

## THE AEROPLANE

WE all know the story of the Wright brothers – the Americans who flew the world’s first powered aeroplane in 1903. It’s a fascinating and romantic tale which has spawned books and films and turned the pair into US icons.

There’s just one problem: the real story of flight starts on *this* side of the Atlantic.

**Sir George Cayley** (1773-1857) is the real ‘Father of Aerodynamics’. In 1849, he launched a glider at Brompton, Yorks – it was **the world’s first flight**. Wisely, he employed an unnamed 10-year-old boy as his test pilot. (Sir George, a Scarborough baronet and MP, was a prodigious inventor who also worked on self-righting lifeboats, caterpillar tracks and seat belts).

**John Stringfellow** was a tool maker from Sheffield who moved to Chard in Somerset to work in the lace industry. Slightly eccentrically – it was 1842, and airliners were many decades away – he dreamed of setting up the world’s first international airline. With engineer William Henson, he set up the Aerial Transit Company and commissioned brochures which showed aeroplanes carrying passengers on sight-seeing trips over exotic locations like the Pyramids. You can’t fault them for thinking big, but unsurprisingly they failed to attract any serious financial backers. The disillusioned Henson emigrated to America, but Stringfellow (1799-1883) continued undeterred, working out optimum wing shapes and materials, and calculating the surface area of wing needed per pound of weight to produce lift. He built a working aircraft, which had a three-metre wing made from silk with cane struts, featuring a rigid leading edge combined with a looser trailing edge, and a steam engine which powered two propellers. However, it was so delicate that outdoor flights proved impossible – the silk became heavy with atmospheric moisture and gusts of wind could be disastrous – so early attempts at flight took place inside a large silk mill in Chard. Finally, in 1848, Stringfellow’s machine took to the air, unmanned. Although it travelled less than 10 metres, this was **the world’s first powered flight**.

Perhaps disheartened after his years of labour for little reward, Stringfellow – the modern-day lapdance guru Peter is descended from him – put his machine on ice. A model of his aeroplane is on display at the Science Museum.

The quest for manned flight remained. In 1899, the British engineer and glider pilot **Percy Pilcher** (1867-1899) came very close to being a household name and scooping the Wright brothers by several years. Pilcher had earlier designed and built a glider called *Hawk*, and had set a gliding distance record of 250 metres near Eynsford in Kent. Then he set about developing a powered aeroplane, and settled on the idea of a three-winged triplane (multiple wings give extra lift without the huge increase in weight that a single wing of the same total area would need.) Power came from a small internal combustion engine. He had arranged to demonstrate his triplane to the public on September 30, 1899, at Stanford Hall near Rugby. Unfortunately, it was not ready and, so as not to disappoint the crowd, he decided to fly *Hawk* instead. Conditions were very blustery, and the glider's tail snapped off in flight, sending it crashing to the ground, killing Pilcher. In 2002, BBC's *Horizon* commissioned the construction of a replica of his triplane at Cranfield University. It flew for over a minute and was a better machine than the Wright Brothers' 'Flyer'. A monument to Pilcher was built on the spot where he crashed; the original *Hawk* is at the Museum of Flight in East Lothian, and a replica can be seen at Stanford Hall.

## ANAESTHETICS

IMAGINE the scene: it's 1847, and three young doctors are passing round a bottle after dinner. Instead of a vintage port, though, it contains a recently-discovered chemical – chloroform. Each in turn inhales deeply and slips unconscious to the floor. Eventually one of them – **James Young Simpson** – recovers and climbs groggily to his feet. 'My word!' he exclaims, 'This is far better and stronger than ether. It will turn the world upside down!'

Young Simpson and his assistants – Drs George Keith and James Duncan – were not chasing new cheap thrills to compare with opium, but engaged upon a quest which would revolutionise the world of surgery.

At that time, operations were a terrifying prospect. Strapped to a table, given something to bite on and perhaps some alcohol to dull the pain, you would faint from agony if you were lucky, and die of shock if you were not. Medicine had taken a long-awaited leap forward the year before, when ether, another early anaesthetic, had been used for the first time (first in America, and then in Great Britain). But ether had several unpleasant side effects – not least that it was highly flammable and made patients vomit. Young Simpson (1811–1870), a baker's son born in Bathgate, Linlithgowshire, was one of many resourceful Brits striving for something better.

