preferred single-action weapons in which the hammer had to be pulled back for each shot, while the British preferred double action arms which could either be fired

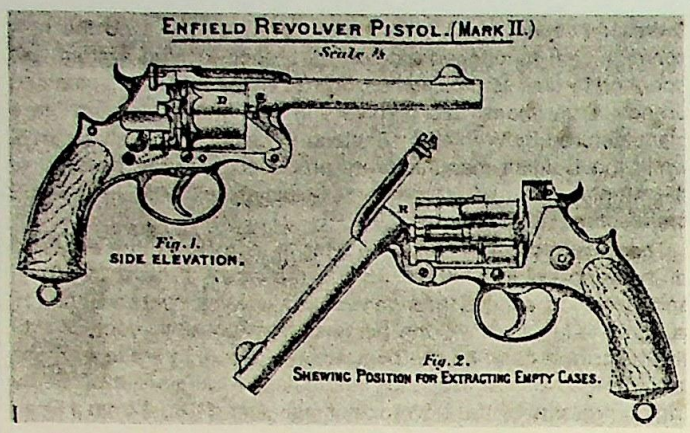
in a similar manner, or simply by placing steady pressure on the trigger. This difference in taste was probably caused by difference in use. The average American westerner was not a gunfighter as many people today believe. He primarily carried a revolver for self-defence, for use against vermin and perhaps even small game. Thus he wanted a gun for accurate shooting, often at quite long range. The single action gave hime this facility because manual cocking made the trigger action very much lighter. British users on the other hand were often military officers, and for them long range accuracy was less important, because their soldiers already had rifles. What the officer required was a pistol with which he could, if necessary, shoot his way out of a swarm of yelling savages. So in his case, the paramount need for speed was important. Although the single-action revolver still holds its place in the affections of many Americans, the double-action has for many years been almost universally used with improved methods of loading and ejection pioneered by Smith and Wesson in the United States and Webley in the United Kingdom, both firms had produced reliable systems by the 1870's. In 1857, the first centre-fire cartridge was produced. After further development it became the most common type of bullet used and the predecessor to the modern bullet. In America centre fire was eventually, accepted for military purposes. The Peacemaker (Figure 16) arrived on the scene in 1873.



The Colt Peacemaker model of 1873. Caliber .45. The most famous revolver in history and legend, this is the revolver that "made all men equal" in the pioneer days of the West. Metallic cartridge pattern.

COLT "PEACEMAKER" (1873) - Figure 16

The difficulty with cartridge loading was how to get rid of the spent case. In 1880, the Enfield 476 revolver was produced and it was to some degree a good solution to the problem (Figure 17). Superficially it was a break-open revolver but it was so successful due to the rapid ejection of spent cartridges compared to what already existed. Other makers had different ideas and with a various compilation of underlevers, undercatches and many mechanisms of all shapes and sizes, they strived for solutions to avoid the patent rights.



This Enfield saw some service in the early days of the Royal Canadian Northwest Mounted Police. It was replaced by Colts. Today the organization has become the Royal Canadian Mounted Police armed with Smith & Wesson revolvers.

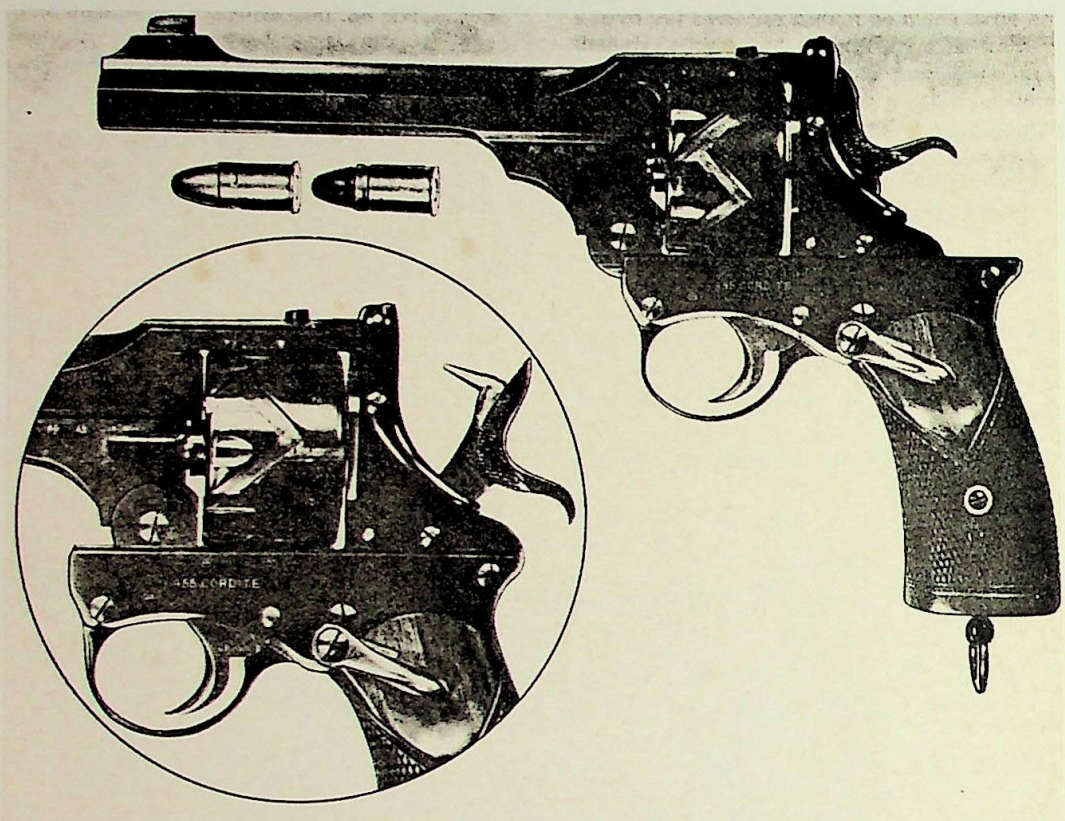
ENFIELD 476 REVOLVER - Figure 17

The designers of the Webley revolver .455 (Figure 18) had an even better idea, they produced a fairly massive bulky section in the central stirrip which ejected the empty cases but it left the fired ones in. This design dominates revolver extraction mechanisms in Britain, right up to the present day. With this breakthrough in the design, the problems of high speed ejection were thus being solved.

The revolver in one sense reached its mechanical zenith, with the introduction of the Webly-Fosbery automatic revolver (Figure 19). It was designed by General G.V. Fosbery (V.C.) in the mid 1890's

THE WEBLEY REVOLVER .455 - Figure 18

but it was not marketed on any scale until 1901. It successfully harnessed the recoil of the barrel and action to turn the cylinder and cock the hammer ready for the next shot. The modern revolver had for all practical purposes reached the peak of its development by the beginning of the twentieth century, and although it is still a very widely used gun, no fundamental improvements in design have been made since then. This perfection of the revolver coincided very closely with the introduction of the automatic pistol.



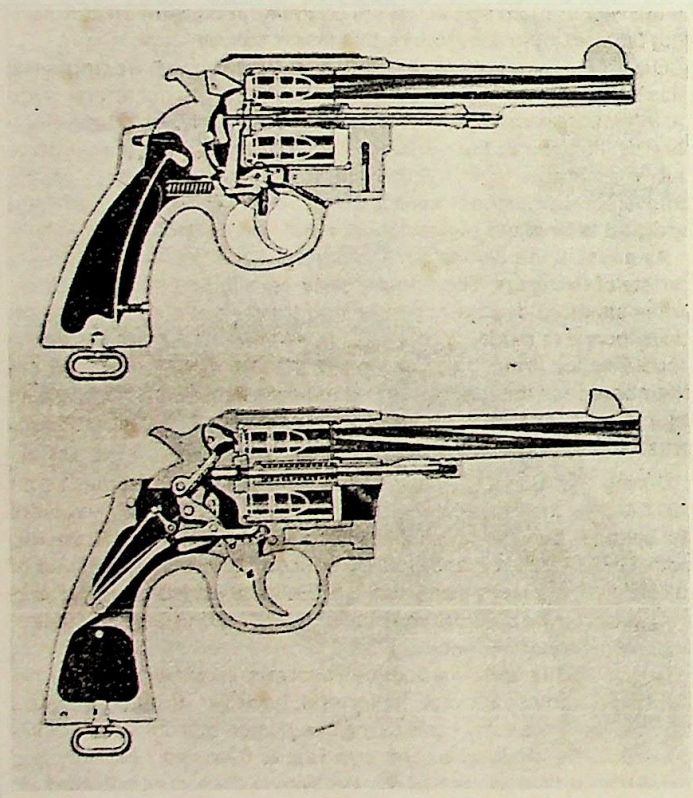
Webley-Fosbery Automatic Revolver. Insert shows barrel and cylinder assembly in full recoil. Cylinder has been revolved halfway to next chamber and hammer cocked. Recoil spring will thrust assembly home and revolve cylinder ready for next shot. Model shown is the .455. This revolver was also made in caliber .38.

WEBLEY - FOSBERY AUTOMATIC - Figure 19

CHAPTER 8

THE REVOLVER IN MILITARY SERVICE

The Colt .45 Automatic pistol was the primary handgun of the United States Forces during the First World War. But a shortage of such weapons compelled the army to adopt the swing-out cylinder double-action designs of both Smith and Wesson and Colt manufacture. Under the designation of Model 1917, both patterns were chambered to take the standard .45 automatic pistol cartridge to minimize ammunition supply problems (Figure 20)



Section views of World War I U. S. revolvers. Upper: Smith & Wesson. Lower: Colt. Caliber .45 (U. S. Gov't).

SMITH AND WESSON AND COLT - Figure 20

Smith and Wesson developed a special half-moon type clip which would hold three of these rimless cartridges. Using these clips the revolvers could be loaded and unloaded rapidly. The Smith and Wesson chambers permitted firing the cartridges in an emergency without the use of the clip. This was possible because the .45 A.C.P. cartridge was designed to sit in the chamber on the mouth of the case. In such an instance the standard rim-type revolver extractor could not operate. As these cartridges have no rim it was necessary to punch or pry the empty cases out of the chamber.

