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# Gunpowder

Clive Ponting

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## About the Author

Clive Ponting was until recently Reader in Politics and International Relations at the University of Wales, Swansea. His *Green History of the World* was an international bestseller, and his revisionist biography of Churchill raised a storm of controversy. Available in Pimlico are his most recent books: *The Pimlico History of the Twentieth Century*; *World History: A New Perspective*; *Thirteen Days: The Road to the First World War*; and *The Crimean War*. He recently took early retirement and now lives on a small Greek island where he is creating a Mediterranean garden and cultivating olives.

Also by Clive Ponting

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# GUNPOWDER

An Explosive History:  
From the Alchemists of China to the Battlefields of Europe

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CLIVE PONTING



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## Prologue

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### 5 November 1605: the Gunpowder Plot

Please to remember  
The fifth of November  
Gunpowder treason and plot.  
We know no reason  
Why gunpowder treason  
Should ever be forgot.

SHORTLY BEFORE MIDNIGHT ON Monday 4 November 1605, following a tip-off to the government, Sir Thomas Knevett, a Justice of the Peace for Westminster, led a party of men to search the cellars and storerooms under the House of Lords. They saw a suspicious figure in a cloak and dark hat, booted and wearing spurs as though ready to make an escape. He was arrested and taken away for questioning. He gave his name as John Johnson. He kept up this pretence for forty-eight hours under increasingly severe torture until he finally admitted that he was Guy Fawkes (a Catholic from York and a mercenary who had fought with the Spanish since the 1590s).

An anonymous letter had alerted the government to a threat to destroy Parliament when King James formally opened proceedings on 5 November. The full search of the cellars conducted after Fawkes was arrested revealed thirty-six barrels of gunpowder (nearly a ton of explosives), carefully concealed under piles of firewood. Had they been detonated they would have killed the king, most of his family and members of both the House of Lords and House



of Commons. Under torture Fawkes outlined the details of the plot.

It had begun in April 1604 among a group of Catholics who, with little reason, had expected that James VI of Scotland, who had succeeded Elizabeth I on the throne as James I of England the previous year, would introduce toleration for their religion after years of deep suspicion about their activities. Instead, in February 1604, he had condemned Catholicism as 'superstition' and ordered all Jesuits and other Catholic priests to leave the country. For decades Catholics, opposed to Henry VIII's break with Rome in the 1530s and the increasingly Protestant nature of the Church of England, had worked towards a revolt that would place a Catholic monarch on the English throne. The prime candidate had been James's mother, Mary, Queen of Scots, until Elizabeth had her executed in 1587. The plots to install a Catholic were often linked to an external threat to the English kingdom (usually from Spain) as part of the vicious religious wars that divided Europe for more than a century after Luther's stand against the corrupt nature of the late medieval Church. All the plots had been discovered or betrayed, but this did not stop Catholic families in England supported by a growing group of their fellow religious in exile on the continent from dreaming about a Catholic restoration. The execution of the main Catholic claimant to the throne, Mary, Queen of Scots, and the defeat of the Spanish Armada in 1588 had done little to reduce anti-Catholic feeling in England. The English government maintained a network of spies among the Catholic communities at home and in exile abroad. They were usually aware of any plots that were under way.

The 'gunpowder plot' was masterminded by Robert Catesby, a member of one of the main Catholic landed families. On 20 April 1604 he met four other conspirators, Jack Wright, Thomas Percy, Tom Wintour and Guy Fawkes, in the Duck and Drake inn near the Strand in central

London. Catesby proposed that they should blow up both the king and Parliament as a first step to establishing a Catholic monarch on the throne. The conspirators took an oath that evening on a prayer book and then heard mass. Their original plan was to carry out the attack in February 1605 when Parliament was due to reconvene. During the autumn of 1604 they reassembled in London. They used Catesby's house in Lambeth as a base where they could store the gunpowder, wood and other items. Gunpowder was bought that autumn under the pretext that it was for the English regiment serving with the Spanish army fighting the Protestant Dutch rebels (this was not illegal under the recent Anglo-Spanish peace treaty). However, on Christmas Eve it was announced that, because of the threat of plague, the meeting of Parliament would be postponed until October 1605 (it was delayed again in the summer of 1605 until November) and the conspirators had to adjust their plans.