Within four days of discovering the amazing properties of chloroform for himself, he used it to help a woman who was having a prolonged and difficult labour. The first *official* public trial of chloroform in surgery was successfully undertaken by Professor James Miller on 10 November, 1847, in the Edinburgh Royal Infirmary. Operating on a boy aged five, he successfully removed a piece of diseased bone from the child's arm. Miller wrote that there was 'not the slightest evidence of the suffering of pain... He still slept on soundly, and was carried back to his ward in that state. Half an hour afterwards, he was found in bed, like a child newly awakened from a refreshing sleep.' On 20 November, a report was published in *The Lancet* (incidentally, **the world's longest-running medical journal**, founded by Thomas Wakley in October 1823). Despite resistance to chloroform from the church and members of the medical profession, who called it unnatural, it gained the approval of Queen Victoria when the eminent Dr John Snow used it to help her deliver Prince Leopold in 1853 and Princess Beatrice in 1857. Snow, a celibate vegetarian and devout Christian, is regarded as **the world's first anaestheologist**. He experimented on animals to work out accurate dosages and invented equipment to regulate and deliver the amount a patient received.

Strangely, Victoria did not use ‘gas and air’ – today the world’s most common form of pain relief used in childbirth – despite the discovery of its palliative properties more than 50 years earlier. Gas and air is a mixture of nitrous oxide and air or pure oxygen. Nitrous oxide (N<sub>2</sub>O) itself had been discovered by the brilliant Yorkshireman **Joseph Priestley** (1733-1804 – see *Fizzy Drinks*) in 1772, but it wasn’t until the exuberant chemist and serial inventor **Sir Humphrey Davy** (1778-1829 – see *Electric Light* and *Industrial Revolution*) accidentally alleviated a toothache with it in 1800 that its anaesthetic properties were realised.

Davy, a woodcarver’s son from Cornwall with a genius mind and a terror of being buried alive, worked in his early career as a researcher at the Bristol-based ‘Medical Pneumatic Institution’ – a laboratory and clinic which used human guinea pigs to test the effects of various newly-discovered gases. One experiment carried out there was an ill-fated effort to cure Jessie, the daughter of James Watt (see *Industrial Revolution*), of tuberculosis by making her breathe in carbon dioxide (which actually suffocates). Another attempted TB treatment involved arranging for cows to breathe over patients. It was whilst experimenting with nitrous oxide that Davy ‘breathed 16 quarts of the gas in seven minutes’ and became ‘completely intoxicated’. He said it made him feel ‘sublime’ and ‘superior to other beings’. It also temporarily banished his raging toothache and in his first book, *Researches, Chemical and Philosophical, Chiefly Concerning Nitrous Oxide*, published in 1800, he thus recommended it enthusiastically as an anaesthetic.

Sadly, no-one listened and instead it was nicknamed ‘laughing gas’ and used as an entertainment at travelling shows. People would pay to inhale a minute’s worth and become giddy until the effects wore off. It was not until the 1840s that gas and air was first used in dentistry, and it wasn’t used in childbirth until 1881 in St Petersburg.

Between 1933 and 1936, Preston-born anaesthetist **Robert Minnitt** and London engineer **Charles King** created a variety

of gas and air machines, for both home and hospital use, by which women in labour could control their own use of the anaesthetic. A further improvement came when in 1961 when **Michael Tunstall**, from Aberdeen, introduced pre-mixed nitrous oxide and oxygen, rather than air, in a single cylinder, replacing Minnitt's machines.

But what of chloroform? Its use was widespread for the next half century or so, but after fears that it was carcinogenic and could cause heart attacks it was abandoned in favour of safer and far more effective anaesthetics (such as halothane, discovered in Britain by **Charles Suckling** at ICI in 1951, and since used around the world). But not before many people had cause to be eternally grateful to James Young Simpson.

## CHAMPAGNE

'COME quickly, I am tasting stars!' These are supposed to have been the words of the French monk Dom Perignon at the moment he discovered champagne. He could have tasted them decades earlier if he'd crossed the channel and visited the British scientist **Christopher Merrett**.

