MILITARY ILLUSTRATED

PAST & PRESENT

No. 1
June/July 1986
£1.95

Fosten:
British Orders of Dress, 1890

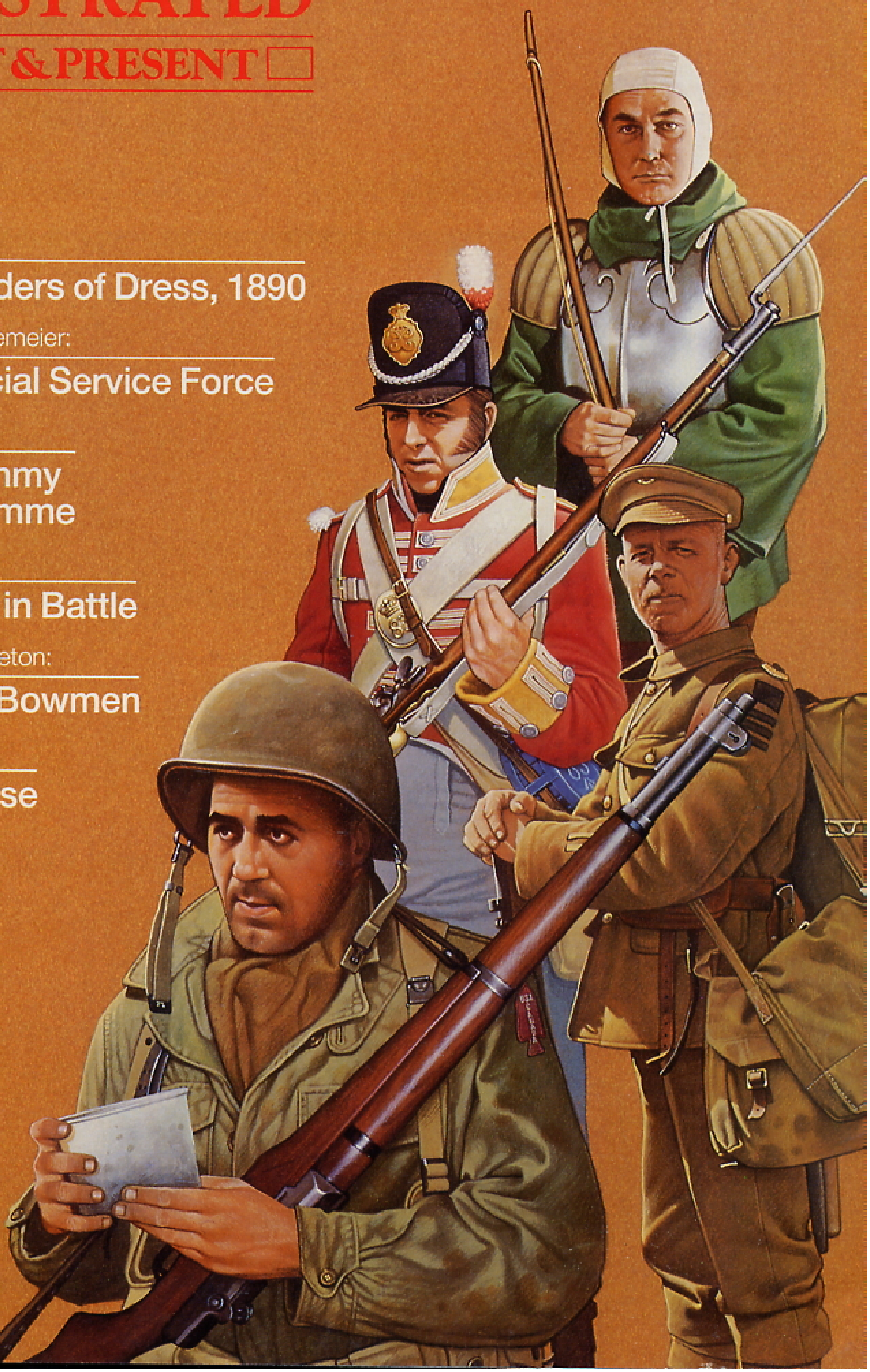
Dawson & Kutemeier:
First Special Service Force