On 23 March 1605 they took a lease (at a cost of £4) on a house owned by John Whynniard in the Palace of Westminster. (In the early seventeenth century the palace was still a warren of houses, shops and inns with interconnecting cellars and storage areas.) The 'house' was in fact little more than a small flat where only one person could sleep but its great advantage was that it had a cellar that ran below the House of Lords. This cellar was, in reality, a large storehouse that had originally formed part of the old medieval kitchens of the palace. It was full of accumulated rubbish and provided an ideal area for hiding the explosives. It also had easy access to the Thames so that the gunpowder could be brought across the river from Catesby's house in Lambeth. By the middle of July the conspirators had moved thirty-six barrels of powder across the Thames and stored them in the cellar under the House of Lords.

During the summer of 1605 reports reached the government from their spies on the continent that a plot was under way. These reports named a John Johnson as one of the chief conspirators. The government had no record of such a name and did not realise that the person involved was Guy Fawkes. It is not known exactly when Fawkes returned to London but it was probably in August. When he went to the cellar he discovered that some of the gunpowder stored there had got damp and was therefore useless.<sup>1</sup> More powder was brought across the river from Lambeth and then hidden under loads of firewood.

The conspirators settled the final details of the plot in October. They agreed that Fawkes would be responsible for lighting the fuse, which was the most dangerous job. It was hoped that he would then be able to escape across the river. While Parliament and the king were being blown up, Catesby and the other conspirators (who now numbered thirteen) would begin a rising in the Midlands, capture the king's daughter, the young Princess Elizabeth, and put her on the throne under a Catholic regent.

The plot was betrayed in a letter given to a servant of Lord Monteagle outside the peer's house in Hoxton on the outskirts of London on the evening of Saturday 26 October. Monteagle was warned not to attend the opening of Parliament because 'This Parliament shall receive a terrible blow, and yet they shall not see who hurts them'. Who sent the letter betraying the plot is unknown. Monteagle immediately took the letter to the king's chief adviser, Lord Salisbury, who summoned the Privy Council. They decided to let the plot mature and did not inform the king who was away hunting at Royston in Hertfordshire.

On 30 October, Fawkes made a final inspection of the cellar: everything was in place. Early on 4 November, Catesby left London to lead the rebellion in the Midlands. At 10 p.m. that evening Fawkes was given a watch by Thomas Percy so that he could time the fuse. At about this

time the first government search of the cellars of the Palace of Westminster was carried out by Monteaule accompanied by Lord Suffolk. They walked as casually as possible through the cellars in the hope that they would not arouse any suspicion. During their stroll they noticed a huge pile of firewood in one corner under Whynniard's house. It seemed to be far too much wood for a small house that had only one fireplace. Their suspicions confirmed, they reported to Salisbury. Sir Thomas Knevet was called in to carry out the detailed search which discovered Fawkes, already in position to light the fuse at the crucial moment.

After the arrest of Fawkes, news of the gunpowder plot spread rapidly around London. On the evening of 5 November bonfires were lit across London to celebrate the failure of the conspiracy. The remaining conspirators fled the city to join up with Catesby who still favoured an uprising even though there was now almost no chance of success. On 7 November Catesby, with over thirty accomplices, left his house and rode to Hewell Grange, the home of Lord Windsor, where they took arms, gunpowder and money. Late that evening, followed by forces led by Sir Richard Walsh, the High Sheriff of Worcestershire, they arrived at Holbeach House near Kingswinford in Staffordshire. The role of gunpowder in the plot was not yet over. The conspirators found that the gunpowder they had taken from Hewell Grange, which had been transported on an open cart in the rain, was too damp to use. Foolishly they spread it out in front of a roaring log fire to dry. A spark ignited the powder and Catesby was engulfed in flames. He survived, but another conspirator, John Grant, was severely burned and blinded. Early the next morning, after a brief battle with the forces led by Walsh, Catesby and Percy were killed and the remaining conspirators captured.

