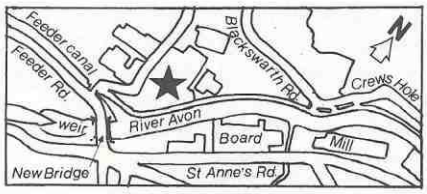
Alkali production at the Netham

Ray Holland



Site map based on road layout pre-1982

Bristol has never been identified with a single industry but always with a multifarious collection of different industries, some disappearing while others emerge and develop. Until recent years there was a flourishing industrial community some two miles east from the centre of Bristol, on the river Avon in the Crews Hole Valley. The largest manufacturing plant was at the Netham Chemical Works which produced alkalis in the late 19th and early 20th centuries. It has disappeared, together with many other industries; lead works, copper-smelting works, brass works, coal mines and the latest casualties, St Annes board mill and the tar distillery set up at the instigation of Isambard Kingdom Brunel. The tar works operated under a series of names, as William Butler Ltd, Bristol & West Tar Distillers Ltd (later a wholly-owned subsidiary of SW Gas Board), and finally British Steel Corporation (Chemicals) Ltd, until it was closed down in 1981 and demolished.

The Netham works occupied 65 acres. The main site had a frontage on to the north bank of the River Avon and the remainder of the works and the waste heap or dumping ground faced the Feeder Canal. The major part of the raw materials and finished products was carried by barges.

The foundations of this great alkali works were laid in the 1840s. *The Bristol Mirror*, 29 March 1845, reported that Henderson and Vesey's Netham Works were bankrupt and being taken over by Stephen Cox. ln 1852, Cox in partnership with a Mr Score, set up as 'Vitriol & Alkali-Manufacturers', but this partnership was soon dissolved and Cox became bankrupt in 1859. Then the chemical works was taken over by the principal creditors and run under the style of Thomas, Prichard & Wethered Ltd. On 5 August 1859 the Netham Chemical Company Ltd was registered. According to the Memorandum & Articles of Association, the company was carrying on the business of 'Manufacturers of Vitriol, Alkali, Soda and other chemical compounds'.

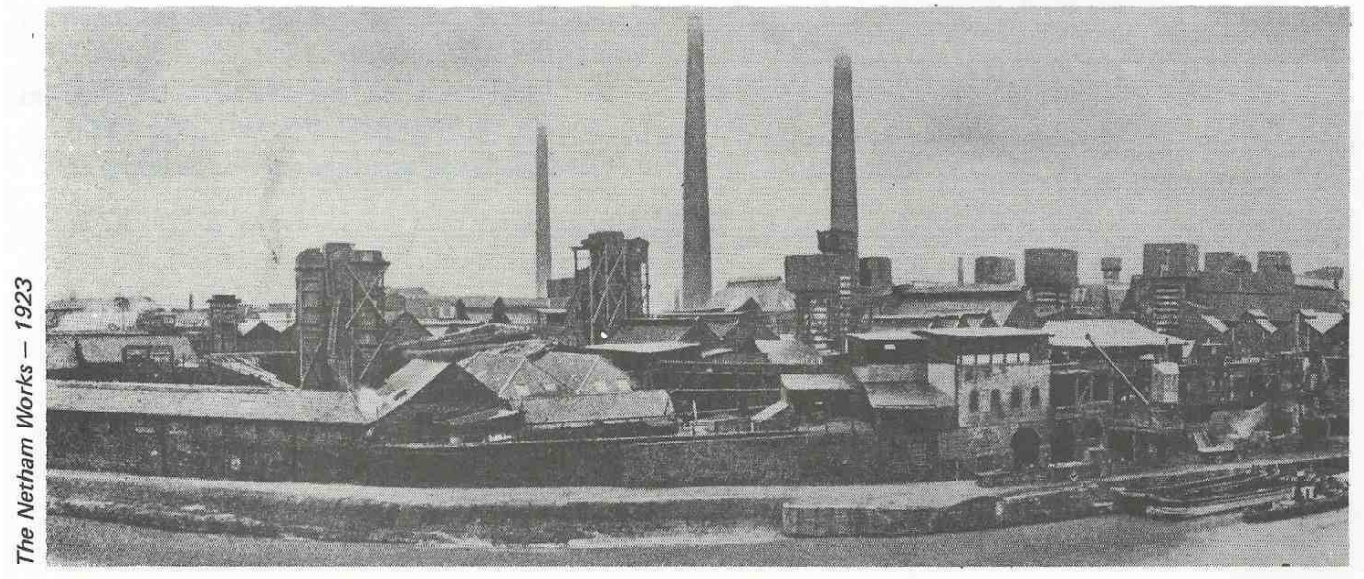
On 1 March 1861 Philip John Worsley was appointed Assistant Manager, and after three months' probation was made Manager. In 1871 he was given a place on the board in appreciation of his management. On 22 October 1890 the Netham Chemical Company Limited was merged with several other companies to form the United Alkali Company Limited and P J Worsley became a director. This company was one of the four founder firms of Imperial Chemical Industries Limited when it was established, 1 January 1927. The panoramic photograph taken in 1923 shows the immense size of the works which was finally closed down in 1949.