In 1662, Oxford graduate Merrett (1614-1695), from Winchcombe, Gloucestershire, presented a paper to the Royal Society describing how adding sugar or molasses to wine caused secondary fermentation in the bottle and so created sparkling wine. So, *pardon messieurs*, the 'quintessentially French' drink is actually a *British* invention.

The earliest French document to mention sparkling champagne was written in 1718, and it referred to experiments with secondary fermentation carried out 20 years before. The first French champagne house, Ruinart, was established in 1729, fully 67 years after Merrett first published his discovery.

Of course, once you've invented champagne, you're faced with the problem of storage. The average bottle of champagne contains 50 million bubbles at three times the pressure of a car tyre; ordinary wine bottles tend to explode under that kind of stress. So you need

special toughened glass for the job – and who came up with *that* solution? Yes, that was us, too.

**Admiral Robert Mansell** (1571-1652) set up a glass factory in Newcastle after retiring as a naval officer. He discovered that by adding iron and magnesium to the molten mixture in his furnace he could make much stronger glass. It was this ‘verre Anglais’, and its successor materials, which the French pinched for their fizz. Oh, and we also began employing corks to stop up bottles while they were still using wooden bungs wrapped in hemp, which did not produce a very good seal.

It would be crazy – even in a book celebrating Britain’s greatness – to suggest that our viticulture is better than that found across the Channel. French champagne is the acme of sparkling wines, but UK winemakers like the award-winning Ridgeview Estate in Sussex are proving that Merrett’s methods work well here, too.

## DIETING

**DR GEORGE Cheyne** was **the world’s first diet guru** – despite himself being as fat as a hippo.

A farmer’s son from Aberdeen, he set up a successful medical practice in Bath in 1718 and began treating the aristocratic and affluent who suffered from ‘diseases of over-indulgence’ and frequented the spa town to take the waters.

Cheyne (1671-1743) was highly critical of patients who failed to take responsibility for their own health, claiming that there was nothing more ridiculous than people ‘perpetually complaining and yet perpetually cramming’. In 1724, he wrote *An Essay of Health and Long Life* – the *I Can Make Thou Thin* of its day – which extolled the virtues of exercise and fresh air, and warned against foreign and luxury foods. It also advised purging by making yourself sick.

Sadly, he didn’t take his own advice: by that point, he weighed in at a colossal 32 stones and travelled in a specially-designed carriage, the whole side of which opened to allow him to clamber in and out.

Despite this apparent contradiction, his book flew off the shelves – it was eventually reprinted seven times, and made him one of the best-known physicians in Britain. But his own life at the time must have been hellish: ulcers blistered his legs, he had gout, he suffered headaches, depression and lethargy and was so short of breath that a servant walked behind him carrying a stool so that the eminent doctor could take a rest if he had to travel more than a few yards. Eventually, a milk and vegetable diet helped Cheyne lose two thirds of his body mass, recover his exuberance and make him, in his own words, ‘lank, fleet and nimble’. Although the weight went back on over time, he would return to his milk and vegetable regime to lose the pounds. He died in Bath aged 72 ‘in full possession of his faculties to the last’.

## PLASTICS

PLASTIC is used everywhere from the cockpit of the Space Shuttle to the toothbrush in your bathroom – and **the world’s first plastic** was invented in 1862 by a metallurgist from Birmingham. His name was **Alexander Parkes** and, modestly, he named it ‘*Parkesine*’.

It was made by reacting cellulose (extracted from wood pulp) with nitric acid. The resulting material – chemically, cellulose nitrate – was used to make buttons, billiard balls and combs which Parkes displayed at the London International Exhibition that year. To the Victorians, this was a revelation: a lightweight, man-made substance, transparent or opaque, easily coloured, and capable of being moulded (‘plastic’ comes from the Greek word *plastikos* meaning ‘can be moulded’), carved or spun into fibre.

It was not without its drawbacks, however. The billiard balls made an alarming bang when they collided at speed (a Colorado bar owner who had bought some claimed that the sudden noise resulted in every customer drawing his gun) and it was extremely flammable. It was joked at the time that the perfect Christmas present for one’s mother-in-law was a Parkesine dress and a packet of cigarettes.

Parkes was an enthusiastic inventor, taking out no less than 80 patents during his life. He carried his enthusiasm over into other areas of endeavour, too, fathering 20 children by two wives.