As Fawkes revealed the scale of the gunpowder plot and the names of those involved, the government took further

action. The bodies of both Catesby and Percy were exhumed from their graves and beheaded. Then their heads were taken to London where they were placed on specially built metal posts outside Parliament. The trial of the eight surviving conspirators on charges of high treason took place in Westminster Hall on 27 January 1606. There was never any doubt about the verdicts - all the facts were clear. The purpose of the trials was to set out the full nature of the plot for public consumption. All the men were found guilty. The first executions took place three days later at the west end of St Paul's Churchyard. The main conspirators, including Guy Fawkes, were executed the next day in Old Palace Yard, Westminster - a venue specially chosen to emphasise their failure to blow up Parliament. All the executions were brutal in the extreme. Fawkes was the last to be killed. Like the others, he was hanged but taken down from the gallows while still alive. Then he was placed on the quartering block where he was castrated and had his innards cut out. He was conscious throughout this process.

For most English readers the gunpowder plot and the annual celebration of bonfire night with fireworks is by far the best-known episode in the history of gunpowder. The rest of the story is little known and the remainder of this book is an investigation of the origins and history of the first explosive known to humans. The great polymath Francis Bacon, who lived through the gunpowder plot, wrote in his *Novum Organum* of 1620:

It is well to observe the force and virtue and consequence of discoveries. These are to be seen nowhere more conspicuously than in those three which were unknown to the ancients and of which the origin, though recent, is obscure and inglorious; namely, printing, gunpowder and the magnet.

Bacon was unaware that all three of these inventions originated on the far side of the world in China about seven hundred years before he was writing.

The history of gunpowder begins some fifteen hundred years ago among the alchemists of China who were searching for the elixir of life. By chance they discovered a strange mixture that burned and exploded. Although Europeans long claimed to have invented gunpowder, its true origin in China was finally accepted by the mid-twentieth century. However, it is often stated that although the Chinese knew of gunpowder they did not have either the inventiveness or the expertise to use it for military weapons and instead were content to restrict its use to fireworks. This is a historical myth. Gunpowder was very quickly taken over by the military and by about AD 1200 the Chinese had developed every type of weapon that ever used this explosive - incendiaries, flame-throwers, bombs, rockets, cannon and hand-held guns. Gunpowder remained a Chinese secret for almost half a millennium until it spread westwards, first to the Islamic world and then to Europe. The impact of this new substance on warfare was profound and it also transformed whole societies. Once the new technology had been absorbed and further developed in Europe, it helped this previously backward region dominate the rest of the world. Gunpowder remained the first and only explosive until little more than a hundred years ago. The story of gunpowder ends with its replacement by even more devastating chemical high explosives such as dynamite and TNT in the late nineteenth and early twentieth centuries.

How then did a mixture of substances intended to provide immortality lead to death and destruction on an unprecedented scale across the world?

1 This was a common problem for all types of gunpowder and one that was never solved throughout its history.

## The Fire-drug

FOR MOST PEOPLE in the West, China is a strange, remote and exotic country of whose history we know little. Until recently the most populous state in the world, it is inhabited by a variety of people speaking many different languages and using a script totally unlike any known in Europe. Its history is often assumed, wrongly, to be largely static - an almost endless succession of dynasties all dominated by a large bureaucracy of scholars who administered the state. Its ways of thinking seem equally strange and are largely associated with a philosophy known as 'Confucianism'. This name is a mistake, derived as it is from the ignorance of the Jesuits who first visited China in the sixteenth century. The Chinese scholars told them about a person called Khung Fu Tzu who was revered as the originator of ideas about the relationship between people, society and the state. The Jesuits Latinised this name as 'Confucius' not realising that the Chinese were talking about a 'Master Khung'. In fact, China had been a Buddhist state for almost as long as it was 'Confucian', and had a history of scientific advance and technical invention that was far in advance of the rest of the world for many centuries.