The Colt, on the other hand, was so chambered that the cartridges could pass to far into their chambers to be fired at all, unless their heads were supported by the half-moon clips. Colts and Smith and Wesson revolvers were also manufactured for use by Canadian and British forces. The .455 Eley, the official rimmed cartridge of the British Government during World War 1 required no modification except calibre. Because of the tremendous number of these .45 A.C.P. caliber revolvers available after the war, the Peters Cartridge Company produced the .45 automatic cartridge with a special rim under the designation of .45 auto-rim.

The cartridge does not require the use of the half-moon extracting device. The official revolver of the British forces during World War 1, (though supplemented by Colts and Smith and Wessons as required) was the Webly hinged frame in calibre .455.

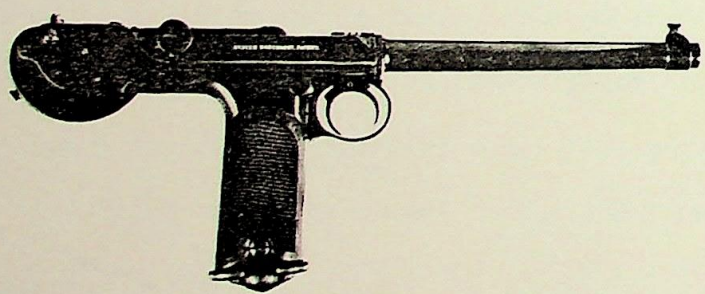
Except in the United States, experience with revolvers during the course of World War II convinced military thinkers that the Webley should be replaced by automatic pistols utilising the same caliber ammunition as the submachine gun. This will unquestionably be the foreign military trend to the future and things have indeed progressed this way up until the present day. Pistols and machine guns using the same calibre of ammunition.

CHAPTER 9

THE FAMOUS AUTOMATIC PISTOLS

Hiram Maxim, had by 1884, already made use of the recoil of one cartridge to load and fire the next one in his highly successful machine gun, so it was not surprising that the same principle would be applied to pistols. The first to appear was the invention of an Austrian, Schenkoy, but it achieved little success and few were made.

Next in the field was Hugo Borchandt, a German by birth although he had spent most of his life in the United States. In 1891, he returned to his native country where his first self-loading pistol was put into production in 1893 (Figure 21).



The original Borchardt pistol.

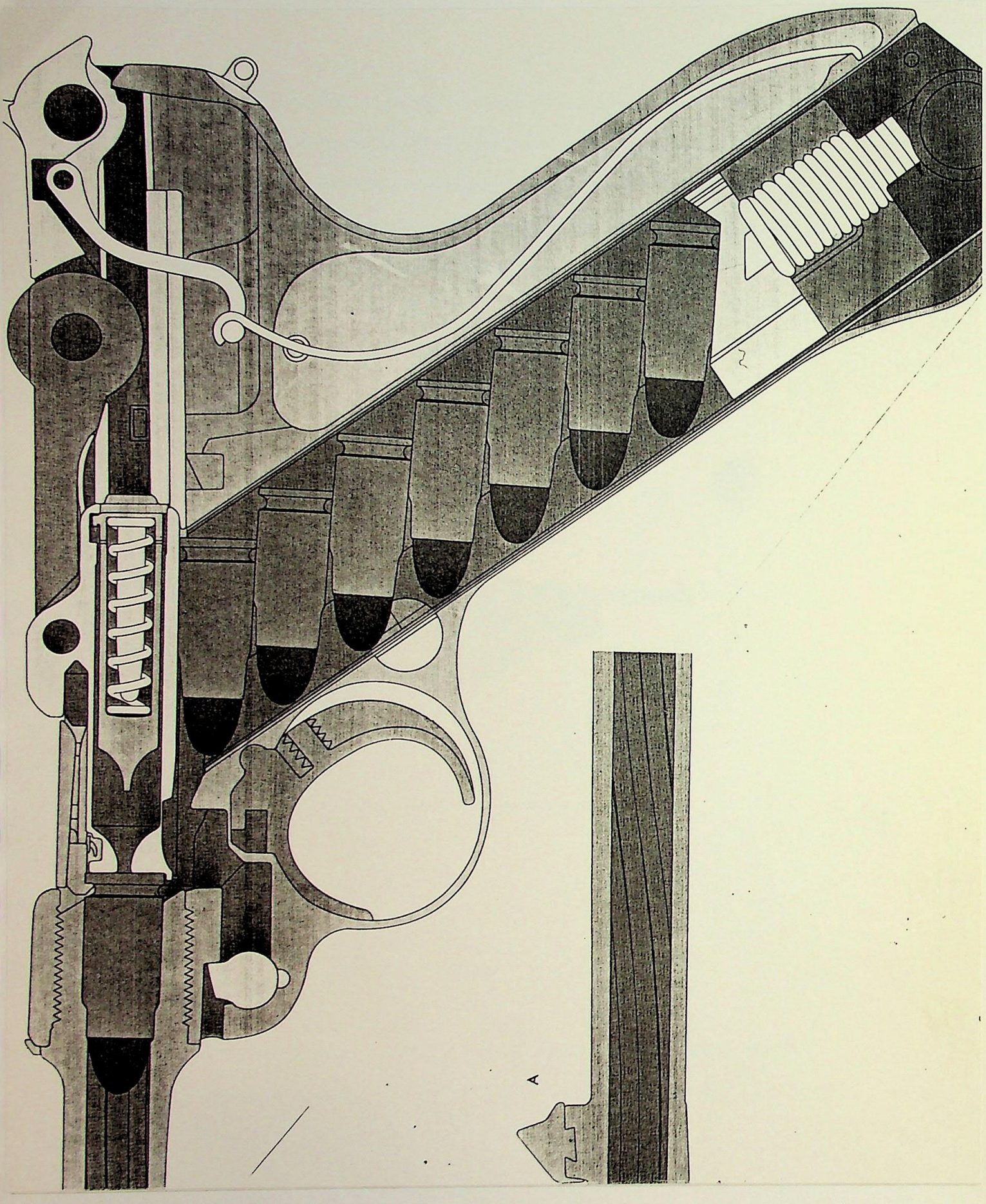
BORCHARDT PISTOL (1893) - Figure 21

Though an ingenious weapon it was not a real success. It was large and clumsy and although it shot well enough with a butt added on to it, it did not meet the currect need for pocket arms.

Another German of genius, George Luger, then simplified and improved Borchandt's design, after which the Luger pistol, in a variety of shapes and calibers, became one of the best known weapons in the world (Figure 22). In 1908, the German government adopted the Luger as its official service pistol but the caliber was increased to 9mm. However, the 9mm cartridge itself is similar to the earlier one in body diameter.

The 9mm case was developed directly form the 7.65mm, so that interchangeability of the two cartridges is very simply effected merely by replacement of barrels. Only the chambers and the bores differ.

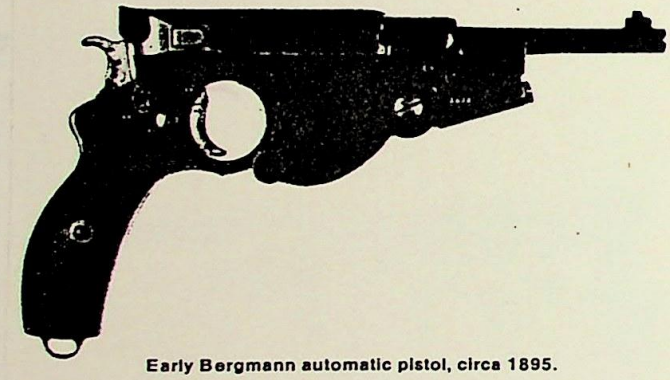
These pistols have never been manufactured commercially in any other calibres than 7.65mm and in 9mm. Early in the century a quantity were hand-manufactured in calibre .45 for the United States government test. Although they were never manufactured in commercial quantities they have become collectors items.



THE LUGER (1906) (9mm) PARABELLUM CARTRIDGE - Figure 22

Other European self-loading pistols followed quickly, chief among them being the Austrian Mannlicher which was introduced in 1901. This was not particularly successful, although it is still occasionally encountered. One of its defects was that it used a special cartridge obtainable only from Austria.

The German Bergman produced a long line of pistols beginning in 1894 (Figure 23).



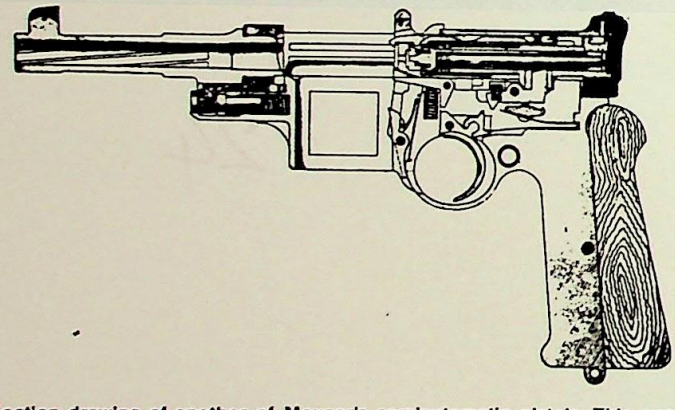
Early Bergmann automatic pistol, circa 1895.

BERGMANN AUTOMATIC - Figure 23

These models included locked and unlocked breech types, exposed and internal hammers, in-built and detachable magazines, and many

calibres and styles. One of these Bergmann's was manufactured in Belgium under the name "Simplex". It utilised an 8mm cartridge developed specially for it. This cartridge was modified by John Browning and the F.N. Works in Belgium and is familiar throughout the world today as the .32 Colt Automatic Pistol cartridge, or the 7.65mm Browning Automatic pistol cartridge. No other pocket pistol cartridge in history achieved the success this one did.

The Mauser (Figure 24) was another German pistol which was to become almost a household word. It was in 1895 that Mauser introduced his 7.63mm military model which is still in wide general use throughout the world. Hugo Borchardt was officially credited by German ammunition manufacturers, who first produced



Section drawing of another of Mauser's semiautomatic pistols. This one was not produced commercially. A variant of its locking mechanism is used in some automatic arms today.

MAUSER SEMIAUTOMATIC PISTOL - Figure 24

this cartridge, with having done much of the experimental engineering work on the Mauser pistol itself although the basic design was that of Mauser. Winston Churchill used a Mauser automatic pistol in the cavalry charge at Omdurmann. He recommended the pistol highly, stating that because of its efficiency and magazine capacity he was able to shoot his way out of a native trap, killing several of the "fuzzy-wuzzy" warriors in the course of saving his own life. However, it was many years before the British service gave any particular attention to the general adoption of automatic pistols for military service.