British chemists **John Whinfield** and **James Dickson** made **the first polyester** (see *Synthetic Fibres*) 80 years later and many other plastics have followed.

The most amazing of them – potentially – is ‘Starlite’, created by accident 20 years ago by a former ladies’ hairdresser from Hartlepool called **Maurice Ward**. Ward, an amateur chemist who had set up a small plastics business, was playing around with various chemicals and somehow produced **the world’s most heat-resistant material**. Actually, ‘heat-resistant’ doesn’t really tell the full story: Starlite can withstand temperatures three times that at which diamonds burn. He has been in discussions with NASA (his plastic has an energy absorption rating 2,470 times better than the heat shield tiles used on the Space Shuttle), aircraft manufacturers and governments. The British Atomic Weapons Establishment subjected it to simulated nuclear explosions at 10,000°C, twice, and couldn’t destroy it – whereas pure carbon, which has the highest vaporisation point of all elements, melts at 3,500°C.

If this all sounds too good – and strange – to be true, you can see for yourself: visit YouTube and search for ‘Starlite and *Tomorrow’s World*’. You’ll find a video from the respected BBC TV science programme from 1990, in which a presenter tries to cook an egg coated with a thin layer of Starlite using an oxyacetylene torch. After five minutes of burning at 2,500°C, the egg is still cool to the touch, and when it is cracked open it is still completely raw.

Frustratingly, given its astonishing, almost limitless potential, Ward has so far been unable to agree terms for the commercial use of the plastic. His lawyer, Mishcon de Reya partner Toby Greenbury, told the *Sunday Telegraph*: ‘Maurice is a one-man band. He’s an inventor, and he has an unusual way of looking at things. It has proved to be very difficult to deal with large companies. I would really like to

see this commercialised in Maurice's lifetime. It's difficult to think of another invention that is bigger in its implications.'

## TRAFFIC LIGHTS

**THE world's first traffic lights** were installed at the intersection of Great George Street and Bridge Street near the Houses of Parliament in December 1868. In what seems like an early example of our national mania for health and safety, they were put up 30-odd years *before* there were even any cars on the road. But in fact mid-Victorian London's roads were actually far more dangerous than today's – at least, according to Westminster Council. The council's website claims that 1,102 people were killed and 1,334 injured on the capital's roads in 1866.

Invented by Nottingham engineer **John Peake Knight** (1828-1886), the signals were operated by policemen. By day, the officers would use a lever to move four-foot-long arms to direct the horse-drawn traffic; by night, they would use gas-powered lanterns – coloured red for stop and green for go.

Ten thousand leaflets were printed to tell Londoners how they would work. Unfortunately, a gas leak caused the traffic lights to explode just three weeks after their installation, burning the face of the police officer on duty, and they were dismantled. Knight also introduced the emergency cord in train carriages. Electrically-powered traffic lights were introduced in the 1920s.

## THE VACUUM CLEANER

WHEN **Hubert Booth** watched a demonstration of an 'amazing new cleaning machine' for railway carriages, he was unimpressed. Choked by the flying dust that the American inventor was blowing out of a carpet and trying to catch in a box, he asked why he did not use suction instead. Angry with the Gloucester engineer's impudence, the inventor said that it was impossible and stalked out of St Pancras Station in a huff.

But Booth could not rid himself of the idea and, in 1901, he developed **the world's first vacuum cleaner**. His contraption, called the Puffing Billy, was so big that he used a horse-drawn cart to transport it from job to job and it had to remain outside the building while in use, with an 82ft hose threaded through an open window. Powered by a petrol generator, it was bright red and incredibly noisy. Booth, who was born in 1871, said he was 'frequently sued for damages for allegedly frightening cab horses in the street'.

To promote it, he offered to clean the dining room of a local restaurant for free. It gained huge publicity, and one of his first jobs was cleaning the carpet in Westminster Abbey before the coronation of Edward VII in 1902. Portable electric versions were on the market by 1906, and soon his vacuum cleaners were installed in Buckingham Palace, the House of Commons and Windsor Castle. As the machines were so expensive to buy, roughly £350 each (over £25,000 today using an RPI measure), Booth employed operators to go to people's homes for an annual subscription of £13 (£1,000). It made him a wealthy man.