The origins of gunpowder are found in other philosophical ideas from China, just as influential there as 'Confucianism'. Known as Taoism, this set of ideas, which briefly became popular in the West in the 1960s, can be

traced back to some of the philosophers of China's 'Warring States' period and, in particular, the shadowy figure of Lao Tzu who probably wrote the *Tao Te Ching* ('Canon of the Virtue of the Tao') around 300 BC. These philosophers rejected the courts and growing bureaucracies of the petty states across what is now central China as they fought their endless brutal wars (a history remarkably like that of Europe in the last five centuries). Instead, these scholars withdrew to the countryside to meditate on nature and its ways. They attacked the scholastic knowledge that dominated 'Confucianism' and advocated greater knowledge of the world of nature and how it operated. They emphasised the unity of nature and its independence of human standards. Unlike Christian thought, Taoism had no concept that there could be 'laws of nature' that were imposed from above by an omnipotent 'God' whom all the creatures in the world had to obey. They wanted to observe nature and learn to understand it, not to take action against its principles. They let events work themselves out according to their own principles. Taoism, like many other traits in Chinese thinking, was down-to-earth and practical - knowledge was not theoretical but based on experiment and observation.

Taoists were obsessed with change, in all its forms. They believed that the natural world reflected the basic principle of the Tao - unceasing cycles of alteration. Another defining characteristic of Taoist thinking was that it did not believe in a separation of spirit and matter - something that it deemed to be impossible. Again this is very different from the dominant western way of thinking which sees a clear distinction between the two. Neither did Taoists believe in a single, permanent individual soul. For them, immortality was not about the survival of the soul - they thought immortality was bound to be both spiritual and material because everything was an organic whole composed of both elements. Taoists had no concept that ethics and



behaviour could affect an individual's position in any afterlife - all humans were a mix of good and bad. Immortality could be achieved not through morality but through practice and by controlling and modifying the natural and variable cycles of change. By this means, human life could be extended so that immortality would be obtained. The process of ageing could be undermined by expelling the 'Three Worms' from within the body so as to create a *hsien* or 'true man' who became physically lightened and ethereal while living for ever in a young body. Such people would move across the earth, living in the mountains and forests, rarely meeting 'ordinary' humans. The most adept would become *thien hsien* and live as celestial immortals among the stars. Within a century of the origins of Taoism many people were convinced that individuals had achieved *hsien* status. The transformation into a *hsien* would not be 'unnatural' - it was no more than a type of the metamorphosis already observed in nature in the case of many insects as they changed, for example, from caterpillars into butterflies.

For Taoists, long life and possibly immortality could be achieved through certain practices - breathing exercises, exposure of the body to sunlight (in the case of men) or moonlight (in the case of women), mild gymnastics and certain sexual practices such as retention of semen. However, many people, in particular emperors and high officials, did not have the time to indulge in these prolonged exercises. Taoists therefore searched for a shortcut that would expel the 'Three Worms' and achieve immediate immortality. At some time in the third century BC two men, Hsü Fu and Han Chung, set sail for the Eastern Ocean to search for the islands of Phêng-Lai where, it was believed, the immortality-giving drug could be found. They were never seen again. Thereafter, the search for immortality concentrated on recipes for various elixirs.