In 1897 the American, John Browning one of the great names in the world of firearms, also began to design successful self-loaders (Figure 25).

COLT .45 "BROWNING AUTOMATIC" - Figure 25

Brownings first pistol, like many other designs was developed in Europe in 1899. The arm was manufactured by F.N. (Fabrique Nationale D'Armes de Guerre, which today is Europe's largest arms manufacturer, at Herstal, Belgium).

Browning's first pistol made in the co-called 7.65mm or .32 automatic calibre has been used as a side arm in practically all military groups in the world at one time or another. It has in all instances, however, been a substitute standard weapon or one purchased by officers personally.

The F.N. model of 1903, developed by Browning appeared as the Colt Hammerless .32 Automatic pistol. The design was blowback, the hammer was enclosed and a grip safety was provided. From this development came a modification in 1910 from the F.N. factory. Hundreds of variants of this pistol have been manufactured in Belgium, Italy, France, Germany, Spain and Czecholslovakia since the introduction of the arm itself. In 1908, Browning's small pocket pistols of the so-called vest pocket type were introduced in the United States as the .25 Colt Vest Pocket Automatic model and in Belgium as the F.N. Baby Browning. This too, represents a type which has been tremendously imitated and copied throughout the world. Items resembling it very closely may be encountered with literally hundreds of varying trade names, representing pistols manufactured in Spain, Italy and Belgium.

A few years later the British firm of Webley and Scott followed suit, first with their unsuccessful Mars, but later with a series of reliable, if not particularly distinguished, arms of the same type. It is clear, however, that the automatic pistol, initially at any rate, had more appeal to the mainland nations of Europe than to Great Britain and the United States, and by 1914 almost every other country in the world had adopted one type or another as its service pistol.

CHAPTER 10

POSTWAR DEVELOPMENTS IN REVOLVERS

To be of military value, revolvers must be relatively light in weight and compact in size, and must be effective within the limitations of their sighting equipment. For all practical purposes, a revolver cylinder cannot be made to take more than six cartridges of relatively large calibre. This is an elementary matter of dimension. In this respect, of course, the revolver must always be inferior to the automatic pistol, where the cartridges are in a magazine, one on top of the other without the necessary metal separation of the revolver chambers. In the area of research by the aviation industry into aluminium has produced qualities of aluminium forgings which are entirely suitable for all practical revolver frame purposes. Though in field use it has been determined that high tensile steels are still necessary for ultrapowerful cartridges in so far as cylinder and barrel construction are concerned. Since, the bullet must jump a gap between the chamber and the barrel, there must always be a substantial loss of gas at the juncture. Colt and Smith and Wesson both hold tolerances at this point to an absolute minimum, but any device to give a better seal must

inevitably require mechanical complications, which would offset its value. As metallurgical knowledge advances, titanium metal will unquestionably influence revolver design in the production of a lighter weapon with the approximate strength of the standard steel patterns. However, such use will probably be confined to cylinder and barrel production as the lighter aluminium has proven itself sturdy enough for the frame sections. In all practical use, if the cylinder holds during the course of firing, the frame is not subject to any great pressure.

Despite extensive developments of the.38 special using aluminium cylinders, Smith and Wesson and Colt, when using these cylinders found it advisable to return to the use of high tensile steel in their smaller models. Because of this factor the forges aluminium cylinders produced by these firms are adequate for factory loaded ammunition, they did not always hold up under the "strain" introduced by experimenters. In the interests of safety, therefore, steel cylinders are recommended.

CHAPTER 11

THE REVOLVER VERSUS THE AUTOMATIC PISTOL

Generally speaking the automatic pistol, holds eight or more rounds, is slightly more accurate, and easier to conceal than the revolver. It is however, more complex, more susceptible to stoppage through dirt, and perhaps slower to get into action because it is often unsafe to carry a round in the chamber. In contrast the revolver usually holds six rounds, may be a bit more difficult to fire accurately and is harder to conceal. It is however, less susceptible to dirt and may be carried safely fully loaded and ready to draw without any need to manipulate any safety catch or other item except - the trigger. The advocates of both types will continue to argue the merits of their chosen weapon, so that all that need be said here is that while almost every army now uses an automatic pistol, many police forces retain, and indeed on occasion revert to, the revolver. The whole future of the pistol as a military arm must be open to doubt, since more and more reliance is bound to be placed on either the sub-machine gun or the assault rifle as a personal weapon by officers, at least in combat arms. Its role as a police weapon is, however, likely to continue either in revolver

or automatic pistol form in police forces the world over. The sport of pistol shooting continues to flourish. It gives a good deal of harmless enjoyment to a considerable number of people.

One new and apparently flourishing aspect of the sport is the rise in recent years of long-range pistol shooting. Some of the free-style arms used bear a good deal more resemblance to rifles than pistols, but some good shooting is produced by standard models in ranges which would have seemed incredible only a few years ago.

In recent years the British military concept is becoming like that of the continent, strictly that of the practical military appraoch. There is also, of course, the fact that the utilization of the same ammunition in pistol and sub-machine gun is a distinct economic and logistical factor. In this connection it must be pointed out that in Europe the revolver has been considered generally to be obsolete since the introduction of the successful automatic pistol about the turn of the century.

In Germany, for instance, this feeling is so deep seated that even the police will use revolvers only under direct compulsion. At the close of the war the United States and Great Britain both equipped German police forces, in areas under their control with quantities of Smith and Wesson revolvers. As rapidly as

possible, these police organisations found ways to trade these excellent revolvers as part payment on decidedly inferior automatic pistols, manufactured in Spain and France. Many of these revolvers were then sold on the world market, some going to the Israeli police organisation. Others went to South America.

In short, the German military psychology is such that the police felt better with an inferior automatic pistol that they did with a superior revolver. In the United States, on the other hand, and in areas which have benefited from or been influenced by American police psychology, the revolver is favoured. Some 99 percent of all police organisations are equipped with revolvers to the exclusion of automatic pistols.

The revolver mechanism is much safer because the rims of the loaded cartridges can be seen at all times in the revolver. If the cylinder is swung out on its crane, a glance will tell if the cartridges are loaded or fired. Firing in single action fashion from a cocked hammer, the revolver gives a far better pull than can be incorporated in a typical automatic pistol.

This, of course, is a great aid to accuracy as it simplifies holding the sights in line during the instant of firing. None of its springs are compressed except when the arm is in the course of being fired or is fully cocked. As a result there is no

spring fatigue which can develop in automatic pistols. No hand activated safeties are required, although some are found on occasional European freak designs. As a result, there is nothing to remember or forget when bringing the revolver into action. Automatic pistols, because of their nature, require in most instances external safeties which must be mechanically thrown off before the arm can be discharged. Perhaps, the most valuable asset of the revolver over the automatic pistol, however, lies in the field of ammunition. If weak or underpowered cartridges are encountered in a revolver, they occasion little or no difficulty since the operation is purely mechanical. If the powder charge is weak or the priming defective, there is nothing to interfere with the firing of the next shot. With the automatic pistol, on the other hand, when a weak powder load will open the action only part way, the resulting jam can cause a serious malfunction. Automatic pistols require a certain minimum amount of blowback action for functioning. Finally, there is the matter of the misfire. A misfire in an automatic pistol is an extremely serious thing in combat. In truly modern arms, where the automatic pistol is equipped with a double-action mechanism as in the revolver, pulling the trigger a second time will allow the hammer to drop again on the defective cartridge, which may or may not fire it, depending upon the primer and propellant condition. In all automatic pistols, should there be a misfire due to any one of the several failures which may cause

it, the slide or bolt mechanism must be withdrawn by hand to eject the defective cartridge from the chamber and to permit the feeding of the next live round for firing. With the revolver, of course, in case of a misfire, another pull of the trigger finger will move the dead cartridge out of line and bring the next one into line for firing. For defensive purposes this is the most serious consideration of all.

European military psychology accepts the personal danger in the course of the operation of an automatic pistol because it operates on a basis of the average, not the individual. American psychology is more aligned to individual, and police thinking that the possible advantage of greater magazine capacity or higher rate of fire is more than offset by the dependability factor. In passing it must be noted that ammunition manufacturing variables, as well as age and storage conditions involved, contribute far more to stoppages and malfunctions in firearms, than do mechanical designs or effectiveness of the weapons themselves.

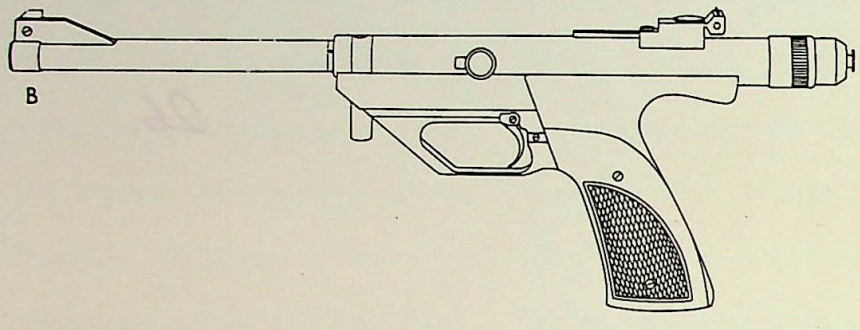
CHAPTER 12

GAS AND AIRGUNS

Firearms inventors, and developments can be credited to gunmakers, engineers and a quota of late nineteenth centuary mechanic-polymaths for whom weapons were just one facet of a wide, creative philosophy. The Parisian brothers Giffard worked on refrigeration steam injection, a "telegraphe pneumatique" and air compressors. Paul Giffard patented a pump cylinder airgun in England in 1862, and ten years later was granted protection for a breechloading rifle which used one compressed air or liquefied air cartridge for each shot. In 1889, he produced what is in effect the modern gun powered by liquefied carbon dioxide, except that his model used a small refillable gas cylinder.

At the time of its design, it was considered suitable for military use, but in more recent years it has been used primarily to train young marksmen and for target shooting. Since, 1958, the Grossman Arms Company of Freeport, New York, has pioneered new uses with their underwater spear guns and the smoothbore weapon for shooting tranquilizers, and other dart-syringes into

wild animals. The Hammerli CO2 pistol (Figure 26) one of the



HAMMERLI CO2 PISTOL - Figure 26

most modern and accurate gas guns available, is a direct descendant of the gun with "air cartridge" invented by Paul Gifford in 1872.

