

An Early Industrial Application for Malleable Platinum

ITS USE IN FLINTLOCK FIREARMS

By Ian E. Cottingham

Johnson Matthey & Co Limited

For a period in the early nineteenth century, when malleable platinum was first available commercially, the high temperature and corrosion resistant properties of the metal were utilised for the manufacture of the touch-holes and pans of flintlock pistols, guns and rifles by English gunmakers, who also used it for some simple decorative purposes. Advances in firearms technology resulted in the effective disappearance of this application round about 1820, although by then platinum was used in various forms of percussion gun. This article considers some aspects of the flintlock use, including the claim made by Joseph Manton that he was the inventor of platinum touch-holes.

Following the invention of gunpowder a variety of firearms was developed, and initially these were discharged by applying a lighted match to priming powder contained in a small pan on the outside of the gun barrel. A narrow hole connected this pan to the main charge positioned in the closed end of the gun barrel adjacent to the breech-plug; thus the ignition of the priming charge caused a flame to pass to the charge, exploding it and consequently expelling the shot from the open end of the barrel. Although there were many disadvantages to this match-lock method of firing, an alternative was not developed until early in the sixteenth century. This consisted of a wheel-lock mechanism using a spring-driven steel wheel to generate sparks from a piece of pyrites pressed against it, and once again the main charge was fired by the ignition of powder held near the touch-hole outside the gun. This mechanism was inclined to jam, and being complicated was not easy to repair. However in the early seventeenth century a French gunmaker produced a more reliable arrangement which by the end of that century, following further development and improvement, had virtually superseded all earlier methods of ignition. His

flint-lock mechanism utilised a piece of flint held in the jaws of a pivoted dogshead, or cock. When the trigger was pressed, the cock swung forward and the flint struck sharply against the steel fixed on the cover that protected the priming charge. As the cover was forced out of the way a shower of sparks caused by the impact fell onto the priming powder, igniting it and hence the main charge. This then was the stage reached in the development of hand firearms when platinum first began to excite the interest of scientists and craftsmen in Europe.

The growth in the standing of London as a centre for fine gunmaking, in the last quarter of the eighteenth century and the early years of the next, was due to a combination of factors including excellent traditional workmanship and the inventive nature of many of the gunmakers who, being engaged in intense rivalry with one another, worked hard to improve their products and hence their craft. At the same time science and technology were developing in London in more peaceful conditions than sometimes prevailed in much of the rest of Europe.

The arrival of platinum in Europe from the Spanish Americas, and the various attempts to render it malleable, have been covered



This double-barrelled flint-lock gun made by Joseph Manton (Serial No. 6468) has touch-holes lined with platinum. The locks are of a waterproof variety, and are fitted with gravitating stops patented by Manton in 1812 (1): "the gravitating stops are for the purpose of preventing a double-gun going off whilst in the act of charging one barrel, though the other should be loaded and cocked; as well as any other accident which might arise, either from a double or single gun being cocked, while on a shooting excursion" (2). The circular counterpoise weights of the stops on this gun, which is in The Armouries of H.M. Tower of London (XII-1284), are faced with platinum, thus utilising both the high density and the decorative appearance of the metal

previously (3). It is worthwhile recalling that ductile platinum began to be available in England in commercially useful quantities only about 1805, but it appears that even before this one or two gunmakers may have been using the metal for specific applications.