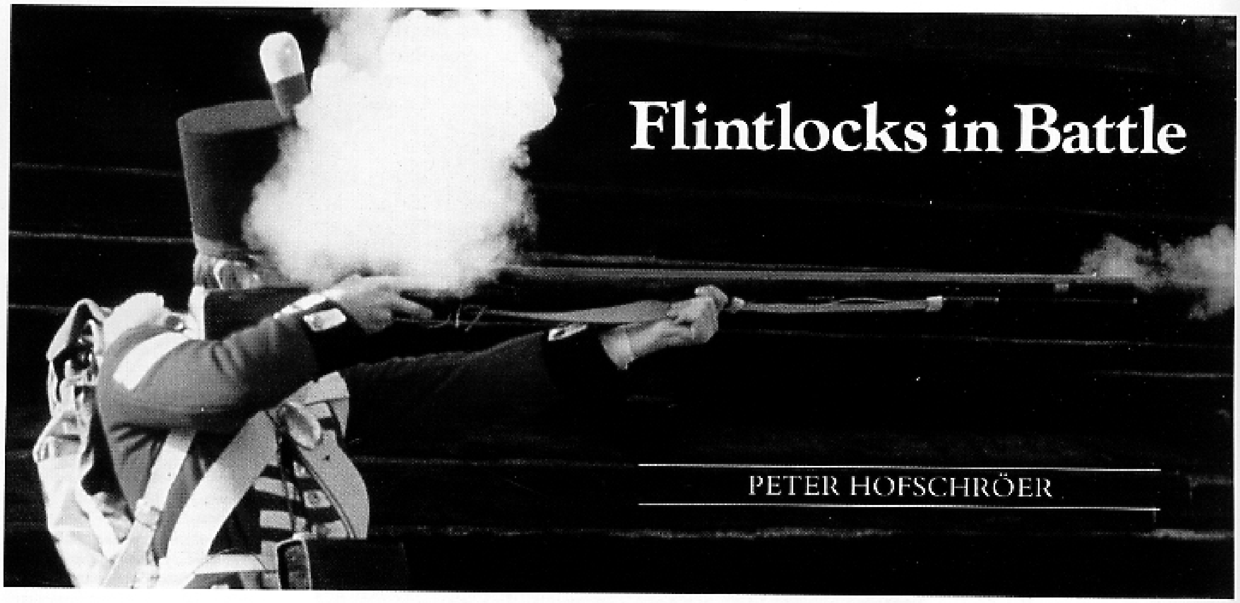
Chappell:
1916: Tommy on the Somme

Hofschröer:
Flintlocks in Battle

Bartlett & Embleton:
Medieval Bowmen

Hook:
Crazy Horse





Flintlocks in Battle

PETER HOFSCHRÖER

A member of the Incorporated Militia of Upper Canada — a unit of the Military Re-enactment Society of Canada – firing a Brown Bess replica. In its various slightly differing patterns, the Brown Bess was the standard infantry arm not only of the British but also of many other European armies during the Napoleonic period, being widely exported as part of Britain's programme of supporting with arms and gold those states which she could not support with expeditionary forces on the ground. Strong, simple, and relatively reliable, it had the advantage of a larger flint than its French Charleville counterparts: about an inch wide, as opposed to about three-quarters of an inch, which gave a better chance of plentiful sparks and quick ignition. Its main weakness was the fixing of the barrel by means of lugs brazed to the barrel and pins through the stock. The pins were harder to remove when cleaning the weapon than were the barrel bands of French muskets, and were easily lost. The lugs were attached to the barrels after boring, and — according to the musketry expert, Col. George Hanger — this process distorted the barrel: ' . . . crooking the barrel in soldering on the loops with hard solder . . . from the barrel being made hot, it draws the barrel also and spoils it; barrels should never be put in the fire after they are bored, and should not be fixed in the stock by means of loops, but with rings, as the foreign arms are.' (Reflections of the Menaced Invasion, *1804.) We are grateful to Richard Feltoe for his striking photograph.*

It is a cliché of historical writing on the period of the Napoleonic Wars that the flintlock musket carried by the Napoleonic infantryman was slow to load, wildly inaccurate, and highly unreliable under campaign conditions. Broadly, there is no arguing with these general criticisms; but the fact remains that armies so equipped won battles, founded glittering reputations, and filled mass graves across half the world during a period of almost continuous campaigning lasting more than 20 years. Clearly, in trained hands and under suitable circumstances, the flintlock musket was as devastating as any weapon in history. It may therefore be valuable to try to look beyond the easy rhetoric; and to examine the rather more vivid picture painted by contemporary quotations, the results of contemporary trials, and the experience of modern 'black powder' enthusiasts with faithful, working replicas of the weapons of that time.

The basic operation of the smooth-bore, muzzle-loading flintlock musket is too well known to justify more than the briefest description here. First seen in the hands of European soldiers late in the 17th century, it had been improved and refined in various ways; but the 1790s found it basically unchanged since its appearance, and near the end of its useful life. It consisted of three main 'assemblies': the lock, stock and barrel. The barrel was an iron tube blocked at the breech end by a screwed-in plug, and bored immediately ahead of the plug with a 'touchhole' up to 4mm across, which connected with the exterior priming pan. The barrel was mounted, by means of lugs and pins or external metal bands, into a wooden stock.