The modern target arms and the Crossman innovations use liquefied carbon dioxide in steel containers of the type supplied for charging soda-water bottles. Gas guns may be defined as those using a propellant other than compressed air, or the gases resulting from the burning of gunpowder.

CHAPTER 13

LEISURE AND SPORTING GUNS

In terms of general develoment the really striking thing is that small arms have fundamently changed so little over the last eighthy years. It is only in style that there is really any difference. Military or leisure pistols like any other small arms became progressively smaller, lighter and more sleek in appearance, but basically functioning mechanically the same.

However, modern guns are also less likely to rust and their plastic components (because of their properties) when chosen for particular applications in the gun are less likely to break. In the field of leisure guns, developments have tended towards the esoteric and convenient. Arms of convience as a concept was always a novel idea. For example, weapons have occasionally been concealed in everyday objects such as walking sticks (Figure 27). Most gun enthusiasts, find small miniature arms like this fascinating and still continue to be popular.

The high powered pistol with telescopic sights, has been one of the most extreme developments undertaken in recent years by the Americans.

The Remington Rifle Cane.

JUST THE THING FOR TAXIDERMISTS.

No. 1 Cane weighs 16 oz. No. 2, 24 oz.

Protection against Dogs and Highwaymen.

Uses these Cartridges.

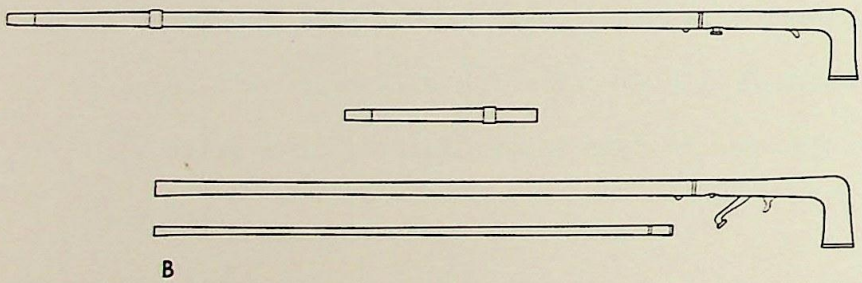
No. 2, or 32-100. No. 1, or 22.

Can be used with Shot as well as Ball Cartridges.

PRICE LIST.

Rifle Canes	$10 00 each.
" Ivory Head	15 00 "
Cartridges, No. 1	6 00 per M.
" " 2, Short	12 00 "
Shot Cartridges, No. 1	12 00 "
" " 2	17 00 "

A



B

A An advertisement for the Remingt Rifle Cane, which appeared in *Georg W. Hawes' Ohio State Gazetteer and Business Directory for 1859 and 186(* Reproduced from the Bella C. Landa Collection by permission of the New York Historical Society.

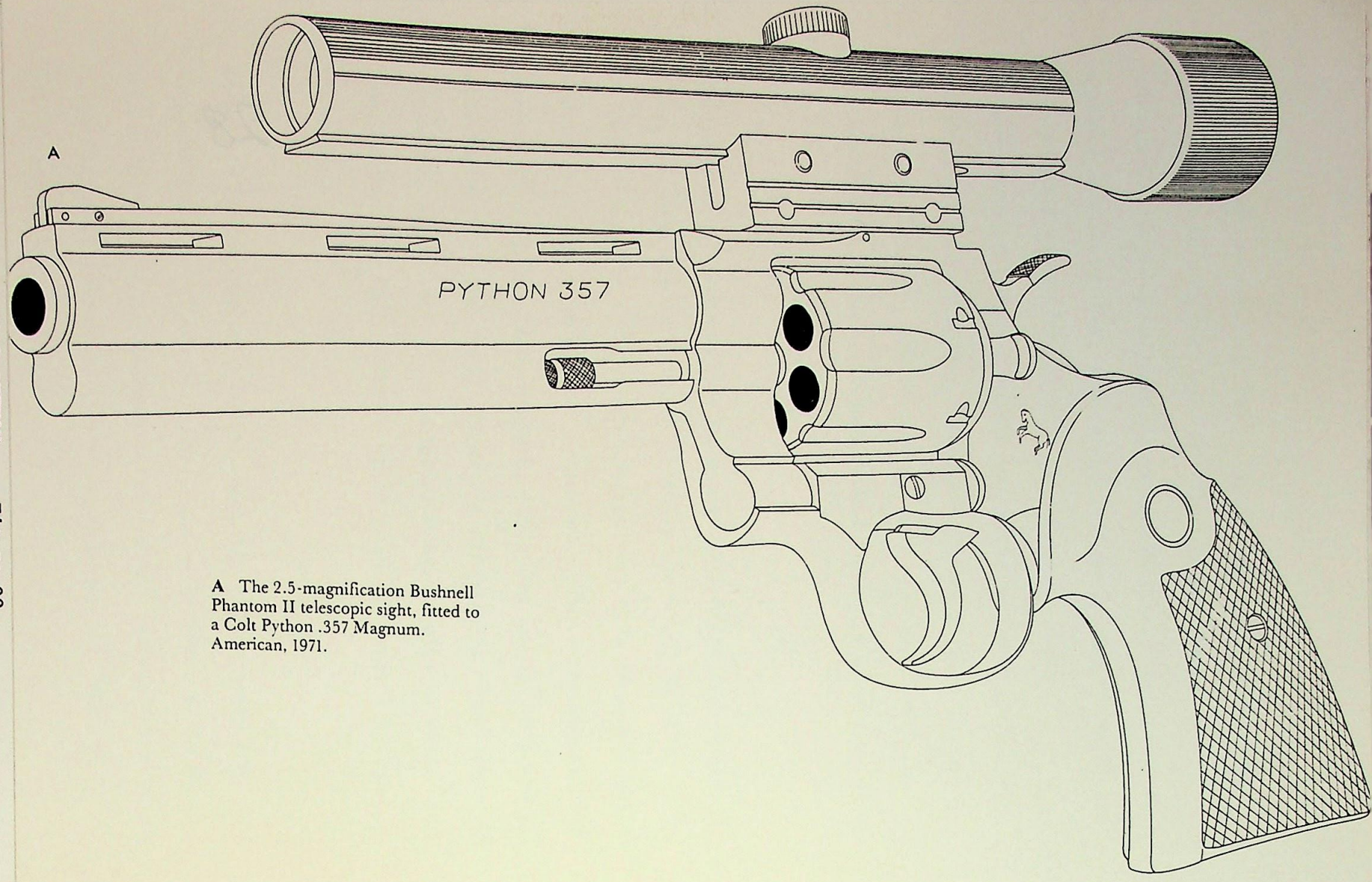
B Day's Patent Cane, a disguised gu invented by John Day of Devon, England, in 1823. A percussion lock trigger are hidden near the handle, which has a silver ring dated 1859. A ramrod was carried in the barrel, which was sealed by a tompion when gun was used as a walking stick.

"WALKING STICKS" - Figure 27

The Colt Python (Figure 28) seen fitted with A 2.5 magnification Bushnell Phantom II telescopic sight, is an average example. Like ordinary sights, these telescopic sights need careful handling to avoid accidental knocking of the sights out of adjustments. However, it is a very popular form of shooting for the American sportsman, and is a spinoff from the endless quest to achieve accuracy in the field of leisure arms. Another popular aspect to the sport has been the increasing number of people who are handloading their own ammunition. This involves making bullets by hand.

Charges of powder can be accurately measured out, to a tenth of a grain which is often more precise than the factory made product. It can also work out a lot cheaper. The whole operation can easily be carried out at home, with the use of a small press, to pull the cartridges together. With a little bit of care during assembly, home loaded ammunition can actually be more accurate than the commercial product. This form of ammunition can also provide the enthusiast with another interesting facet to his hobby.

Generally today, lesiure arms are good business for the people involved in selling guns. There is a growing nostalgia for guns of the past, amongst enthusiasts the world over. The demand for these type of weapons is immense. The production of facsimile



A The 2.5-magnification Bushnell Phantom II telescopic sight, fitted to a Colt Python .357 Magnum. American, 1971.

COLT PYTHON - Figure 28

military arms and ammunition is increasing though most people prefer to shoot original arms if they can get them. The ammunition for original weapons is unavailable. The price of antique guns have risen fast with the demand, that it would cost five hundred pounds to purchase an 1850 rigle musket. Nevertheless an original musket may not even have a good enough barrell, to shoot properly. However, a good replica is much cheaper to purchase, and will shoot very well and there are certainly enough able craftsmen around to make good copies of old guns.

The value of all the replica guns purchased today in Britain alone, exceeds the total value of money spent on all other leisure arms. The only shotguns being very fine shotguns, which are produced and continue in popularity. From a few specialised gunmasters in Birmingham, England, rifle muskets are exported all over the world. The United States is the biggest market which is surprising since they are a large producer of arms as well. In America there is also, another elite group of expensive arms produced.

These are commemorative weapons, which are finely made, and finished examples of classic guns. Again, however, it is worth noting that collecting commemorative weapons, encorporates fairly large financial commitments, but people enjoy the "art" of collecting such prized items.

CHAPTER 14

MODERN GUNS

In the context of a combat situation "survival to a soldier" is of paramount importance. The reliability of his gun may make all the difference. Modern special purpose arms have been developed, which will float in water, and will not easily corrode. These types of arms mark a point in specialisation where leisure arms duplicate military needs. For example, the crashed pilot or shipwrecked sailor, whether civilian or military, requires a gun which is robust and reliable. During such circumstances the gun must be designed to meet the conditions which are most likely to be encountered.

In the new generation of survival arms, which are constantly being developed, the parts are usually stored in each other. For example, the barrel and action are usually protected from corrosion, simply by the way they can be stored in a butt, adding to the convenience as a small weapon. Arms like this which dismantel are nothing new, neither is the ideas of using the butt as a "container" for the remaining parts of the weapon. Yet the combination of concepts to improve reliability breaks new ground

in survival weapons. Modern materials have been incorporated (over the last fifty years) into arms manufacture very successfully. Light alloys and impervious plastic mouldings have made a real proporition not only the survival type of arms, but all types of weapons.