Most of these elixirs were mixtures of dangerous metallic compounds derived from arsenic, mercury and lead. Taoist advice was that perseverance was vital in achieving immortality and any adverse symptoms from the elixir were merely signs that the mixture was beginning to work in removing the poisons from the body. The sixth-century AD text 'Records of the Rock Chamber' advised:

After taking an elixir, if your face and body itch as though insects were crawling over it, if your hands and feet swell dropsically, if you cannot stand the smell of food and bring it up after you have eaten it, if you feel you were going to be sick most of the time, if you experience weakness in the four limbs, if you have to go often to the latrine, or if your head and stomach violently ache - do not be alarmed or disturbed. All these effects are merely proof that the elixir you are taking is successfully dispelling your latent disorders.

Not surprisingly, cases of elixir poisoning were common.

In about the first century BC the development of elixirs and the search for a way of making gold came together. 'Base' metals, which rust, corrode and decay, were thought to be like mortal men. The 'philosopher's stone' which would transform base metal into indestructible gold would also, the Taoist alchemists believed, transform human bodies. Artificial gold would be the container for the immortality elixir as the alchemist Li Shao-Chün told the great Han emperor Wu-Ti in 130 BC: 'I will show you how to make vessels of yellow gold and from these you may drink and achieve immortality.' The search for an immortality elixir and the 'philosopher's stone' formed the basis for the alchemists' efforts for centuries. From China many of these ideas spread to the Islamic world (from which our word

'alchemy' is derived) and from there to Europe. The influence of these Chinese patterns of thought can be seen in the work of Roger Bacon (c. 1214-94), an English Franciscan friar, who was one of the first Europeans to know of the existence of gunpowder. In 1266 he wrote in his *Opus Majus*: 'That medicine which will remove all impurities and corruptibilities from the lesser metals will also, in the opinion of the wise, take off so much of the corruptibility of the body that human life may be prolonged for many centuries.' The unavailing search for the 'philosopher's stone' was to continue to dominate European science into the eighteenth century.

Researches in China took place across the country in small workshops as Taoists isolated new chemicals, searched for new combinations and tested them by burning and other physical and chemical processes. These were practical men who worked with a handful of assistants and reported to each other as they carried out their search for the one mix of substances that would provide immortality. They tried every possible weird and wonderful mixture of substances until, entirely by accident, they discovered the first explosive in human history - gunpowder. This black powder is a mixture of three substances - charcoal, sulphur and saltpetre. Had it not been for the search for the immortality elixir, these substances would probably never have been combined because such a combination seemed to serve no obvious purpose. (The explosive power of this mixture depends on the proportions of the three substances and in particular on a high percentage of saltpetre.)

Charcoal had been known for thousands of years. Sulphur was, according to the 'Pharmacopoeia of the Heavenly Husbandman', known and used from the second century AD - the Taoists believed it strengthened the male essence and cured female frigidity. Saltpetre is potassium nitrate and is usually found mixed with similar sodium and magnesium salts. It forms in high temperatures and high

humidity where organic material, especially excreta, can break down. The best places to find saltpetre are therefore in old damp cellars and stables, and in warm climates it may be found lying on the soil (for example, in parts of India and China). A Chinese pharmacopoeia described it as follows:

It is a 'ground frost', an efflorescence of the soil. It occurs among mountains and marshes, and in winter months it looks like frost on the ground. People sweep it up, collect it and dissolve it in water, after which they boil it to evaporate it. The crystals look like the pins of a hair-ornament. Good ones can be about half an inch [12.5 mm] in length.

In China saltpetre was known as *hsiao shih*, which means 'solve-stone'. It was recognised as early as the second century BC and within a few centuries a manuscript known as 'Lives of the Famous Hsien' reported that immense longevity had been obtained through eating 'solve-stone'.