The lock mechanism on the right side of the breech consisted of a sprung 'cock' — a hammer with screw-clamp jaws; the priming pan, a small recessed metal block; and the 'frizzen'. This was a combined striker plate and priming pan cover on a spring pivot. Pulling the trigger dropped the cock, and the flint wedge in its jaws struck the frizzen. This flew upwards and exposed the powder in the pan, at the same instant that sparks from the impact of flint and frizzen fell into the pan. The priming flared, and sparks passing through the touchhole set off the main charge rammed into the breech end of the barrel.

There were few significant differences between the muskets used by the various armies. Overall length varied between about 4 ft. 8 in. and 5 ft. 1 in.; overall weight between about 10.3 lb. and 11.4 lb.; calibre, between 15mm and 19mm, the majority being between 17mm and 18mm. The cartridge consisted of a spherical lead ball, and a measured charge of black powder, wrapped together in a tube of thick paper. Charges varied between ½ oz. and 1 oz.; ball weight varied across about the same range.

LOADING and FIRING

Although the musket was a relatively simple weapon mechanically, loading and firing it was a complex procedure. To be effective, the firer needed to be a highly practised individual working in rhythm as part of a well-drilled team. Most muskets required some 20 separate actions during the sequence:

(1) The musket was brought down from the

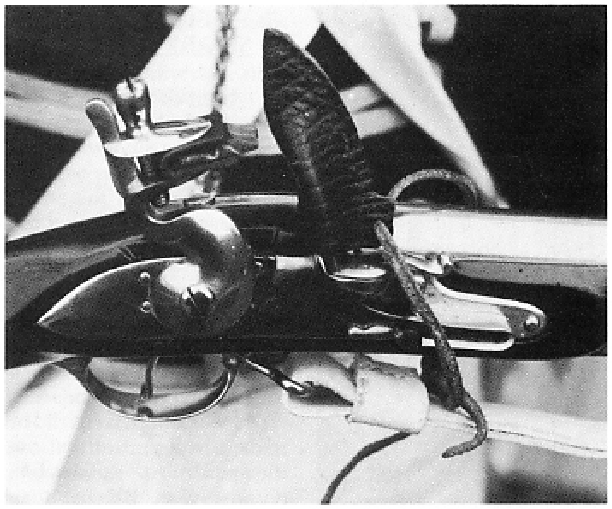
shoulder to a position held across the body. (2) The cock was pulled back to the safety 'half-cock' position. (3) Powder residue and fouling was wiped from the pan with the right thumb; if badly fouled, the pan and touchhole had to be cleared with a 'pricker' and brush. (4) The musket was supported in the left hand while the right hand removed a cartridge from the pouch, usually slung on the right buttock. The pouch had a deep flap of leather, and individual rounds were often kept in holes drilled in a wooden block; fumbling one out could be awkward. (5) The cartridge was lifted to the mouth. (6) The 'non-ball' end of the paper tube was torn off between the teeth. Only now could loading begin.

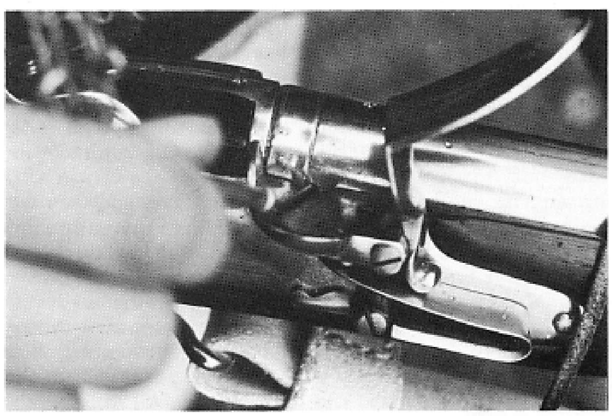
(7) Some powder from the open cartridge was shaken into the open priming pan. (8) The frizzen was closed, to retain the powder. (9) The musket butt was grounded, by the soldier's left foot. (10) The rest of the powder was shaken into the muzzle. If not supervised, men who disliked the 'kick' of the weapon often contrived to scatter a good deal of the powder on the ground at this point.[1] (11) The ball, still in its paper tube, was pressed into the muzzle, the paper acting as a wad for a tight fit. (12) The ramrod was pulled upwards from its 'pipes' or slot under the barrel. (13) When clear of the pipes, it was turned around so that the belled-out end was pointing down. (14) The belled end was placed in the muzzle, and the ball and paper were rammed home, compressing the powder charge. (15) The ramrod was withdrawn, and reversed again. (16) The ramrod was slid back into its pipes. (17) The musket was brought up to the firing position. (18) The cock was pulled fully back. (19) On the order, the trigger was pulled.