Early arms were not always highly regarded by thier operators who often found themselves in the position that their weapon would let them down. The arms of modern times, on the other hand are proven to be reliable in most situations of normal use which may occur during operation. In a military aspect, the dominant development of the past hundred years has been the adoption of smaller and smaller calibers of bullets. Making each round lighter means that the soldier can carry the same weight of ammunition but with continuing developments in fact he had more bullets, and therefore his firepower increased.

Old high powered cartridges have a reduced calibre, of only .22. The weight, however, saved in the small bullet is more than lost in the massive case, which is needed to house the large powder change. This was in fact an attempt, to keep up long range performance but at a price.

The smaller calibre gun may have been lighter but not the weight of the ammunition. In the modern military rifle the calibre is

more often reduced to 5.56mm. THis is smaller than the .22, but the entire cartridge was scaled down and the soldier could benefit either from a reduction in his overall burden or from an increase in his total fire-power. However, there was a price to pay - a loss in long range accuracy, which was becoming more and more important in conventional military operations, especially dealing with snipers.

Very costly and sophisticated sights are a modern feature on military arms. These sights can cost at least £2,000 and can confer on the operator virtually an ability to see and shoot by night without extra illumination.

Such sights on a weapon can magnify up to four times, and can have an image intensification up to 100,000 times. With such sights which are issued to snipers in the British army, they are probably better equipped for night fighting than any likely enemy.

Arms designed specifically for military purposes, unlike the arms used in leisure sports, do not hold aesthetic appeal hgh on the list of priorities.

Instead a major consideration is the ease and cheapness of manufacture, the durability and simplicity of the design and the simplicity of repair.

The use of wood has been a casualty in the process of gun manufcture. Wooden butts are fast becoming a thing of the past on modern weapons.

In place of wood, black plastic injection mouldings are now used. However, no matter what the advantages, plastic, is distinctly lacking in the surface texture of wood. As much as possible of the metal action and main body of the military arm, is now produced by pressing.

Precise fitting is now mainly only found where precision is essential for the proper functioning of the mechanism. Due to this consideration modern military arms have been manufactured in this fashion and it explains how the shapes of modern guns are arrived at. The Scorpion (Figure 29) is a typical example of a neat, compact and durable design. It is produced by the Czechoslovakians for their army, and it can be carried in a holster or be used one handed like a pistol.

The overfast rate of fire caused by the very light bolt is compensated for by an inertia mechanicm in the pistol grip. The whole gun is only 26cm long.

THE SCORPION - Figure 29

CHAPTER 15

SPEARHEAD OF TECHNOLOGY

Nowhere is the severe criteria of technological standards more apparent in military arms manufacture than in the manufacture of the barrel. Entirely gone is the old method of individually cutting the rifling into the barrel. In its place, heavy machinery is used to hammer the rough barrel into shape around a former which is shaped to yield the appropriate pitch and contour of rifling required. A former or Mandril is used which has all the rifling built up on it so that unlike the old method, of cutting, all the grooves are formed in a single hammering operation. As might be expected, the hammering of the barrel elongates it to the required length simultaneously. The smaller components are often made by a modern refinement of the "lost-wax" technique. The components are cast in wax and then invested with a series of coatings which dry hard into the wax. The solid wax is now in the shape of the required component with a built up series of coatings on it.

The coating will take on all the exact intricate detail of the solid wax mould. This method of production is very expensive,

but it is necessary to obtain the detail needed on such components. The wax is then melted out and the coating is left, and then baked hard. A fine mould has now been produced into which molten metal will be poured to cast the most minute detail of the required part. The mould must then be broken to get the components out, and the process begins all over again. The newly cast parts are cooled down and then assembled onto the gun with a minimal amount of finish. A complete weapon is assembled and "benchfired". This is a method of testing the weapon while it is still in the workshop to find any faults. This is done by mounting the weapon in a clamp and firing it into and old box filled with sawdust. After the weapon is fired it is carefully inspected by a craftsman to seek out faults. The barrel especially is examined for flaws, simply by looking up it at the shadow cast by a bar, and rotating it slowly. If all is well with the gun, the proof marks are hammered onto the barrel.

CONCLUSION

Today pistols in military context are generally only carried by officers. The main weapon for the soldier is a small lightweight automatic "weapon". Pistols though, are still very popular to the sporting enthusiast. So in this light, the "rifle" of the near future will be lightweight, and will suit any build of man. No space on the weapon will be wasted and the magazine will sit just behind the trigger. Much of the action will probably reach back into the butt while extensive use of "punched" stampings will be prominant. Plastics will also be incorporated to a greater extent than they are at present to reduce weight. However, traditional steels will be used in the parts such as the barrel because real durability will always be requried. It will have an optional automatic fire, or a single shot. Short range limitation will eliminate the need for a tall backsite, and this will make straight stocking (almost linear in shape) fully practical.

Its barrel will be long enough for good short range accuracy, and its calibre at around 4.85mm small enough to make cartridges as light as possible. With this particular layout of components the gun will probably end up with a very straight line. This means that the gun can be pointed at the target accurately and a quick

shot can be fired. However, the form of the handgun or rifle or the future is anyone's guess. It could have a miniturised radar set or personnel lazar. But whatever form the soldier's weapon takes in the future there are those people for whom the gun will always be a fine combination of polished walnut and blued steel.

BIBLIOGRAPHY

"Weapons through the Ages", William Reid
Published : Perrage Books, London, 1984

"Guns in Colour", Logan Thompson
Published : Octopus Books

"Small Arms and Cannons", C J Marchant
Publsihed : Brassays, Oxford,

"Modern Gun Values", Jack Lewis
Published : D.B.I. Books, 1978

"Exploded Firearms Drawings", Harold Murtz
Published : D.B.I. Books, 1977

"Military Smallarms of the 20th Century", Ian Hogg
Published : Arms and Armour Press, London, 1973

"Small Arms of the World", W H B Smith
Published : Arms and Armour Press, London, 1973

"Modern Small Arms", Frederick Myatt
Published : Salamander Books, London, 1978

"Firearms History", Edward Ezell
Published : Arms and Armour Press, London, 1978

"Firearms - Maintenance and Repair", J B Wood

"Gun and Rifles of the World", Howard Blackmore

"The Book of the Gun", Harold Peterson
Published : Arms and Armour Press, London, 1976

"Pistols of the World", Ian Hogg and John Weeks

"The Gun Digest", 33rd Edition, 1979
Automatic Pistols, Part One

"Automatic Pistols", Part One

"European Weapons and Armour", Ewart Oakeshott

"Pistols of the World", Blair Glaude

"English Pistols and Revolvers", John Nigel

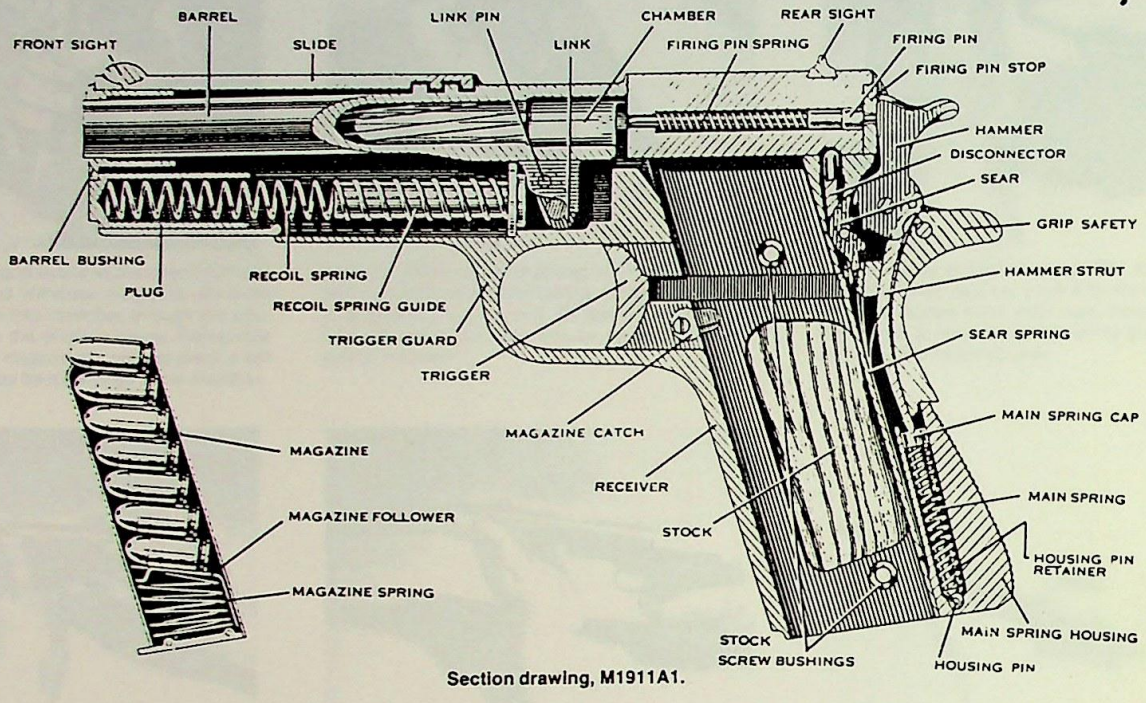
"The Gun and its Development", W W Greener
Published : Arms and Armour Press, London, 1972

"Firearms Encyclopedia", George C Norite
Published : Wolfe, London, 1973

"Guns Review", Volume 25, Number 12

"Handguns of the World", Edward Ezell

REFERENCES



Section drawing, M1911A1.

Field Stripping the M1911A1 Pistol

While no stripping beyond that illustrated is ever necessary to clean and properly care for this pistol, the following instructions will be helpful to those who wish to master every detail.

To Remove Safety Lock. (1) Cock hammer. (2) Grasp thumbpiece of safety lock between thumb and index finger, pull steadily outward and at same time move back and forth.

To Remove Hammer. (1) Lower hammer—do not snap it. (2) Use safety lock to push out hammer pin, removing from left side. (3) Lift out hammer and hammer strut.

To Remove Mainspring Housing. (1) Using hammer strut, push mainspring housing pin out from right side of receiver. (2) Slide housing and its contained spring down out of its guides. (3) Push in on mainspring cap; at the same time push out mainspring cap pin.

To Remove Sear and Disconnector. Using hammer strut, push out sear pin from left side of receiver and remove sear and disconnector.