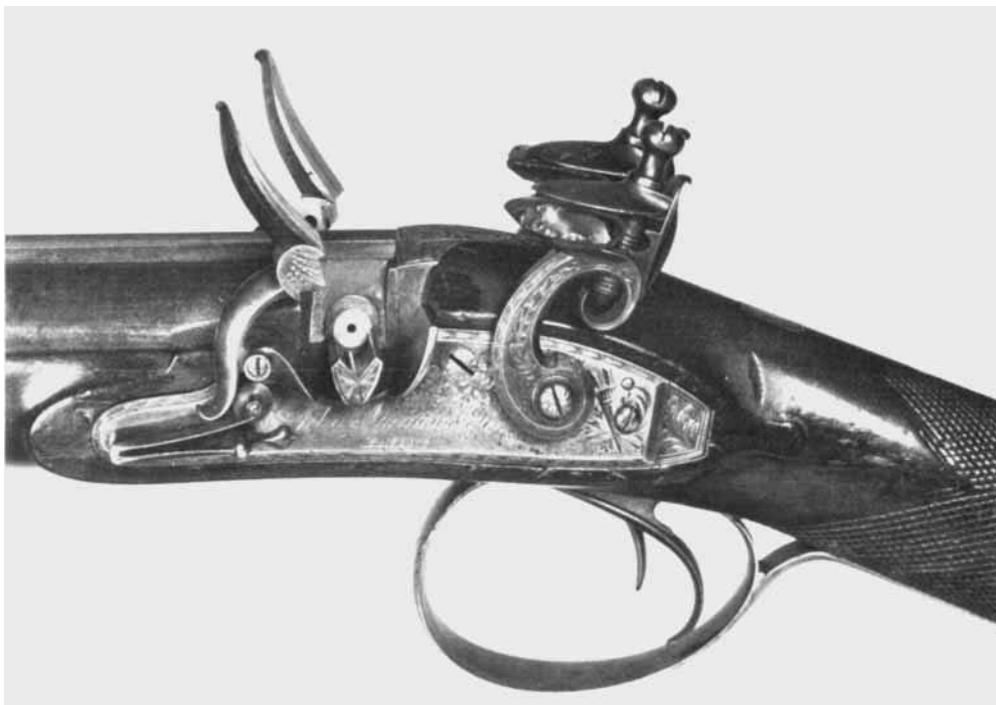
The burning and explosion of the gunpowder used in firearms at that time generated hot gases of a corrosive nature; these, and the action of the flame, caused a deterioration of the metal surfaces with which they came into contact. If the touch-hole was simply a hole drilled through the gun barrel, or the breeching, the hole became progressively enlarged with use, and this in turn led to a loss of power when the gun was fired. This could be avoided by lining the hole with a high temperature corrosion resistant material, and gold—which had been used in Spain for this purpose since at least the second quarter of the seventeenth century (4)—became fairly generally employed for better quality firearms. However, in the early years of the nineteenth century platinum began to be used as a replacement for gold for lining touch-holes and pans,

as well as for a number of decorative purposes.

In time the benefits of platinum touch-holes appear to have been fairly generally accepted by the gun users, but the use of platinum for the possibly less exacting purpose of lining priming pans was not so well thought of. In 1811 B. Thomas—a pseudonym of Thomas Burgeland Johnson, the Liverpool printer and writer on field sports—wrote:

"As to gold pans, they are more for show than utility. A steel pan will be found, with common care in cleaning it, to last longer, and to answer every purpose as well, as when lined with gold. However, a gold or platina touch-hole is preferable to the common one. Platina has but lately been tried for this purpose, and found to answer equally as well as gold; at the same time it is much cheaper. I have two fowling-pieces with platina touch-holes, which I have used four seasons, and the platina appears, in every respect, equal to gold." (5)

However platinum did find application for various pans, including a patented pan with a "V" shaped cross-section, illustrated here, where a raised band of platinum was often used to bisect the pan, thus retaining priming



In 1815 John Manton took out a patent for "An Improvement in the Construction of Hammers and Pans to the Locks of all kind of Fowling Pieces and Fire-arms". Part of this claim consisted of dividing the pan, along the centre line from the touch-hole, by a ridge "about one-sixteenth of an inch in height, and about the thirtieth of an inch thick" (6). On the John Manton double barrelled gun (Serial No. 7787) illustrated here platinum was used for this purpose. This gun forms part of the magnificent collection made by R. L. Scott, and bequeathed by him to the City of Glasgow (39-65wr)

powder close to the touch-hole regardless of whether the muzzle of the gun was elevated or depressed.