The Prussians, so often the military innovators of the 18th century, introduced two important improvements. In 1773 they gave their muskets 'cylindrical' ramrods, which could be used without reversing them as they were pulled from the pipes; and in 1781 they introduced the 'conical' touchhole. This was wider at the barrel end than the pan end; the pan did not have to be primed separately, as powder was forced through the hole when the main charge was rammed home. These simple changes shaved vital seconds off the loading procedure. (Other Prussian improvements included a guard round the pan, which both protected the priming from the wind and prevented injuries from excessive 'flash' from the priming; and a spring-loaded bayonet clip.)

The rate of loading and firing was subject to many variables, and it is difficult to produce any reliable or helpful statistics. A trained man, drilling unhurriedly far from danger, might manage to load in 15 seconds — a few seconds less, with a Prussian musket. (Long trained to high rates of fire, Prussian troops recorded up to an extraordinary *seven* shots a minute even in the first half of the 18th century. In the Napoleonic Wars their best men were reckoned to be about twice as fast as the French, three times as fast as the Austrians.)

Under battle conditions, this rate dropped drastically after a few shots. It should be stressed that contemporary infantry tactics were entirely based upon volley fire. The classic method of 'giving fire' was the rolling volley by sub-units. In this way the enemy could be brought under fire by some part of a unit's line every few seconds. Even ignoring the difficulty of ordering this measured sequence by shouted commands in the din and smoke





Above
The lock of a modern reproduction of the Brown Bess. The hammer is pulled back to 'half-cock' or safety position. Note the leather stall over the frizzen, intended to prevent accidental discharge. The flint wedge is wrapped in a piece of leather; an alternative was lead foil. This protected it from the direct pressure of the screw jaws, which might crack the flint if tightened too fiercely.

Centre
The priming pan is open and empty; the soldier clears his touchhole with the 'pricker' or bodkin, carried on a chain hooked to a buttonhole, together with a small brush.

Left
Having torn off the end of the cartridge with his teeth — a necessary part of weapons drill, which explains why contemporary recruiters inspected would-be enlistees' mouths for sound front teeth and a close bite! — the soldier pours part of the powder charge into the priming pan. At this stage it was very vulnerable to rain and wind.

[1] This did not degrade the practical performance of the weapon as much as one might think. It was calculated that only a proportion of the slow-burning powder was consumed before the ball left the barrel — which would have had to be 45 in. long for complete 'useful burn'.

of battle — described below — it is easy to imagine how one or two men, fumbling their drill in the haste and tension of combat, could quickly destroy the sequence. Apart from human frailty, the characteristics of the musket itself made it almost inevitable that fire became slower and more ragged after only a very few volleys.

MECHANICAL SHORTCOMINGS

Rain and wind could render the 'firelock' useless. With armies often marching and sleeping in wet weather, paper cartridges could become damp in the pouch. Powder poured into wet pans and barrels would become an inert paste. Men covered their locks and muzzles with oilcloth or rags when out of battle; but as soon as they were uncovered, rain easily found its way into the smallest gap — and frizzens did not make a waterproof seal over the pans. At Katzbach in August 1813 Blücher's and MacDonald's troops fought a vicious battle largely with bayonets and clubbed butts in torrential rain which made firing impossible. Colour Sgt. Calladine, 19th Foot, recalled losing comrades in a skirmish in Ceylon in 1818: '. . . the day being very wet, their firelocks would seldom go off . . . not one piece in ten would go off.' (One is reminded of the wry 18th-century German proverb: '*Alle Kunst ist umsonst, Wenn ein Engel in das Zündloch prunst*' — 'All skill is vain when an angel pisses in your touchhole'.)

Even on dry days a sudden gust of wind could easily blow the priming from the pan before the sparks could ignite it. The author has often had his face covered by showers of such unburnt powder while taking part in Napoleonic re-enactments.

The flint itself might function only sporadically. A chancy material, it often has hidden flaws. A gunflint might shatter at the first shot, sending sharp splinters flying. It might send sparks everywhere but into the pan. It might refuse to spark for a few shots, and then start working again. It might fall out of the jaws of the cock for no apparent reason. Even the best flint starts to wear away quickly, its forward edge becoming saw-toothed; it often needs replacing every 20 or 30 shots, a chore which takes up to half a minute.

Even in ideal conditions, a misfire rate of 15% was not unusual; in battle that figure could rise as high as 100% on occasion. The risk of misfire became higher with each shot fired. Burnt gunpowder produces a very thick fouling in the pan, the touchhole and the barrel. As a battle progressed, more and more time had to be spent in clearing the pan and touchhole with brush and pricker. Fouling made it noticeably more difficult to force the ball down the bore after even a few shots.

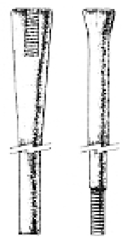
These weaknesses might all be classed as mechanical — as endemic to the weapon itself. As significant were the human difficulties of the man firing it.