To Remove Magazine Catch. Press in checkered left end to permit turning catch lock a quarter turn to left out of its seat in receiver, using long leaf of sear spring. Catch, its lock and spring may now be removed. Be careful not to let spring jump away when released.

To Remove Trigger. Pull straight to the rear.

To Remove Slide Stop Plunger, Safety Lock Plunger and Plunger Spring. Draw straight to rear.

Notes on Assembling

Barrel link must be tilted forward and link pin properly in place before it will slide into place in the slide.

Put sear and disconnector together, hold by their lower ends, place them in the receiver, and replace sear pin.

Sear spring should be replaced after sear and disconnector are in place, care being taken that lower end is in its place in the cut in the receiver; upper end of left-hand leaf resting on sear.

Insert mainspring housing until lower end projects about one-eighth inch below frame. Then (1) Replace hammer and pin; (2) Grip safety; (3) Cock hammer and replace safety lock; (4) Lower hammer and push mainspring housing home, and insert pin.

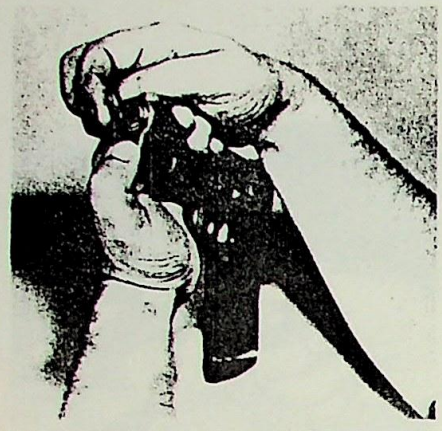
Cock hammer. Insert end of magazine follower to press safety lock plunger home.

When inserting slide stop, make sure that its upper rear end stops on the receiver just below the small slide stop plunger. Then push stop upward and inward with the one motion. This will enable the upper round part of the stop to push the plunger back and let the stop snap into place.

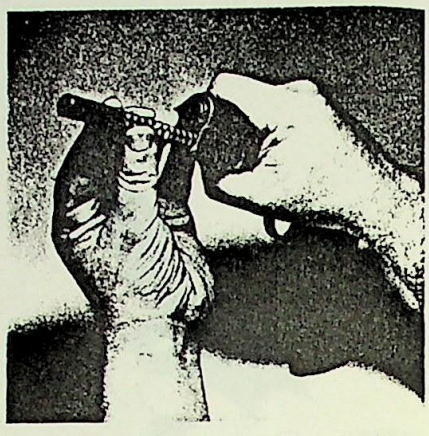
In replacing sear and disconnector, hold the receiver as when firing, then tilt front end down. Insert the sear and the disconnector using the trigger bar as a guide to align the holes in these two parts with the receiver holes. Slight pressure may be applied on the trigger until the holes are properly lined up. When replacing the mainspring housing, it is important that the rear end of the hammer strut be in its place in the mainspring cap.

Field Stripping the M1911A1 Pistol

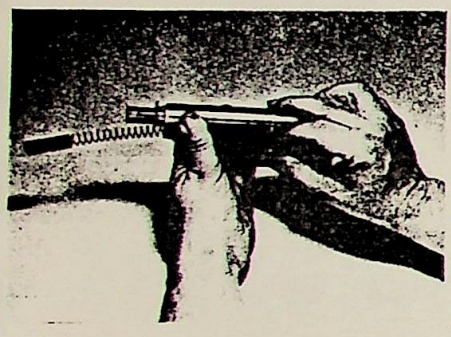
Remove magazine and examine chamber: (1) Press magazine catch and withdraw magazine. (2) Draw back slide and look into chamber through the ejection port to be sure the pistol is empty. Remember that even when the magazine is out, the pistol is still dangerous: there may be a cartridge in the chamber.



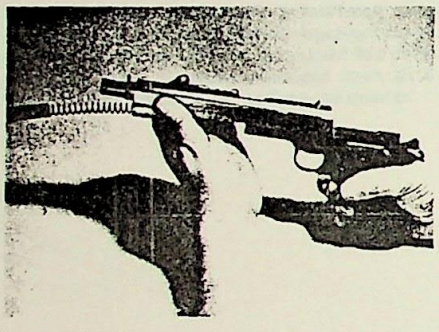
Release tension of recoil spring: (1) Press in on plug which covers end of recoil spring, using thumb or butt of magazine if it is too stiff. (2) Barrel bushing, freed from spring tension, may now be turned to the right side of the pistol.



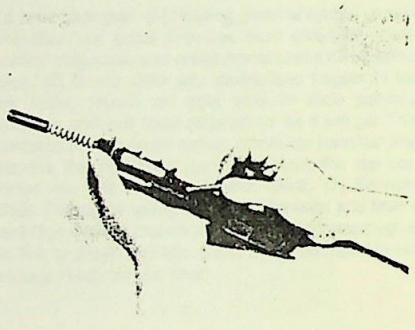
Ease out plug and recoil spring: The spring is very powerful. Take care not to let it fly out of the pistol. Do not withdraw these parts from the pistol yet, as they serve to keep the recoil spring guide in place and make the next step easy.



Remove slide stop. (1) Push slide back until the rear edge of the smaller recess in the lower edge of the slide is even with the rear end of the slide stop. (2) Now press from the right side against the protruding pin which is part of the slide stop. This pin passes through the right side of the receiver, then through the barrel link which holds the barrel, then through the left side of the receiver. (3) Now pull slide stop out from left side of pistol.



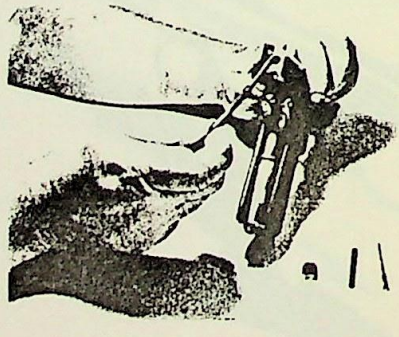
Remove slide and components: Pull slide forward on its guides in the receiver and remove. With the slide will come the barrel, barrel link, barrel bushing, recoil spring and recoil spring guide.



Remove recoil spring guide: (1) The recoil spring guide (on which the recoil spring compresses) may now be lifted out to the rear. (2) The recoil spring and plug are pulled out from the front. (3) The barrel bushing is turned to the left which unlocks it so it can be withdrawn.

emove barrel: Turn barrel link forward on its pin and ithdraw barrel assembly from the front of the slide. ote: Normally no further stripping of this pistol is re- ired.

To remove firing pin: (1) Should it be necessary, the firing pin may be easily removed by pressing the pin in against the tension of its spring, at the same time pushing down on the firing pin stop which holds the firing pin in place. This may be done with a nail, match or similar object. (2) Slide the stop down out of its grooves and ease out the firing pin and spring.

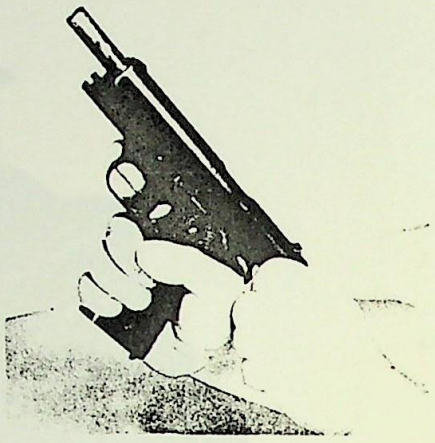


To remove extractor: When the firing pin has been removed the extractor, which is a long piece of spring steel inserted in a hole to the left of the firing pin, may be pried up and pulled out to the rear as illustrated.

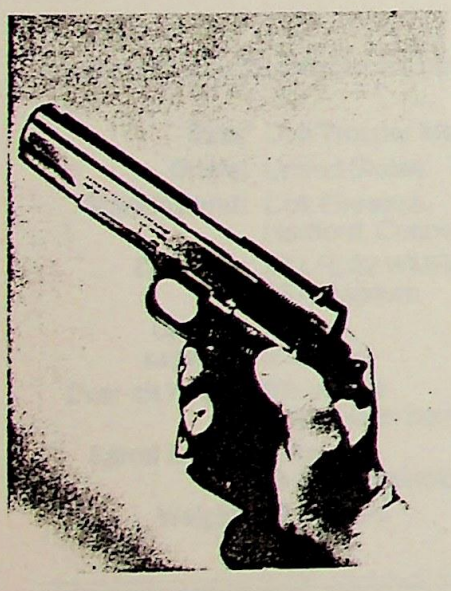
Instructions for Loading and Firing the M1911A1 Pistol

To remove magazine: Press magazine catch (button). Magazine will normally be ejected and should be caught with left hand. If spring is weak, it may come only part way; withdraw it from handle.

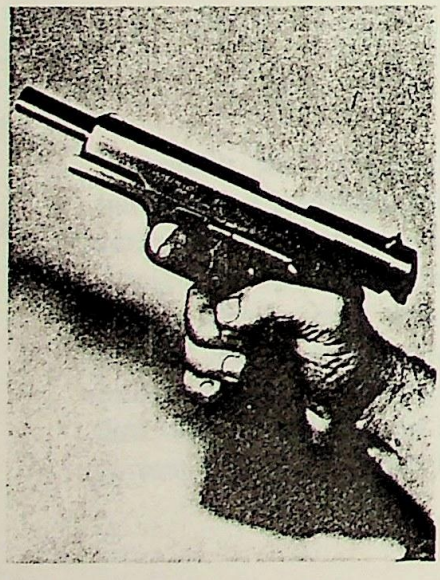
Load magazine: Holding firmly in left hand, press cartridge down in forward end of magazine follower (platform) and slide in under the curved lips of the magazine. Press following cartridges down as illustrated. Any number from 1 to 7 may be inserted.



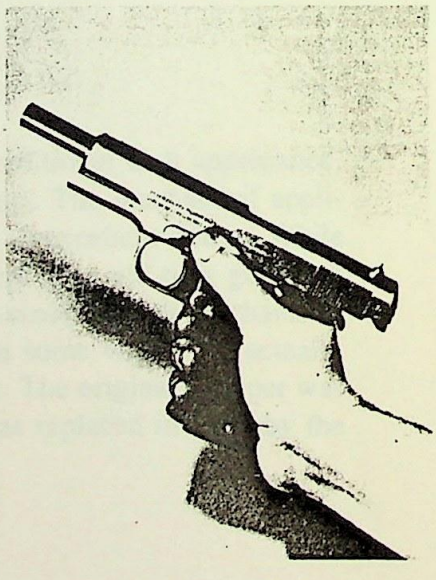
To load chamber: (1) Holding pistol at height of right shoulder and pistol 6 inches from shoulder, insert loaded magazine and press home until it locks with a click. (2) Grasp slide with thumb and fingers of the left hand, thumb on right side of slide pointing upwards and pull back slide as far as it will go. This compresses the recoil spring, cocks the hammer and permits the magazine spring to push the top cartridge into line with the breech block. (3) Release slide. The recoil spring will drive it forward and feed a cartridge into the chamber; barrel will be forced up on its link and will lock into slide; firing mechanism will engage ready for first shot.