The processes

The main processes at Netham were the chamber process, for making sulphuric acid (vitriol), and the classic Leblanc soda process.

In the first of these, sulphur dioxide from roasted pyrites (iron sulphide), principally from the Tharsis Sulphur and Copper Company at Huelva Spain, was converted into sulphuric acid by the action of nitrogen dioxide and water. The chemical reactions took place in huge lead-lined chambers. In 1883 there were 14 chambers, each of approximately 50,000 cubic feet capacity producing a total of 440 tons per week of 70% sulphuric acid.

As originally worked, the first phase of the Leblanc process consisted of salt heated with sulphuric acid, to form sodium sulphate ('saltcake') and for every ton of salt decomposed about 12 hundredweights of hydrochloric acid gas went into the atmosphere! The Alkali Act of 1863 was introduced to limit this emission which destroyed vegetation around the alkali works. The Netham Works was registered under the Act as No 20. In the 2nd Annual Report of the Alkali inspector, Works



The Netham Works – 1923

No 20 merited a comment, 'that from the appearance of the vegetation around there were many well founded complaints!' By the new legislation not less than 95% of the acid gas had to be condensed. The apparatus for this was available, in an absorption tower patented by William Gossage N0 7267 in 1836. It was a packed tower, down which water trickled in counter current to absorb the acid gas.

In the next stage of the Leblanc process, saltcake was heated in rotating cylindrical furnaces (revolvers), with coal and limestone to produce sodium carbonate and calcium sulphide (the mixture being called 'black ash'). Finally, the black ash was treated with water to 'lixiviate' (dissolve and extract) the sodium carbonate, the solution being evaporated to yield 'washing soda' crystals or furnaced to make anhydrous soda ash. The remaining calcium sulphide ('galligu') was deposited on waste heaps which grew at an alarming rate over the years and from which the smell of hydrogen sulphide - bad eggs! - was released in wet weather.

The industry devoted considerable effort attempting to recover the sulphur content of this residue. The first successful process was devised by Ludwig Mond in about 1867 and adopted at Netham in 1868 where it worked for more than 20 years. The alkali waste was partially oxidised to thiosulphate and the sulphur precipitated by adding hydrochloric acid. This process, however, only recovered half the sulphur. It was left to Alexander Chance of Oldbury to devise a method in 1882 which converted the whole of the sulphur in the black ash residue. Carbon dioxide was blown through a slurry of alkali waste to liberate hydrogen sulphide. Concurrently, C F Claus invented a kiln to convert the hydrogen sulphide into sulphur. Licences to work both the Chance and Claus processes were taken out by the Netham Chemical Company on 29 September 1888.

One of the main byproducts of the Leblanc process was ' bleaching powder, made by absorbing chlorine in slaked lime spread in thin layers on shelves in large bleach chambers. The 1891 inventory records: 4 Deacon chambers each 64ft long, 24ft wide and 10ft 3ins deep, each with 256 shelves, with a total shelf area of 744,496sq ft producing 90 to 100 tons per week.