BURNS, BRUISES, NOISE and SMOKE

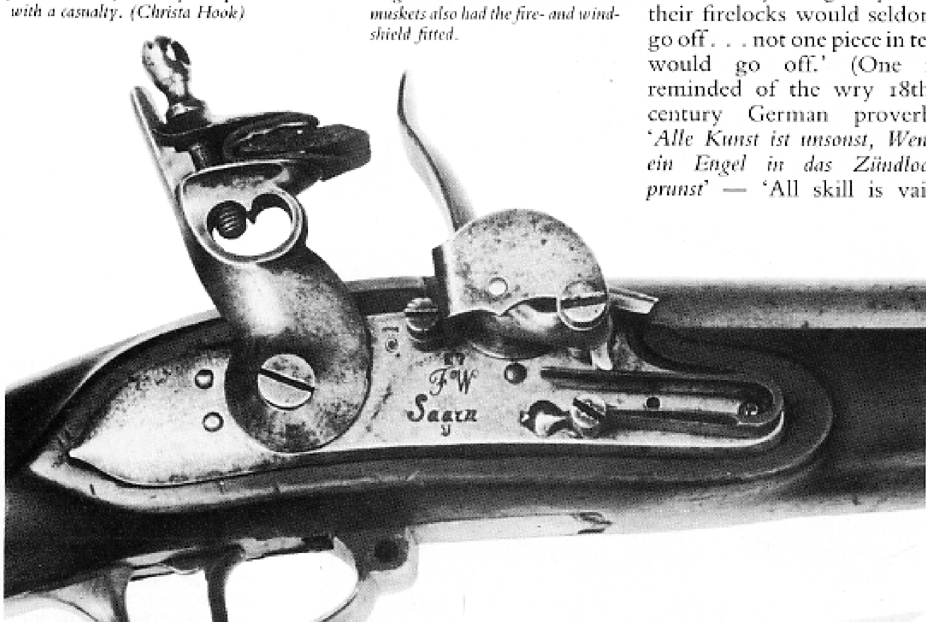
Tired, probably hungry and thirsty, and either chilled or parched depending upon the weather in which he had been marching and bivouacking, the Napoleonic soldier fought for his life with a heavy and unpleasant weapon which must sometimes have seemed as dangerous to him as to his enemy.

The whole battlefield use of the flintlock was based

Right
A modern 're-enactor', dressed as a Royal Artilleryman of the Napoleonic period, withdraws the ramrod from its pipes under the barrel. Note the awkward stretch necessary for this manoeuvre. To reverse the ramrod for use soldiers often rested one end against the cross belts on their chest and slid their right hand down to get a better grip. The advantage of the Prussian 'cylindrical' ramrod was that the bottom end could be inserted straight into the muzzle at this point, without reversing.



Sketches of the Prussian 'cylindrical' ramrod (left) and a conventional 'conical' ramrod. The reason the latter had to be reversed, and the belled end used for ramming, is clear — the other end bore a small screw-tapped section, which would have distorted the soft lead ball. The Prussians simply sunk a screw-tapped recess into the belled head of their ramrod, taking a 'male' tool fitting. This screw fitting was for the attachment at need of the 'worm', a corkscrew tool used for 'drawing' misfired charges. This irritating process took several moments, while the soldier fished and twisted in the barrel with his ramrod, trying to engage the point of the worm in the lead ball. In action a man with a musket jammed with useless powder and paper was far more likely to swap weapons with a casualty. (Christa Hook)



Lock of the 1809 'New Prussian' musket, perhaps the best mass-produced weapon of its class. This particular example was manufactured at Saarn in the Rhineland. Note the guard around the priming pan, a feature seen on Prussian muskets from the 1782 model onwards; the pan itself was made of brass, inhibiting corrosion. Some Austrian muskets also had the fire- and windshield fitted.

upon massed firing. The individual was seldom given the ammunition or the leisure to practise individual marksmanship; indeed, in many armies it was positively discouraged. The very design of some weapons — Prussian, and imitative Russian types — reflected a deliberate attempt to make it hard for the soldier to 'draw a bead' by setting barrel into stock at an uncomfortable angle. Individual marksmanship was a distraction from the soldier's task, which was to keep tight formation and pull his trigger when ordered. Aiming was the task of his commander, who used the massed volleys of his whole unit like a giant shotgun. Given the inaccuracy of the individual musket (see below) this was an entirely rational approach.