It is not absolutely certain who was the first gunmaker to employ platinum but the presently available evidence suggests that it was one of the Manton brothers. During his examination of the Wollaston manuscripts, now held in the Cambridge University Library, the late L. F. Gilbert discovered that a considerable proportion of the platinum refined by William Hyde Wollaston was described as being of "touch-hole" quality. He also identified the names of many of those with whom Wollaston conducted business and an examination of his accounts in the ledgers of his bankers, Messrs. Coutts, confirmed that some of the principal London gunmakers were among his customers. From manuscript entries Gilbert calculated that about 17,000 ounces of platinum had been of

"touch-hole" quality. Although not all of this may have been sold to the gunmakers, between 1809 and 1822 no less than 700 ounces of gunmakers scrap were returned to Wollaston, so presumably that industry was using a substantial amount of the metal (7). Dr. M. C. Usselman, who has recently made a thorough examination of the Wollaston papers, suggests that "bars" or "ingots" sold during the years 1819 to 1821—when no ingots were specifically referred to as being of "touch-hole" quality—may also have been sold to gunmakers (8); if so a total of some 27,000 ounces of Wollaston's platinum could have been used by this industry during the period 1805 to 1821. Clearly gunmaking was then by far the largest single application for his malleable platinum.

In his paper Gilbert referred to an early chemistry textbook (9) in which Samuel Parkes, the author, stated that he had been informed

that Manton of Dover Street was the first to employ platinum for touch-holes.

In time, platinum was probably used by all the English gunmakers for the touch-holes of their best quality flintlocks. Of course, there was no standard configuration or dimensions for the platinum linings, which appear on the outside of the gun as a circle, possibly $5/16$ of an inch in diameter, with the narrow touch-hole drilled through its centre. On occasions a thin disc of platinum would merely face the surface of the barrel around the touch-hole; rarely a thick plug of platinum would pass through the wall, but more frequently the touch-hole was only lined with a thin sleeve. Thus the weight of platinum employed varied considerably but would not exceed $1/8$ ounce at the most, and would usually be much less. Although ingots were generally sold for this purpose Wollaston apparently also made reference to wires for touch-holes (10).

John and Joseph Manton

The Manton brothers were famous London gunmakers and their history has now been thoroughly researched and admirably presented by Neal and Back (11, 12). John Manton, the eldest son of a Grantham farmer and land-owner, served his apprenticeship with provincial gunsmiths before moving to London. After rising to become foreman for Twigg of Piccadilly, one of the most famous gunmakers of that period, John started his own gunmaking business at 6 Dover Street in 1781, and the firm remained at that address until long after his death in 1834. While working for Twigg, who enjoyed royal patronage, John Manton undoubtedly developed his gunmaking skills and learnt a great deal about the making of fine quality firearms. After Twigg's death in 1790 his business deteriorated rapidly and former clients requiring guns of the highest quality turned to Manton, with whose work they were already acquainted. Thus John Manton established himself as one of the greatest and most versatile gunmakers. Several of his apprentices were also to become famous in the gunmaking business, none more so than his

younger brother Joseph who, after first being apprenticed to a Grantham gunsmith, joined John in London as an apprentice. Joseph Manton, fourteen years younger than his brother John was clearly both quick to learn and ambitious. In 1789 he started his own firm, which was to become one of the most famous for its fine sporting guns, and from the time of his marriage in 1792 until 1819 the business was located at 25 Davies Street, Berkeley Square. Therefore there can be no doubt that Parkes, writing in 1815 of Mr. Manton of Dover Street, was referring to John. However there is no certainty that Parkes was correct about the first gunmaker to use platinum, indeed there is some evidence to suggest that he may have been wrongly informed.

Samuel Parkes—Chemist

In view of the importance which may be attached to the information given by Parkes it is worthwhile considering the context in which it occurred, and also his technical standing. Parkes was not involved in the manufacture of firearms nor, as far as is known, in their use; he was the proprietor of a chemical manufactory in London and an acknowledged chemical expert and author. He supplied acid to Wollaston, and in January 1811 purchased a platinum boiler for the production of sulphuric acid. The required 377 ounces of platinum were purchased from Wollaston who probably also supervised the construction of it, for he later wrote to Parkes asking about its performance.

While it is not known from whom Parkes obtained his idea about the first gunmaker to employ platinum for touch-holes, the context in which it occurs suggests that it was someone involved in manufacturing gun barrels. Parkes did acknowledge (13) that he had received information about fulminate chemicals from the ingenious Scottish clergyman Alexander John Forsyth—inventor of percussion ignition firearms—of whom more will be said later, so it seems clear that Parkes was in communication with people knowledgeable on platinum, and on firearms.

