CHAPTER 1

The international natural ice industry

Throughout history, ice has been traded in many parts of the world, used by the rich to cool foodstuffs, wine and other drinks. By the late 17th century, it was common for the European upper classes to store ice, and by the end of the 18th century, ice houses were common in most towns and cities.[11] However, the end of the 18th century also marks a turning point: in Europe, the trade in natural ice began to increase. Europe was industrialising, especially in the UK where industrialisation involved further reorganisation of production, expanding mechanisation, urbanisation and population growth.[12] It also meant that more people relied on buying rather than making the food and drink they needed. This put great demands on the suppliers of food and drinks. Supplies often had to be transported over long distances, and it was essential that they were not spoiled during transport or storage.[13] The best way to preserve food was to cool it down, and before artificial methods became available, natural ice provided the best means of refrigeration. Thus, from being the preserve of the upper classes, ice became a household necessity and was in huge demand. In this book, when ice is mentioned it is natural ice unless otherwise specified.

American natural ice production and trade

Plans for the export of ice first emerged in Boston in the US. In 1805, Fredric Tudor, a New England businessman, wrote in his diary about plans to export ice to tropical regions.[14] He and his brother William had

11 Beamon & Roaf (1990), p. 18.
12 Bruland & Mowery (2014), pp. 85–86; Hobsbawm (1968), p. 56; Harley (2014), p. 491.
13 Harley (2014), p. 509.
14 Weightman (2002), p. 7.

already been toying with the idea for a few years.[15] Their business plan was to export New England ice overseas and attempt to achieve a trading monopoly,[16] and in the following year they exported ice to Martinique in the West Indies.[17] Initially, they experienced many practical problems, but after ten years they succeeded in monopolising much of the ice trade from the US to the Caribbean.[18] They then turned their attention to markets in the southern US and in 1833 expanded their export activities to India, China and other Far Eastern countries.[19]

Advanced production techniques were key to the success of the American ice industry. An ice plough was invented in 1827, which saved 60% in labour costs in what had become a highly labour-intensive industry.[20] Subsequent advancements included special tools for almost all stages of the production process.[21]

Despite the Tudor brothers' efforts to monopolise the ice export trade, they began to experience competition from other enterprises in the area. In 1842, one competitor, the Boston-based firm of Gage, Hittinger & Co., made the first attempt to ship American ice to the UK, although without success.[22] In 1844, a consortium of shipping merchants, calling themselves the Wenham Lake Ice Company, tried to ship ice to the UK, having first constructed a series of ice houses on Wenham Lake (six miles north of Salem in Massachusetts).[23] Their first consignment left Boston for Liverpool in June 1844. It was a great success and Wenham ice became synonymous with high quality natural ice.[24] The Wenham Lake Ice Company gained a unique position in the UK ice market, creating a brand that was in huge demand. (It also launched affiliated products

15 Smith (1981), p. 43. Smith's collection. Manuscript letter, Boston, 17 June 1806, by William Tudor Jnr, describing in detail he and his brother's first attempts to market ice in the West Indies.

16 Smith (1981), p. 43; Weightman (2002), p. 11. Smith describes the strategy as follows, '… he (Tudor) employed every art and device business practice could contrive to retain his monopolies over the trade.'

17 Beamon & Roaf (1990), p. 11; Smith (1981), p. 43.

18 Beamon & Roaf (1990), p. 38; Weightman (2002) pp. 39–43.

19 Smith (1981), p. 43–44; Beamon & Roaf (1990), p. 39.

20 Cummings (1940) in Beamon & Roaf (1990), p. 41; Cummings (1949), p. 22.

21 Beamon & Roaf (1990), pp. 39–41.

22 Smith (1981), p. 44.

23 Beamon & Roaf (1990), p. 41; Smith (1981), p. 44.

24 Smith (1981), pp. 45–49.

such as the Wenham Lake refrigerator – an icebox – designed for the use of Wenham Lake Ice only.)[25] A number of affiliates emerged in different cities, such as the ice import firm Wenham Lake Ice Company founded in Liverpool (later named Messrs H. T. Ropes and Co.).[26] As many had before them, the company soon realised that success breeds competition, and in 1846 their prices in the UK were undercut by Norwegian exporters, who charged less for Norwegian ice.[27] In 1850, increasing volumes of ice were supplied to the UK from Norway and less from Lake Wenham, where provision for domestic consumption took precedence.[28]

However, the name Wenham Lake Ice continued to be used in the UK market, but now in connection with ice from Norway. There are a number of explanations for this. One is that, in a last ditch attempt to recover profits, the Wenham Lake Ice Company bought the rights to produce ice from a lake in Norway (Oppegårdstjernet) close to Drøbak and Christiania (later Oslo) Fjord and branded it as Wenham Lake Ice for sale in the UK.[29] A second is that, in the 1860s, an English brewer obtained the rights to sell ice in the UK from the same lake under the name of Wenham Lake Ice.[30] A third explanation is that it was an English speculator who sold ice in London from the lake Oppegårdstjernet as Wenham Lake Ice.[31] Finally, the fourth story is that it was the ice merchant Søren Parr, one of the largest ice merchants in Norway, who sold ice from the same lake as Wenham Lake Ice, in London.[32] The idea is supposed to have come from a Mr Playford, Parr's agent in London, who believed that the brand name would make it easier to sell the ice for high prices as a bespoke quality product.