The normal formation used to achieve this effect was the three-rank battalion (although two-rank formations were the norm for the British, and were used increasingly by other armies as the wars progressed). With three ranks it was usual for the front rank to kneel and the second and third to stand, the third firing through the gaps between the shoulders of the second. The kneeling rank thus had to suffer the discharge of their comrades' muskets above their heads; and the second rank had the pans of the first rank flaring immediately in front of them, and those of the third around their ears. Apart from the burning powder and wadding thrown out from the muzzle, the ignition of the priming was itself liable to cause painful, and even dangerous injury. There are many references to badly burned faces and ears. The *London Chronicle* of 21 April 1796 reported: 'Yesterday the guards had a grand field day in Hyde Park. An accident happened to one of the privates, who had his eye nearly blown out by the sudden discharge of the firelock of the person next to him in the ranks.' If such accidents could happen under the tight supervision of the parade ground, what must it have been like to use these weapons in battle?

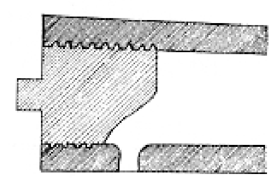
Using a flintlock for any length of time inevitably bruises and burns the hands painfully. There is a famous account in the unpublished journal of Napoleon's senior medical officer, Baron Larrey, referring to the 1813 campaign. The army was ordered to select four soldiers from each of 12 corps to be executed for cowardice, as an example, on suspicion of having self-inflicted wounds to the hands. Powder burns on skin and sleeves were cited as evidence. Larrey, convinced that these were *bona fide* wounds, persuaded Napoleon to allow him to make a detailed examination; and managed to convince the Emperor of the soldiers' innocence in all cases. The raw conscripts' arms drill was shown to be hopelessly deficient: men in rear ranks were consistently wounding those in front by resting their muskets against them, or by underestimating the kick and letting the discharging weapon jump sideways.

The kick of a flintlock is fairly brutal — roughly comparable to that of a modern 12-bore shotgun, even though the slow-burning powder gives a 'pushing' sensation. Lt. Edward Wheatley, 5th Line Bn., King's German Legion, at Waterloo: '. . . I fired a slain soldier's musket until my shoulder was nearly jellied and my mouth was begrimed with gunpowder to such a degree that I champed the gritty composition unknowingly . . .' *A Soldier of the 71st*, after Vittoria: 'I had fired 108 rounds this day. Next morning we awoke dull, stiff and weary. I could scarce touch my head with my right hand; my shoulder was as black as coal.'

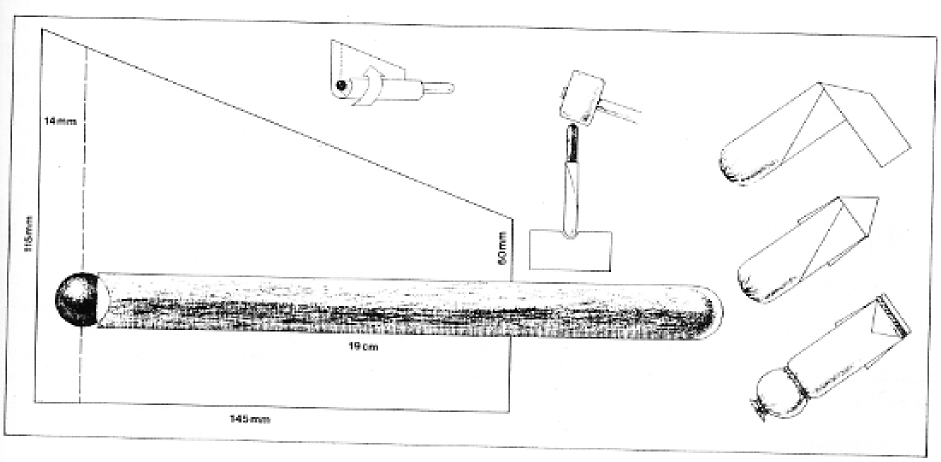
Wheatley's reference to 'champing' powder reminds us that black powder is hygroscopic. Already dehydrated by fear and exertion, the Napoleonic soldier then spent some hours biting open cartridges and getting powder in his mouth. Not only does this taste very unpleasant; it also dries up the saliva rapidly. Many memoirs mention the raging thirst caused in this way.

Bruised, burnt and parched, the soldier striving to follow a complex loading drill was also disoriented by sheer noise, and smoke. The report of a musket, while it does not have the whiplash crack of a high-velocity rifle, is at least as impressive as that of a heavy shotgun. To stand in the middle of a massed battalion firing volley after volley was deafening, even bewildering after a time. Military memoirs are also rich in references to the choking, acrid, dirty-white smoke which hung closely round the firing line after even a single volley, unless there was a stiff wind. This was not like the drifting haze of a wood fire: it was as impenetrable as a chemical smoke screen. From *Recollections of Rifleman Harris*: '. . . I was so hotly engaged, loading and firing away, enveloped in the smoke I created . . . that I could see nothing for a few minutes but the red flash of my own piece amongst the white vapour clinging to my very clothes . . . often I was obliged to stop firing, and dash it aside from my face, and try in vain to get a sight of what was going on . . .'