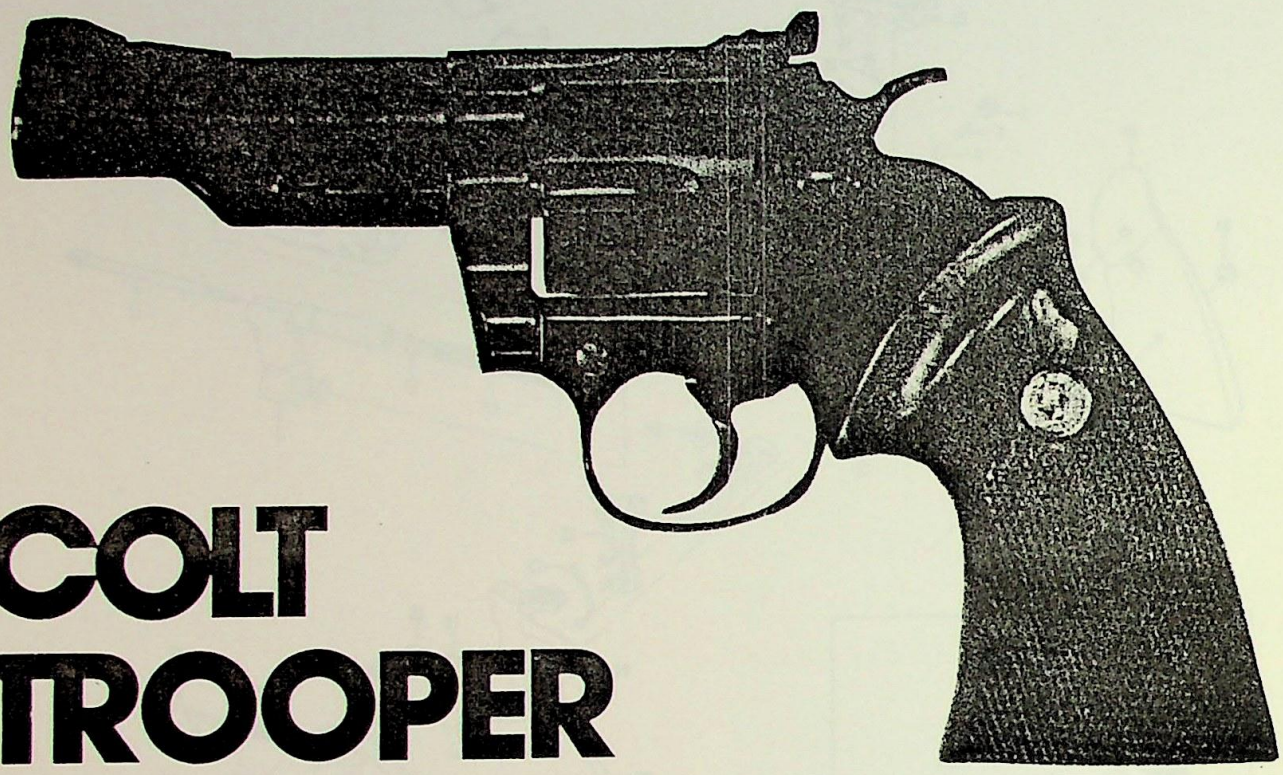
To engage thumb safety: Unless pistol is to be fired at once, always push safety lock up into place as soon as chamber is loaded. A stud on the inner face of the thumb safety locks the hammer and sear when the safety is pushed up into the slide. It can be released by simply pushing down on the thumbpiece.



Slide stop: When the last shot has been fired, a section of the front end of the magazine follower, pushed up by the magazine spring, presses against the underside of the slide stop. This forces the stop up into a niche cut in the slide and holds the slide open as an indication that the pistol is empty.



Reloading from open slide: (1) Press magazine catch and extract empty magazine. (2) Insert loaded magazine. (3) Push down on slide stop with right thumb. This will release the slide to drive forward and load the chamber. Note: Slide stop cannot be released while an empty magazine is in the pistol. Slide will go forward only on a loaded magazine or when the magazine has been pulled part way out.

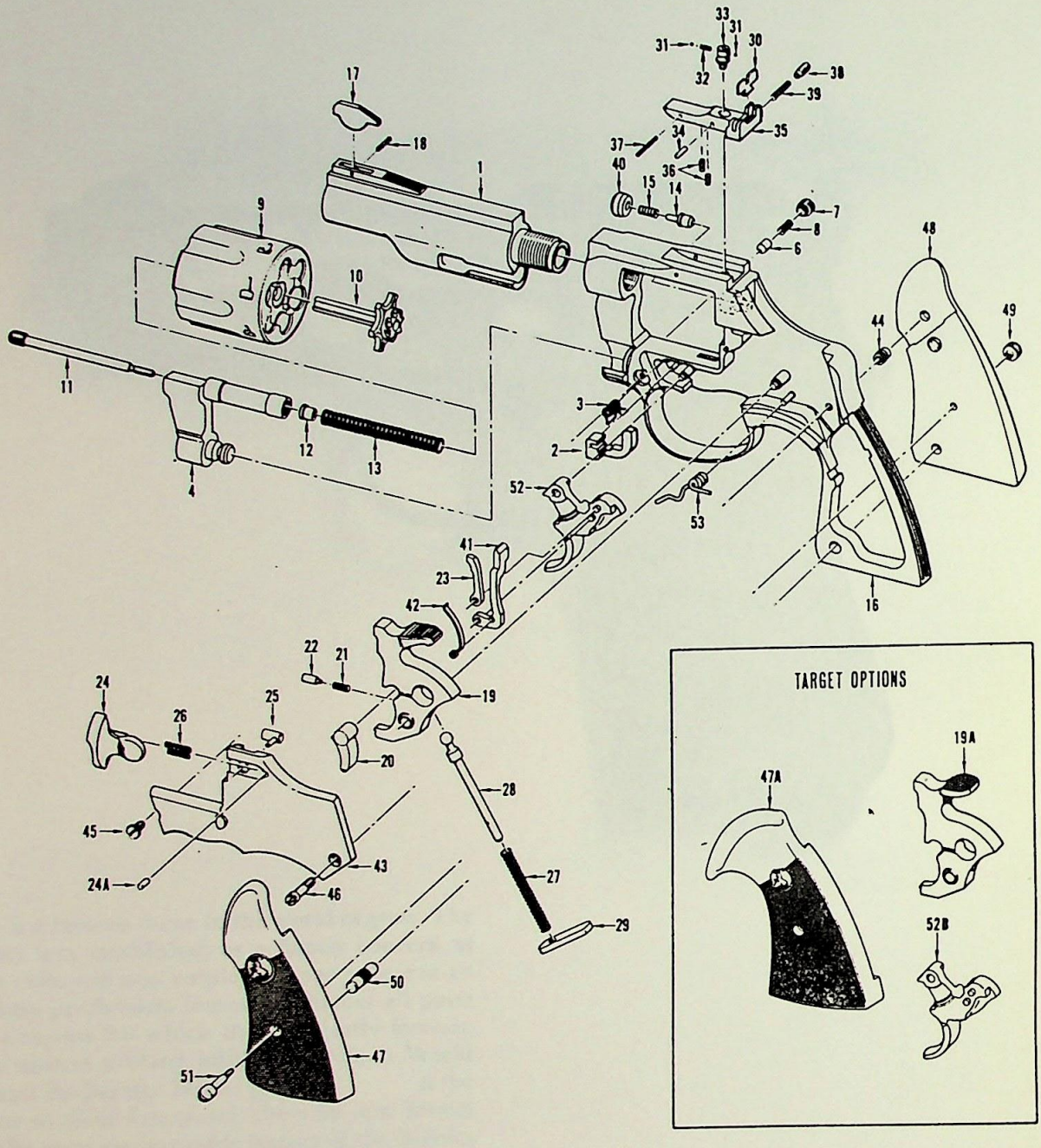


COLT TROOPER

Data:	Colt Trooper Mark III
Origin:	United States
Manufacturer:	Colt Firearms, Hartford, Connecticut
Cartridge:	22 LR, 22 WMR 357 Magnum
Cylinder capacity:	6 rounds
Over-all length:	9½ inches (with 4-inch barrel)
Barrel length:	4 inches (6-inch available)
Weight:	39 ounces