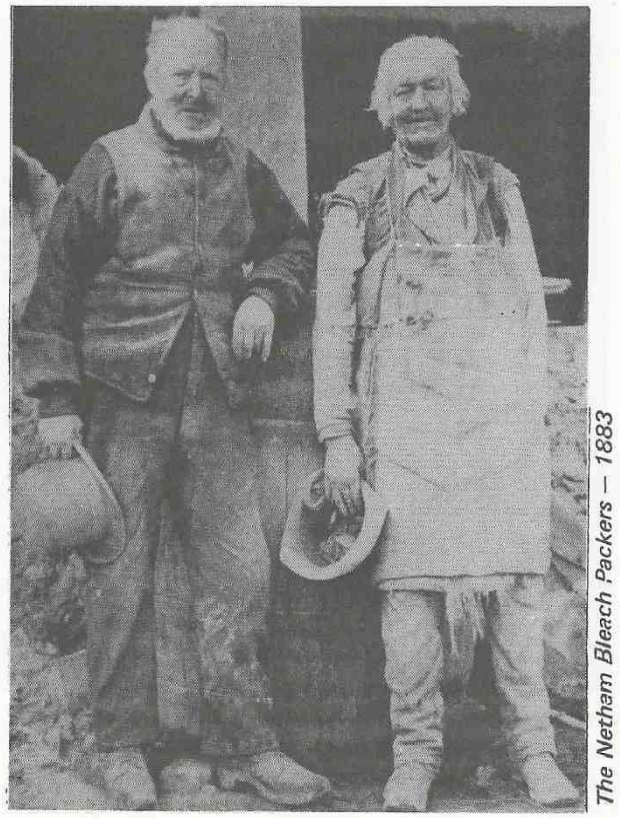
The earliest process used for making chlorine at Netham was by heating salt, sulphuric acid and manganese dioxide in leaden vessels. Later, Yorkshire stone stills were substituted and hydrochloric acid replaced the salt and sulphuric acid. This process was very expensive because no economical method for recovering the manganese dioxide was known until Walter Weldon's invention in 1869, which consisted of blowing air through the chlorine still liquors in the presence of excess lime. Netham took out a licence to work the Weldon process on 18 May 1870.

In a letter dated 22 September 1870 Henry Deacon invited P J Worsley 'to see his new chlorine furnace at Gaskell, Deacon Works, Widnes'. Deacon's patent for making chlorine was No 1403 of 1868. In this process chlorine was generated from hydrochloric acid gas in the presence of air and steam over a copper catalyst. Worsley was evidently impressed and on 1 February 1871 a licence was granted by Gaskell, Deacon & Company to Netham Chemical Company to use their bleaching powder process. In March 1873 Worsley recorded tersely in one of his small memorandum books, 'Deacon plant at work'.

For many years both the Weldon and Deacon processes worked side by side at Netham. However, the 1891 inventory reveals that the Weldon plant had shut down. When the Deacon plant at Netham closed down in 1929 it was the last plant to be worked in this country. (It is interesting to note that Dr Arthur Marsden, formerly Area Scientist, South Western Gas Board, now in his 94th year, recalls seeing the plant in operation!)

The lime dressers and bleach packers were by far the best paid workers and they considered themselves the elite of the works. Their job was certainly dangerous, for chlorine rose from the bleaching powder as it was disturbed and it was impossible to pack the bleach into casks or remain for a few seconds in a bleach chamber unless the worker was protected. He would have smeared grease on his hands and arms, worn goggles and a mask of dampened flannel wrappings, the layers of which stood out three inches beyond his face, to prevent the gas reaching his lungs.

The photograph, taken in 1883, of bleach packers at Netham Works was most probably taken by Cyrus Voss Bark. *The Bristol Times and Mirror* report in 1883 of a visit to the Works concludes: 'An idea of the hard and disagreeable character of much of the work that is done at Netham is conveyed by a series of group photographs taken by Mr Voss Bark by his new instantaneous gelatine process. The men employed by the Company are taken by 'shops' - the workers in the soda shop, the smiths, the basket makers and so on, separately; and they are certainly brought out - features, clothes, dirt and all - with marvellous clearness and fidelity'. Reece Winstone in his book '*Bristol in the 1880s*' plate 130, shows the Victoria Rooms and the adjacent studio with the name 'C V Bark, late Beattie & Bark'.