Under these circumstances, it is hardly surprising that our singed, battered, deafened, choked and half-blinded soldier sometimes made mistakes, even without mechanical failures. Confused men sometimes ram-



Simple cross-section of the breech of the Prussian 1782 musket, showing the biased face of the breech plug and the conical touchhole, both of which helped expel powder into the pan when the charge was tamped home.



Left
Tools and method for manufacturing paper cartridges. We take these views from a French source, but the process was more or less universal. The paper was formed into a tube by rolling round a hardwood rod, whose recessed end held the ball. The cartridge was then placed ball-end first into a recess in a hardwood block, and a few mallet blows mashed the crumpled ends of the paper together. The charge was then poured in from a measure, and the other end was folded over twice. Some examples seem to have been tied with thread (like the 1782 Prussian cartridge, bottom right); others, not. French cartridges were supplied to the troops in packets of 15 rounds. (Christa Hook)

The initial flare from the pan of a Brown Bess; and (right) a split second later, the full ignition. Note the dense puff of smoke, and the large sparks caused by burning grains of powder. The 'hangfire' between the ignition of the priming and the detonation of the main charge could vary a good deal, depending upon the quality of the powder; it was often about .25 sec., and sometimes as much as .5 sec. — which, in the subjective view of the man firing it, can seem an extraordinarily long time. This had two drawbacks. The flare was enough to make a man flinch off his aim before the main charge went off; and the long hangfire might easily persuade him that he had a misfire, so that he was slackening his grip on the stock when the musket went off and kicked him painfully in the shoulder. The author has seen experienced 're-enactors' caught out in this way when deceived by the longer hangfire of powder from an unfamiliar source, and Napoleonic conscripts must have been just as vulnerable to such mistakes.

med a new charge on top of the last, forgetting that they had not fired. Firing a multiple load often burst the musket, with disfiguring or fatal results. Even correctly loaded weapons might have thin spots worn in the bore, or hairline cracks in the stock, which could give way without warning in action. (A good friend of the author is now partially paralysed by a shoulder injury caused when a flintlock stock broke as he fired a blank round.) Men who lost, or even fired away their ramrods were not, however, as helpless as they would be in the later days of rifled muskets, when this curiously common mistake left them physically unable to force a ball down the barrel. The Napoleonic soldier could load 'running ball', if his barrel were not too foul: dropping the ball into the muzzle without wadding, and 'jogging' it down to some kind of seat on top of the powder by thumping the butt on the ground. Compression would be low, but at least he could fire.

THE RECEIVING END

So much for the firer: what of the target? The first question must be, what were his chances of getting hit?

Contemporary trials results need careful interpretation; not only do they reflect ideal conditions, but the information they record is sometimes irrelevant to combat. Picard may tell us that a Charleville firing from a clamped rest at a range of 150m recorded an average error of 29 in. vertically and 23 in. laterally. Col. George Hanger may reinforce the point: 'A soldier's musket, if not exceedingly ill-bored and very crooked, as many are, will strike the figure of a man of 80 yards, it may even at a hundred; but a soldier must be very unfortunate indeed who shall be wounded by a common musket at 150 yards, *provided his antagonist aims at him . . . No man was ever killed, at two hundred yards, by the person who aimed at him.*' But Hanger's comments (from his *To all Sportsmen*, 1814) direct us away from individual accuracy, and towards those tests which were fired by ranks of men at targets representing other ranks of men. The accompanying table is picked for its relative completeness of comparison and its convenience. Scharnhorst had these tests fired by a rank of ten men,

Scharnhorst's Musketry Trials, pub. 1813

Results are expressed as the number of hits/penetrations obtained by each weapon out of 200 rounds fired (i.e. halve for percentages) at a one-inch wooden plank target 6 ft. high by 100 ft. wide.

Range (paces):	*100*	*200*	*300*	*400*	*500*	*600*	*Comments*
Prussion 1782 (unmodified)	92/56	64/58	64/56	42/23	26/8	19/2	(1 oz. charge.) Used by Prussians until 1806/07.
Prussian 1782 (modified)	150/148	100/100	68/64	42/30	0	0	(⅞ oz. charge.) Had modified butt shape.
Prussian Nothardt	145/145	97/94	56/43	67/22	0	0	(⅝ oz. charge.) Used by Prussians 1805–15 and by German states 1806–15.
'New Prussian'	153/153	113/113	70/70	42/34	0	0	(⅝ oz. charge.) Used by Prussians from 1809.
French Charleville	151/151	99/99	53/49	55/38	0	0	(¾ oz. charge.) Used by many other states in Europe.
British 'Brown Bess'	94/94	116/116	75/75	55/53	0	0	(¾ oz. charge.) Used by many British-allied armies.
Swedish musket	80/80	116/116	58/58	47/39	0	0	(1 oz. charge.)
Russian musket	104/104	74/74	51/51	49/46	0	0	(1 oz. charge.)

