CONKERS FOR CORDITE

When Britain's war effort was threatened by a shortage of shells, the government exhorted schoolchildren across the country to go on the hunt for horse chestnuts.

In the autumn of 1917, a notice appeared on the walls of classrooms and scout huts across Britain: "Groups of scholars and boy scouts are being organised to collect conkers… This collection is invaluable war work and is very urgent. Please encourage it."

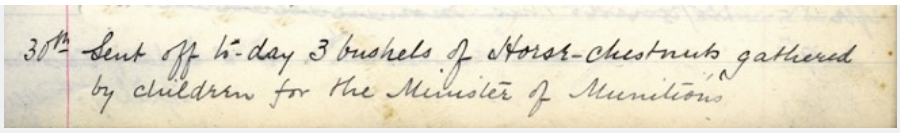
It was never explained to schoolchildren exactly how conkers could help the war effort. Nor did they care. They were more interested in the War Office's bounty of 7s 6d (37.5p) for every hundred weight they handed in, and for weeks they scoured woods and lanes for the shiny brown objects they usually destroyed in the playground game.

Mr. Haylock, the Headmaster wrote an entry in the Willingdon School Log Book for 30 January 1917. 'Sent off today three bushels of Horse Chestnuts gathered by children for the Minister of Munitions.'

Over the previous weeks there were notes in the Log that the children had been out in the parish during the school day collecting conkers as part of the war effort.

Many of the schoolboys belonged to the 1st Ratton Scout Troup founded by Lord Willingdon and the scouts were also seen around the parish busily searching in the grass under the Horse Chestnut trees and filling boxes and baskets with conkers.

Once collected the brought them back to the schoolroom to remove the green shells, leaving just the nuts. These were bagged up in sacks, put on a hand cart and wheeled off to Hampden Park Station ready for collection and transportation by train to London and from there to secret locations.


30th Sent off to-day 3 bushels of Horse-chestnuts gathered by children for the Minister of Munitions

The children's efforts were so successful that they collected more conkers than there were trains to transport them, and piles were seen rotting at railway stations. But a total of 3,000 tonnes of conkers did reach their destination – the Synthetic Products Company at King's Lynn – where they were used to make acetone, a vital component of the smokeless propellant for shells and bullets known as cordite.

Cordite had been used by the British military since 1889, when it first replaced black gunpowder. It consisted chiefly of the high-explosives nitro-glycerine and nitro-cellulose (gun-cotton), with acetone playing the key role of solvent in the manufacturing process.

Prior to the First World War, the acetone used in British munitions was made almost entirely from the dry distillation (pyrolysis) of wood. As it required almost a hundred tonnes of birch, beech or maple to produce a tonne of acetone, the great timber-growing countries were the biggest producers of this vital commodity, and Britain was forced to import the vast majority of its acetone from the United States.

An attempt to produce our own acetone was made in 1913 when a modern factory was built in the Forest of Dean. But by the outbreak of war in 1914, the stocks for military use were just 3,200 tonnes, and it was soon obvious that an alternative domestic supply would be needed.

This became even more pressing during the spring of 1915 when an acute shortage of shells – the so-called 'shell crisis' – reduced some British guns to firing just four times a day.

The British government's response was to create a dedicated Ministry of Munitions, run by the future Prime Minister David Lloyd George. One of Lloyd George's first initiatives was to ask the brilliant chemist Chaim Weizmann of Manchester University if there was an alternative way of making acetone in large quantities. Weizmann said yes.

Developing the work of Louis Pasteur and others, Weizmann had perfected an anaerobic fermentation process that used a highly vigorous bacterium known as Clostridium acetobutylicum (also known as the Weizmann organism) to produce large quantities of acetone from a variety of starchy foodstuffs such as grain, maize and rice. He at once agreed to place his process at the disposal of the government.

In May 1915, after Weizmann had demonstrated to the Admiralty that he could convert 100 tonnes of grain to 12 tonnes of acetone, the government commandeered brewing and distillery equipment, and built factories to utilise the new process at Holton Heath in Dorset and King's Lynn in Norfolk.

Royal Naval Cordite Factory, Dorset - Boiler and Generator House

Together they produced more than 90,000 gallons of acetone a year, enough to feed the war's seemingly insatiable demand for cordite. (The British army and Royal Navy, alone, fired 248 million shells from 1914 to 1918.)

Royal Naval Cordite Factory, Dorset - Acetone Fermentation Tank

But by 1917, as grain and potatoes were needed to feed the British population, and German U-boat activity in the Atlantic was threatening to cut off the import of maize from the United States, Weizmann was tasked to find another supply of starch for his process that would not interfere with the already limited food supplies.

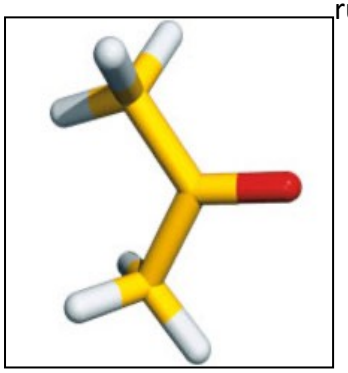
Royal Naval Cordite Factory, Dorset - Acetone Fermentation Tank

Fermentation VATS being erected at Rainham, Essex during the Autumn of 1912

ACETONE PRODUCTION DURING THE FIRST WORLD WAR

'You can have my distillery,' and with these words in 1915–16 Colonel Gooderham generated the second largest fermentation process in the world.

In 1909 in Germany, the pharmaceutical company Badishe Anilin- und Soda-Fabrik (BASF) introduced synthetic indigo, dealing a severe blow to the Indian plantation industry. It was the British, however, that controlled the entire trade in indigo and a manufactured supply meant that an indigo monopoly no longer existed and the price of indigo fell. The German pharmaceutical industry, including BASF and Bayer, had also set its sights on synthetic rubber to replace natural rubber, caoutchouc. In order to avoid a repeat of the indigo disaster, the British scientific community, including Dr Francis Matthews, Nobel Prize winner Sir William Ramsey and Edward Strange, focused their attention on producing artificial rubber.



On 17 December 1909, Matthews and Strange filed a patent describing a process that synthesised a natural rubber monomer, isoprene, from acetone and acetylene. Subsequently, by serendipity, Matthews left tubes on his bench while he went on holiday. On his return he saw that they had solidified as synthetic rubber. He managed to patent his discovery three months before the Germans independently discovered the process.

CHAIM WEIZMANN