In the first volume of his *Chemical Essays*,



Joseph Manton
1766–1835

Regardless of whether Joseph or his brother John was the first to use platinum for lining touch-holes, there can be no doubt that Joseph was one of the finest, possibly the finest, gun-makers of the period. An epitaph written by Lieutenant Colonel Peter Hawker recognises that "... an everlasting monument to his unrivalled genius is clearly established in every quarter of the globe, by his celebrity as the greatest artist in fire-arms that the world produced, as the founder and the father of the modern gun-trade, and as a most scientific inventor, in other departments, not only for the benefit of his friends and the sporting world, but for the good of his King and country."
(14)

when writing on temperature, he regrets that a general purpose pyrometer was not available.

"The want of a good pyrometer is severely felt by the manufacturers of Birmingham. Cases daily occur of losses sustained in consequence of their not knowing the precise degree of heat in high temperatures. A single instance will be sufficient to explain my meaning.

It has been customary to fit up the best fowling-pieces with touch-holes of gold, because those of iron or steel are soon eroded and worn away by the sulphur of the gunpowder, which unites with this metal and converts it to brittle sulphuret.

Nothing can be easier than to mould these gold touch-holes properly, and also to fix them firmly within the gun-barrel; but there is an after-process to be performed, which is attended with considerable difficulty. One of the last operations in finishing a gun-barrel is that of hardening the breech, which can only be done by submitting it to a high degree of heat; and if ever the precise degree that is necessary for the process be exceeded, it is ten to one but the gold melts, and the manufacturer has to replace it with another touch-hole.

The temperature at which gold melts is well known; the gunsmith, therefore, has only to ascertain what degree of heat is necessary for hardening the breech; and then, by employing a pyrometer, the accident above mentioned would never happen." (15)

The generally quoted reference to Manton occurs in a footnote to the second paragraph, and is shown here in full. It is surprising that the author says platinum touch-holes were more expensive than gold ones for, at that time, malleable platinum was very much cheaper than gold; at 17s per ounce it was only one-fifth

When this occurs, the workman has the trouble of again softening the temper of the barrel before he can fix another touch-hole to it, and consequently the same expense and risque of hardening it must be incurred, besides the loss of time. Owing to these inconveniences the gun-smiths have nearly discarded the use of gold, and now make the touch-holes for the best pieces of platina, although they cost nearly double the price. I have been informed that Mr. Manton, a very eminent gun-smith of Dover-street, was the first person who employed platina for this purpose.

By publishing the information he had gained while visiting other manufacturers or talking to his associates, Parkes hoped to increase the knowledge of others and hence improve the production of manufactured goods

Trade labels were a development of tradesmen's cards, which some gunmakers had earlier placed inside their firearms cases. Many were attractively engraved and served as a discrete form of advertising. As well as the gunmaker's name and address, the label would perhaps give royal, or noteworthy, appointments and any of his technical innovations which the gunmaker wished to bring to the attention of his customers. On this label, which was first used in about 1805, Joseph Manton claimed to be the inventor of Platina Touch-holes; the claim was repeated on another design of his label which was used from about 1810 to 1812 (16)



the cost of gold (8). Possibly he was wrong, or was referring to the very first guns produced with the new touch-holes, but clearly this was not the situation when the book by Johnson was written (17).

The metals would both have somewhat similar corrosion resistant properties but the advantage given by the higher melting point of platinum (1768°C compared with only 1065°C for gold) may have been an important consideration when the metal was first introduced for this purpose. However, this was not the only benefit of using platinum; the fact that its hardness was about twice that of gold was also appreciated and made use of. Hawker, a soldier, keen sportsman and writer of a most authoritative book on shooting wrote:

"Touch-holes of platina are considered the best, as those of steel are apt to collect rust, and one of gold is more likely to blow out, and, therefore, will not admit of being made so thin; consequently, (from requiring to be thick), does not shoot so sharp; for the thinner it is, the quicker will be the firing of the gun." (18)

In an attempt to get guns to fire as fast as possible, it appears that in some early instances the platinum touch-holes were made too thin to function entirely satisfactorily; presumably this

was before the gunmakers were fully aware of the properties of the newly available metal (19).