The main charge goes off, as the priming sends a shower of incandescent powder grains and flint chips in all directions. This photograph shows an original Charleville firing on a still, humid day: note the smoke cloud from this single round. The pyrotechnics make it easy to understand how Napoleonic soldiers lost eyes or ears to burn accidents when standing in close-packed ranks for volley fire. There are also many contemporary references to serious fires being started among crops or thatched buildings by priming sparks, or by the smouldering paper wadding which covered Napoleonic battlefields during a hot action. (Gerry Embleton firing; musket courtesy Nicholas Michael; photograph, Martin Windrow)

each firing 20 rounds with each weapon.

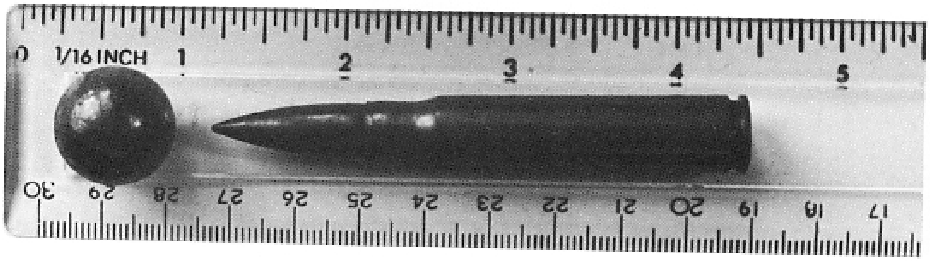
The best 100-pace scores, of around seven hits out of ten shots, are higher than would be obtained in combat, for the reasons already described. At the other extreme, Henegan, commander of the British field train at Vittoria, estimated from rounds issued and fired (about 3,675,000) and enemy casualties (about 8,000) that only one in 459 shots hit; but this includes shots fired outside effective range. More revealing was Talavera: 20 to 30 British volleys over an average 200 yards in half an hour produced some 1,300 enemy casualties — a hit rate of 3% to 4%.

Dry figures fail, nevertheless, to give an impression of the effect of facing a massed, disciplined volley at almost point-blank range. Many of the leading men in, say, an attacking column would fall at once, dead or visibly mutilated by the big, soft lead balls, which caused massive wounds. The others would face a wider range of physical and psychological effects. The shock wave from a close-range volley was enough to physically stagger the enemy; we recall the account of the last attack of La Garde at Waterloo, with the heads of columns convulsing like standing corn in a high wind. The author can confirm from painful first hand experience that even a blank round at close range can lift the victim off his feet and blow him onto his back, completely winded.

(The *London Chronicle*, 23 June 1795, reported that in Edinburgh one Niven fired as a joke a plug of chewed tobacco rammed into his musket: '. . . Mrs Baillie of Olive-bank was wounded in the face, which is much lacerated; and Mr Knox . . . was shot through the breast, and instantly expired.')

The air would be filled with burning powder, which peppers the exposed face, eyes and hands — the natural reaction is to drop one's weapon and rub the eyes. Dazed and deafened by the noise, blinded by the smoke, winded and choking, the victim of a volley would be overwhelmed in all his senses, completely confused.

Now was the time for the enemy to launch their bayonet charge. The loom of scarlet uniforms, the glittering blades, the screams of the charging enemy would have but one effect — you would run for your life, dropping your musket and pack in your haste to escape. Individually, the musket may have been inaccurate; but a properly timed volley, backed up instantly by a charge, could destroy the cohesion and spirit of an enemy unit as surely as a machine gun. **MI**



Below
A visual reminder of the size of a Napoleonic musket ball compared with a modern 7.92mm rifle round (reproduced here actual size). The wounds inflicted depended on many variables; at close range balls were quite capable of blowing a man's brains out, smashing long limb bones, or spreading on impact with major joints to produce nightmare wounds. Some balls were poorly cast and contained air-bubbles, turning them into 'dum-dum' bullets. Equally, the fact that their force became spent at — by today's standards — relatively short ranges produced a crop of 'lucky escape' anecdotes. Memoirs recall men being knocked over, only to find that the ball had not penetrated the skin or the equipment. Lt. Wyndham Madden of the 43rd Light Infantry was saved in December 1813 by a hard, inch-thick, American-made army biscuit tucked into the breast of his coatee. But for every Rifleman Costello, boasting of living nearly 60 years with a ball still inside him, there were dozens of horror stories. Official penetration tests recorded that it took 5 in. of oak to stop a ball at point-blank range; 3 in. at 300 yards. The effect of impact on human flesh and bone; the radical surgical methods of the day, performed without anaesthetic; the filthy conditions of surgery and post-operative treatment — all combined to reduce the casualty's chance of survival to a low percentage.