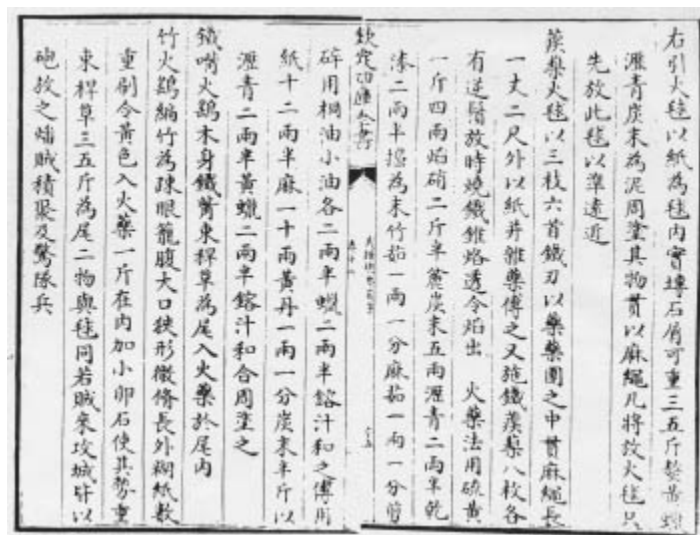
The first known reference to the mixing of saltpetre and sulphur is in the work of the alchemist Ko Hung who lived around AD 300. Some three and a half centuries later, in about 650, the great Sui alchemist Sun Ssu-Mo gave a recipe for combining equal portions of sulphur and saltpetre by grinding them together. He also added the charred pods of the soap-bean tree (which would have provided charcoal). His recipe was very close to some of the earliest forms of gunpowder. In 808 Chao Nai-An compiled 'The Complete Compendium on the Perfect Treasure of Lead, Mercury, Wood and Metal'. This contains a recipe for a 'Method of Subduing Alum by Fire' by mixing saltpetre and sulphur with a dried plant material known as 'aristolochia'. The latter provided carbon and would be enough to cause sudden ignition and flames, though not an explosion. This mixture is certainly a form of gunpowder.

At this period the Chinese alchemists were clearly experimenting with various different mixtures in their search for the immortality elixir. Some of the mixtures were close enough to gunpowder to be dangerous. This is confirmed by the anonymous 'Classified Essentials of the Mysterious Tao of the True Origin of Things', written about 850. This details thirty-five elixir formulae and procedures which, though popular, were wrong, dangerous and discreditable to Taoism. Alchemists were therefore advised not to use them. At least three of these recipes involved saltpetre and would have produced a form of gunpowder. The manual says:

Some have heated together sulphur, realgar [arsenic disulphide] and saltpetre with honey [if dried this would provide carbon]. Smoke and flames result, so that their hands and faces have been burnt, and even the whole house where they were working burned down.

We can therefore date the emergence of the earliest forms of gunpowder to some time around AD 800.

\*



1. The earliest known written formula for gunpowder

The text is the 'Collection of the Most Important Military Techniques' compiled in 1040-4. The formula begins in the sixth column from the right and ends in the eleventh column. (Gunpowder was first known about two hundred years before this text was written.)

Thus in their search for an immortality elixir the Taoist alchemists by chance stumbled across an unlikely mixture of substances - charcoal, sulphur and saltpetre - that would burn easily and, if the proportions were right, explode. The Chinese term *yao* always means 'drug' or 'medicine', and its use in the Chinese name for gunpowder, *huo yao*, which means 'fire-drug' or 'fire-medicine', accurately reflected its true origins. This shows gunpowder's derivation from this mysterious alchemical background and indicates that its explosive potential was an unexpected property. Gunpowder remained a medicine for centuries, even though it did not provide immortality. In 1596 Li Shih-Chen wrote 'The Great Pharmacopoeia' and described *huo yao* as follows:

Gunpowder has a bitter-sour sapidity, and is slightly toxic. It can be used to treat sores and ringworm, it kills worms and insects, and it dispels damp and hot epidemic fevers.

Nevertheless, as so often in human history, the military potential of a supposedly 'peaceful' invention was rapidly recognised. Within little more than a century of its discovery gunpowder was being used by the Chinese in a huge variety of weapons. It was the first stage in the transformation of warfare (and societies) across the globe.