The note that links the name of Manton with the Dover Street address is repeated in later, corrected, editions of Parkes, so it must presumably have gone unchallenged at the time. However, it is now necessary to consider the evidence which is at variance with his writings.

Trade Label Claim

At this time many firearms were housed in wooden cases and it became customary to attach trade labels to the inside of the lid, either when the arms were first made or later when they were returned for repair or modification. Joseph Manton first used such labels in about 1795 and his second design of label, which he used between about 1805 and 1812, included the words "Inventor of Platina Touch Holes". From this it could be deduced that he was the first gunmaker to use platinum, and that possibly the first use and the issue of the label occurred fairly close together.

Firearms manufactured during the period of interest are generally stamped with the maker's name or mark, and frequently also with a serial number which enables the year of manufacture to be determined. Thus a critical examination

of the many arms of the period preserved in museums and private collections should enable the maker of the oldest firearm incorporating platinum, and also the approximate date of manufacture, to be identified. Care is however necessary in such a survey because arms were frequently modified to incorporate the latest improvements, and some guns which were manufactured before platinum was known to be commercially available in Europe do contain platinum touch-holes. Additionally there can, of course, be no certainty that the first firearm to incorporate platinum still exists.

Although platinum was also used by other gunmakers, the evidence provided by the serial numbers of their guns reinforces the belief that one of the Manton brothers was the first to do so. Joseph apparently changed to platinum touch-holes in 1804–5 while John changed in 1803 (20). There was intense rivalry between the two brothers, and it is interesting that they both started to use the new material at almost the same time, and apparently ahead of their other business competitors.

It was stated earlier that the London gunmakers were inventive people, and this claim can be supported by the number of patents taken out by them on their own subject, and also sometimes on quite different ones. Between the years 1797 and 1821 John Manton was granted four patents while between 1792 and 1825 Joseph received twelve. Although these figures may suggest that Joseph was the more inventive of the two, his patents do not provide any evidence to support the claim that he was the inventor of platinum touch-holes.

It is only possible to speculate how the brothers became aware of the availability of ductile platinum with its unique properties so relevant to their application, for, as yet, this writer is unaware of any information on this aspect of the subject. At a time when a practical technique for melting platinum was not known, it might very well have been the high melting point that first attracted the attention of the gunmakers, perhaps even for the reason contained in the book by Parkes although this point was not brought out by any of the other

authors quoted here. They emphasised the advantages resulting from some of the other properties of the metal. Be that as it may, by March 1805 William Cary, a respected philosophical instrument maker of 182 Strand, had been entrusted with the marketing of malleable platinum produced by Wollaston (21). If the dates deduced from the serial numbers of the guns are correct then it would appear that John Manton, at least, was using platinum before that time. Possibly increasing demand from the gunmakers was one of the factors that resulted in Cary being commissioned to sell most of Wollaston's platinum, although there is no known evidence for this suggestion.

Percussion Ignition Systems

Although the best of flintlock firearms were accurate and highly efficient they still had a number of serious disadvantages, one of which was the difficulty of making them moisture proof. Even more unsatisfactory was the time which passed between the pressing of the trigger and the shot travelling the distance to the target for this enabled birds and animals, possibly alerted by the flash of the priming powder, to move their position.

In 1807 a Scottish clergyman the Reverend Alexander Forsyth, a keen sportsman and amateur mechanic and chemist, obtained a patent for a new system of firearms ignition which was to increase greatly their reliability, and which proved to be a turning point in the development of firearms (22). His percussion ignition system utilised the already known principle of exploding certain special compounds by an impact. Fulminate compounds produced by the French chemist Claude Louis Berthollet in 1786 were not a satisfactory replacement for a charge of gunpowder, but Forsyth's patent was concerned with the use and application of fulminates, as an alternative to priming powder ignited by match or flint and steel, to fire the main charge of gunpowder. Although his initial attempts to interest the military authorities in his invention were not successful he went on to establish a successful gunmaking business in Piccadilly, London.