The Netham Bleach Packers – 1883

When P J Worsley took over in 1861 he soon found out that 'there was too much drinking and for want of the foreman checking their work the workmen often spoiled the materials for want of care and laziness, besides doing far less than a proper quantity for their day's work'. His obituary in 1917 records that 'he gradually introduced improved methods and instituted a system of regular sampling and testing the various stages of the work. Commonsense, with theory as a guide soon began to tell and the reign of chemical anarchy and muddle gave place to order and system'.

In his own recollections, he recalled that 'In the early days there was a large stock of soda ash packed in casks which was unsaleable due to inferior quality' He had it "unpacked, dissolved and finished" [ie furnaced] to produce the proper quality'. Again, after experimenting with the caustic plant which stood idle, choked with spoilt material, he wrote: 'great was my pride when l produced to the Directors a sample that they approved'.

As a young man, Worsley's strong inclination was towards pure science, but his career was made in industrial chemistry. His scanty leisure was given to the cause of education and philanthropy. From the chairmanship of the St George's School Board (Netham was in the parish of St George, Bristol) to the vicechairmanship of the University College, afterwards the University of Bristol, he helped to forward every grade of education in the city. As a memorial of his great work in connection with the University of Bristol and his interest in the School of Chemistry, a gift was made to the Chemical Library which now bears his name, the Worsley Chemical Library. He had given the greater part of his collection of books on chemistry to the University during his lifetime. His family papers, the Worsley Collection, are housed in the University Archives.

The later years

In time, Netham chemicals gained a high repute and were in constantly increasing demand. Yet, when the quality of soda ash was high, it was also over produced. The solution to this problem came when Worsley restarted the production of washing soda crystals which he offered to local wholesale grocers. Sales grew and the crystallising plant capacity was doubled. Worsley reckoned this to be a 'turning point of the fortunes of Netham'. The Leblanc process was eventually unable to compete with the new rival Ammonia Soda Process, and black ash production closed down at Netham in 1904. The successful soda crystal trade was continued by dissolving soda ash from the Fleetwood Works of the United Alkali Company and this output continued for a further 40 years.

Another Netham works activity was the production of ammonia chemicals. The Bristol Gas Company supplied Netham with ammoniacal liquor from at least 1867 until 1939. There had been an agreement for the sale of gas liquor from the Avon Street and Canon's Marsh Gas Works for 5 years dated 31 December 1867. Another agreement in 1879 marked the opening of the Stapleton Road Gas Works. The liquor was used to make some ammonium sulphate and ammonium nitrate but mainly to produce ammonium chloride in a variety of grades: grey galvanizers muriate of ammonia, refined ammonium chloride and sublimed salammoniac. It is interesting to note that grey galvanizersimuriate of ammonia and muriatic acid (hydrochloric acid) went to another great Bristol firm, John Lysaght Ltd at the St Vincent's Galvanizing Iron Works, St Philips, where galvanized iron sheets, corrugated sheeting and wire netting were produced. Around 1883, John Lysaght took the Feeder Farm close to Netham, where he established spelter (zinc) furnaces. During the First World War almost the entire ammonia chemicals production was confined to ammonium nitrate for use in the explosives industry.

Another product made at Netham was superphosphate. It had been made from about 1865 but from 1886 to 1933 Norrington, Hingston & Company took over the production as chemical manure manufacturers in a leased building on the Netham site, supplied with sulphuric acid by pipeline. The Alkali Works Act, as amended in 1881, took chemical manure works under its wing but only for the mixing of mineral phosphate with sulphuric acid. The inspectors had no control over some of the vile-smelling ancillary processes.

The Netham Works which in its heyday employed over 400 people has now disappeared. Today, if you travel down Netham Road towards the River Avon there is on the left the newly-emerged Netham Industrial Park, while on the right is a playing field which was the former waste heap levelled and grassed over by Bristol Corporation. Looking at the site from the Newbridge some of the old arches on the towpath frontage are still visible (cf photograph 1 1923), but no longer can the tallest chimney in the Bristol area be seen. Worsley recalls that the first brick of this chimney, which rose to 300 feet above the surface of the ground, was laid on 2 June 1869. *The Observer (Bristol)* Saturday 1 April 1950, graphically describes that it was felled, with difficulty, on 28 March 1950, and the article concludes: 'the following morning as workers cycled along beside the Feeder Canal they felt something was amiss — the Giant was no longer on the skyline'.

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