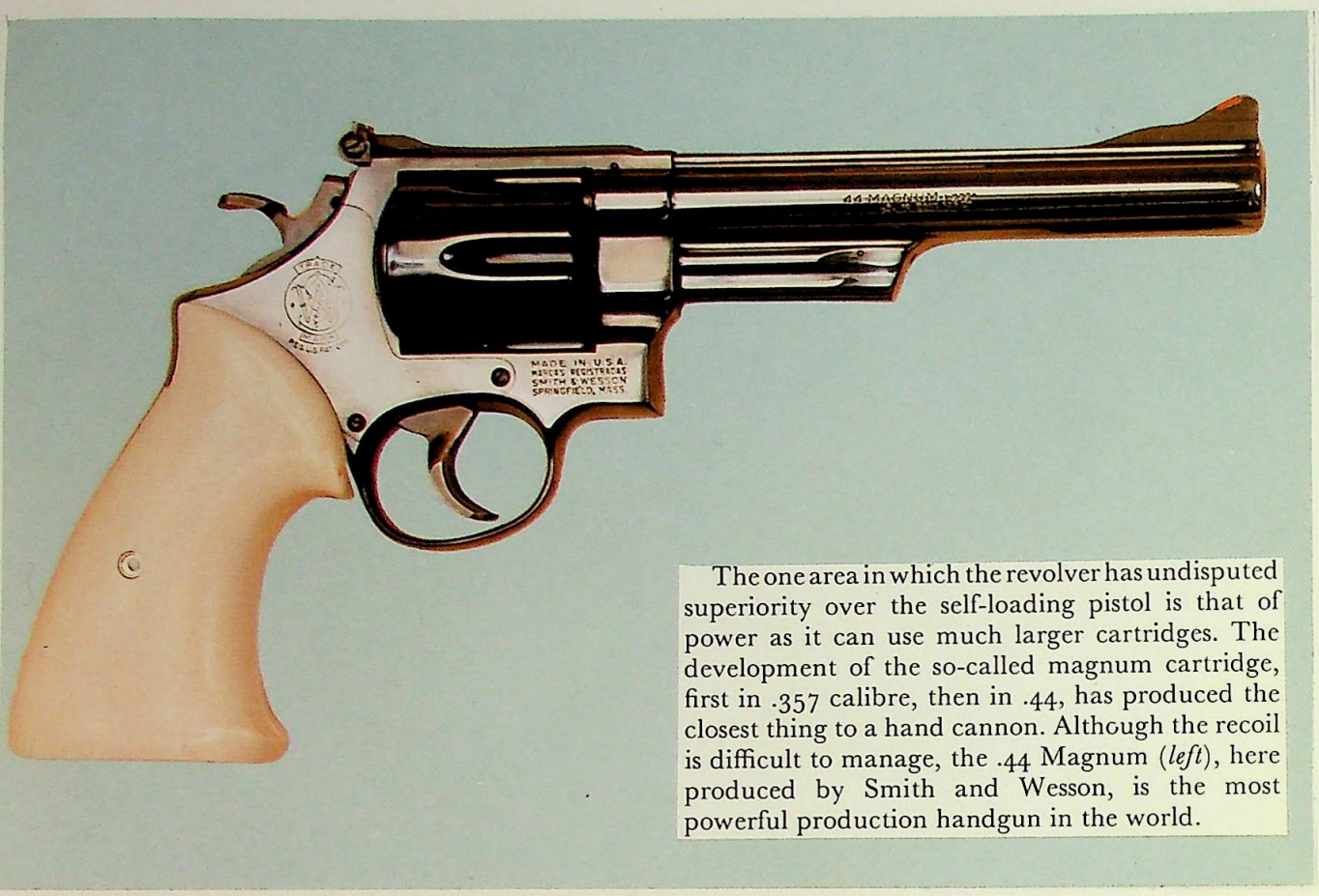
Externally, the Trooper has traditional Colt appearance, but inside it's entirely different. The mechanical application is more modern and it's an excellent design. While it might be temporarily puzzling to an old-time gunsmith who is familiar only with the standard Colt mechanism, it's not really complicated. In some ways, it's actually easier to disassemble or repair. The original Trooper was first offered in 1953 and it was replaced in 1969 by the current version, the Mark III.

Colt
Trooper MK III



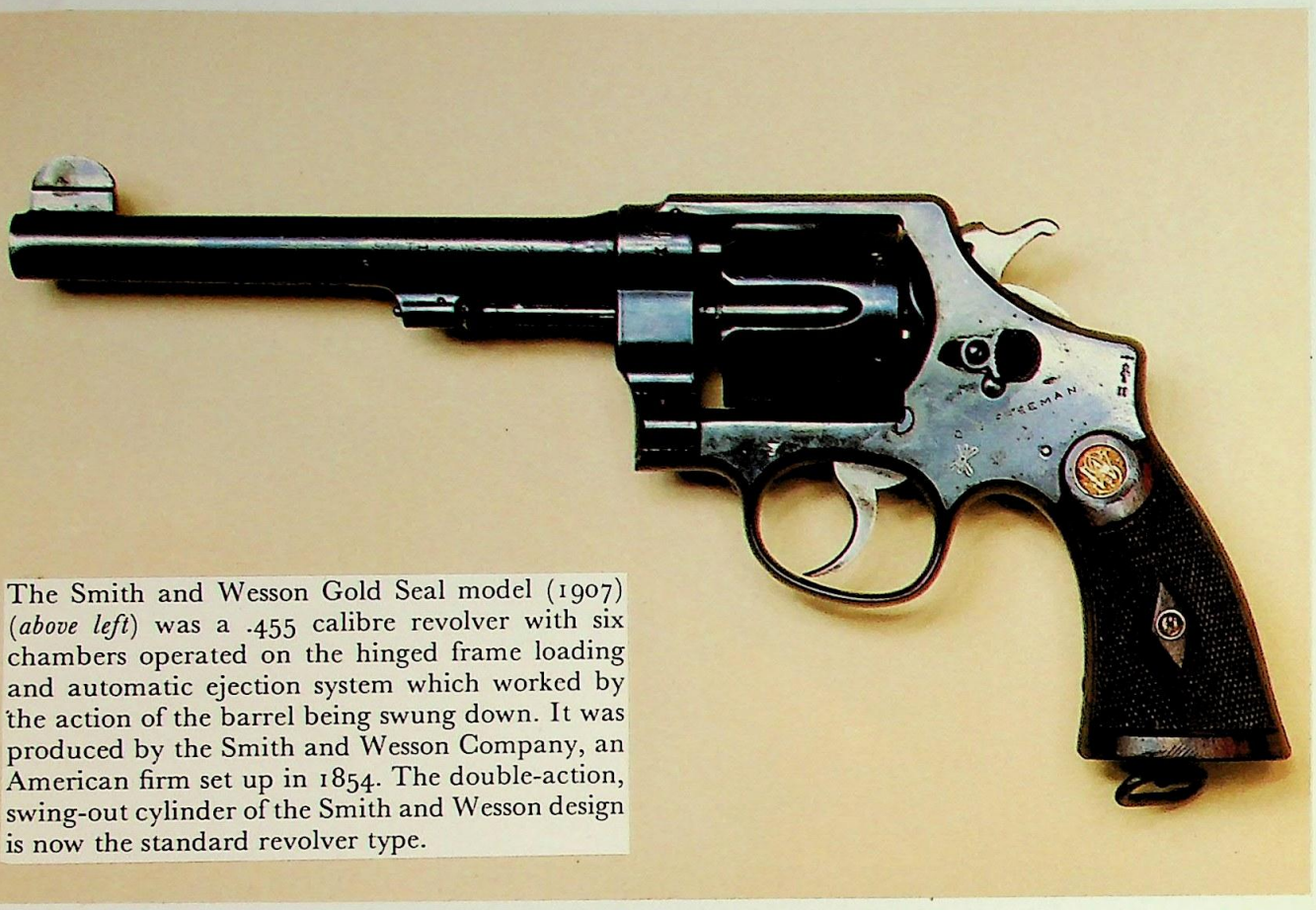
1 Barrel
2 Bolt
3 Bolt Spring
4 Crane Assembly
6 Crane Lock Detent
7 Crane Lock Screw
8 Crane Lock Spring
9 Cylinder
10 Ejector Ratchet and Stem
11 Ejector Rod
12 Ejector Rod Bushing
13 Ejector Spring
14 Firing Pin
15 Firing Pin Spring
16 Frame
17 Front Sight Blade
18 Front Sight Blade Pin
19 Hammer—Service
19a Hammer—Target
20 Hammer Strut
21 Hammer Strut Spring
22 Hammer Strut Spring Guide
23 Hand
24 Latch
24a Latch Insert
25 Latch Pin Assembly
26 Latch Spring
27 Main Spring
28 Main Spring Guide
29 Main Spring Seat
30 Rear Sight Blade
31 Rear Sight Detent Balls (2)
32 Rear Sight Detent Spring
33 Rear Sight Elevating Screw
34 Rear Sight Elevating Screw Pin
35 Rear Sight Leaf
36 Rear Sight Leaf Elevating Springs (2)
37 Rear Sight Leaf Pin
38 Rear Sight Windage Screw
39 Rear Sight Windage Spring
40 Recoil Plate
41 Safety Connector
42 Safety Connector and Hand Spring
43 Side Plate
44 Side Plate Nut
45 Side Plate Screw
46 Side Plate and Stock Screw
47 Stock—Service—Left Hand
47a Stock—Target—Left Hand
48 Stock—Service—Right Hand
49 Stock Nut
50 Stock Pin
51 Stock Screw
52 Trigger—Service—Serrated
52a Trigger—Service—Smooth
53 Trigger Return Spring

Beretta is a famous name in the world of guns. The company was established as a family concern as early as 1680 and now employs 16,000 people in an up-to-date production line which makes all parts of the weapons for which they are justly famous. Beretta started making military pistols in World War I and the Beretta Model 34 pistol is the successor to their first pistol, the 7.62 mm Model 1915. The most recognizable feature of the Beretta type is the exposed portion of the barrel between the slide nose and the breech. The cartridge for the Beretta M34 is the 9 mm short, and the pistol had a simple blowback action with an exposed hammer. The 7-round box magazine fed a rate of fire of 20 rounds per minute. One disadvantage was that the sights could easily be moved and become misaligned, thus causing inaccuracy.



The one area in which the revolver has undisputed superiority over the self-loading pistol is that of power as it can use much larger cartridges. The development of the so-called magnum cartridge, first in .357 calibre, then in .44, has produced the closest thing to a hand cannon. Although the recoil is difficult to manage, the .44 Magnum (*left*), here produced by Smith and Wesson, is the most powerful production handgun in the world.

The 7.62 mm Russian pistol (*above left*) was designed by F. V. Tokarev and produced from 1930. This was a modified version of the Browning design and the weapon's mechanism is basically the same though the Russians incorporated improvements which simplified maintenance. The cartridge chosen for the pistol was the 7.62 mm Tokarev, which was a copy of the 7.63 mm Mauser but with a higher propellant charge. Firing, therefore, is often accompanied by flames from the muzzle. It had an eight-round magazine and was used by the Russians during World War II.



The Smith and Wesson Gold Seal model (1907) (*above left*) was a .455 calibre revolver with six chambers operated on the hinged frame loading and automatic ejection system which worked by the action of the barrel being swung down. It was produced by the Smith and Wesson Company, an American firm set up in 1854. The double-action, swing-out cylinder of the Smith and Wesson design is now the standard revolver type.

The Enfield revolver No 2 was produced in two patterns. The Mk 1 .38 calibre (*above*) has both single and double action, while the Mk II is double action only. Both patterns were used by British forces until the mid 1960s when they were superseded by the 9 mm Browning self-loading pistol.