The early mechanisms for discharging percussion firearms were extremely sensitive and to prevent the consequences of accidental discharge a number of the critical components were lined with platinum. Forsyth's idea was quickly taken up by other gunmakers who attempted to improve on his patent by incorporating variations of their own. For many years platinum continued to be used for a number of specific applications, including the lining of the nipples on which percussion caps were placed—and again it is uncertain who was the first person to use platinum for this application (23)—and also for the vent-holes which were considered to be necessary in various firearms. Hawker (24) expressed the opinion that:

“A detonator without a vent-hole, though perhaps it may shoot a little stronger, is very liable to corrode, and recoils most cruelly. The best vent-hole, to my fancy is a fixed one of platina, similar to a touch-hole; as *vent-screws*, I find, are liable to rust in; and, unless lined with platina, are either soon choked up with rust and dirt, or blown too large by repeated shooting.”

Metallurgical development took place alongside other advances in technology and later in the nineteenth century platinum-iridium alloys were being used for the vents of heavy guns in a number of European countries (25). Before this, however, the flintlock era was over, flint and steel having been replaced by percussion ignition locks for all practical purposes.

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References

- 1 Joseph Manton, *British Patent* 3558;1812
- 2 T. H. Needham (T. B. Johnson), “The Complete Sportsman”, Simpkin and Marshall, London, 1817, p. 165
- 3 Donald McDonald, “A History of Platinum”, Johnson Matthey, London, 1960. This book includes a comprehensive study of the arrival in Europe, the examination and the early uses of platinum from South America. Relevant articles by the same author include “The First Experiments on Platinum”, *Platinum Metals Rev.*, 1965, **9**, (1), 20; “William Hyde Wollaston”, *ibid.*, 1966, **10**, (3), 101
- 4 J. D. Lavin, “A History of Spanish Firearms”, Herbert Jenkins, London, 1965, p. 205
- 5 B. Thomas, “The Shooter’s Guide”, 3rd Edn., Gale and Curtis, London, 1811, p. 205
- 6 John Manton, *British Patent* 3942;1815
- 7 L. F. Gilbert, *Notes Records Roy. Soc.*, 1952, **9**, 311
- 8 M. C. Usselman, *Platinum Metals Rev.*, 1978, **22**, (3), 104
- 9 S. Parkes, “Chemical Essays”, Baldwin, Cradock and Joy, London, 1815
- 10 Correspondence between L. F. Gilbert and W. Keith Neal, March and April 1951, D. M. S. Watson Library, University College London, L. F. Gilbert Collection, box 6, file 3, item 1, and box 8, file 2, item 3(i)
- 11 W. Keith Neal and D. H. L. Back, “The Mantons: Gunmakers”, Herbert Jenkins, London, 1967
- 12 W. Keith Neal and D. H. L. Back, “The Manton Supplement”, Compton Press, Tisbury, 1978
- 13 *Op. cit.*, (Ref. 9), p. 216
- 14 P. Hawker, “Instructions to Young Sportsmen”, 10th Edn., Longman, London, 1854, p. 2
- 15 *Op. cit.*, (Ref. 9), p. 376
- 16 W. Keith Neal and D. H. L. Back, “British Gunmakers Their Trade Cards, Cases and Equipment, 1760–1860”, Compton Press, Warminster, 1980
- 17 Even in the first edition of “The Shooter’s Guide”, 1809, when Thomas’s platina touch-holes had been used for only two seasons, platina was said to be cheaper than gold
- 18 *Op. cit.*, (Ref. 14), 2nd Edn., Hunter and Ridgway, London, 1816, p. 30
- 19 *Op. cit.* (Ref. 12), p. 121
- 20 *Ibid.*, pp. 119, 120
- 21 J. A. Chaldecott, *Platinum Metals Rev.*, 1979, **23**, (3), 118
- 22 A. J. Forsyth, *British Patent* 3032;1807
- 23 P. A. Bedford, *J. Arms Armour Soc.*, 1965–67, **V**, (1), 31
- 24 *Op. cit.*, (Ref. 14), p. 48
- 25 Unpublished letters of George Matthey, in the possession of Johnson Matthey & Co Limited