That Norwegian ice sold in the UK was branded as Wenham Lake Ice may well have stimulated the export of ice from Norway to the UK.[33]

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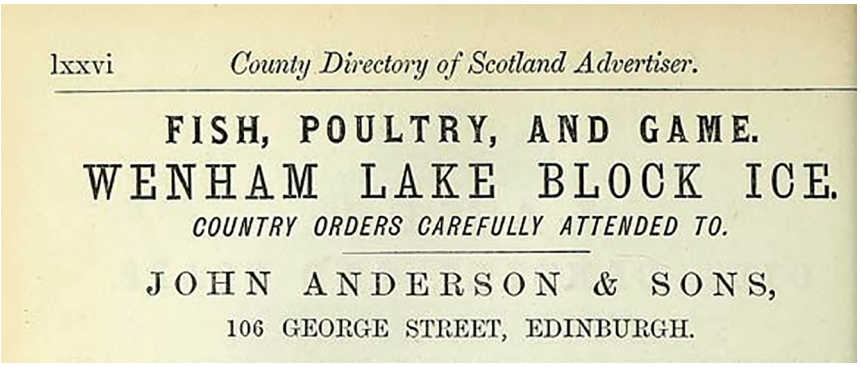
25 Smith (1981), p. 45–49; Weightman (2002), pp. 142–145; Beamon & Roaf (1990), pp. 43–46.
26 *Cold Storage and Ice Trades Review* (15 February 1900).
27 *London Times*, 23 and 30 April 1846. In Smith (1981), p. 49.
28 Smith (1981), pp. 45–49; Weightman (2002), pp. 142–145; Beamon & Roaf (1990), pp. 43–46.
29 Smith (1981), pp. 45–49; Weightman (2002), pp. 142–145; Beamon & Roaf (1990), pp. 43–46.
30 Worm-Müller (1935), p. 689.
31 The Norwegian newspaper *Morgenposten* (24 December 1864).
32 National Library of Norway. The *Worm-Müller Collection III* transcribed interview of 23 May 1935 with Kammerherrerinde Egeberg, born Parr (daughter of Søren Parr).
33 Cummings (1949), p. 48.

In the 1872 County Directory of Scotland, John Anderson & Sons of Edinburgh advertised Wenham Lake Block Ice with '*Country orders carefully attended to*' (Picture 1-1). Three years later, the company purchased its first ice from the Norwegian company T. J. Wiborg Jnr and a business relationship was established that was to last until 1898.



Picture 1-1. Advertisement for Wenham Lake Block Ice (1872).
Source: Scottish Post Office Directories, County Directory of Scotland (1872).

The Wenham Lake Ice Company's adventure in London lasted for about five years. Its demise was the result of high transport costs which made the product uncompetitive in the face of ice imports from Norway.[34] During the 1840s, the Norwegians had successfully copied American ice production techniques and they knew how to operate an efficient business.[35] From the 1850s, Norway supplied most of the UK ice imports. Norway was close to the markets in the North Sea area and had an abundance of good quality natural ice, which was harvested during cold winters from numerous lakes close to the sea, notably in and around Christiania Fjord.[36]

34 David (1995), p. 53.
35 Weightman (2002), p. 140.
36 Ouren (1981), p. 31; Weightman (2002), p. 144.

European natural ice production and trade

Natural ice was not only produced and harvested in Norway.[37] Across Europe, natural ice continued to be produced and harvested on a regular basis in the 1800s and early 1900s. Exports of ice became more common and the harvesting and production of ice from glaciers, lakes and rivers in countries such as Germany, Austria, Switzerland and France acquired a distinct industrial character.

Swiss ice was exported by rail to Germany and France – for example from Lake Brenet in Valleé de Joux to France. The company La Société anonyme pour l'exploitation des glaces des lacs de la Vallée de Joux, founded in 1879, acquired the rights to produce ice from this valley.[38] It built a railway from Lake Brenet to the town of Vallorbe in 1885, went bankrupt in 1886, but later acquired new capital and recommenced its operations. The stated aim of the company was to produce ice 'of exceptional quality' and transport it to the breweries of Paris, Lyon, Geneva and other larger cities. The breweries needed ice for cooling during production.[39] At the height of its activity, the company exported about 40,000 tons of ice per year, using around 3,000 fully loaded rail wagons.[40] The company was eventually dissolved in 1942. Another Swiss company was owned and run by the local authorities in Rothenthurm.[41] It built an ice dam in the town and began production in the 1890s,[42] selling and transporting ice by rail, mainly to breweries in Switzerland, but also in Germany. Around the turn of the century, approximately 5,000 tonnes of ice went by rail every winter and, in the record years of 1910 and 1911, took up more than 1,300 fully loaded freight wagons. Ice was also exported from Switzerland to Munich, Dresden and Hamburg, and Swiss ice was

37 The term 'harvesting' is used when ice is sourced from ponds that have not been substantially worked prior to ice cutting. The term 'production' is used in connection with the sourcing of ice from ponds where prior work had been carried out and where infrastructures were involved. See also page 31 'The difference between ice harvesting and (industrial) ice production'.

38 *Compagnie du Train à Vapeur de la Vallée de Joux; L'histoire de la ligne Le Brassus-Vallorbe,* https://www.ctvj.ch/lassociation/histoire

39 Norseng (2019), p. 228.

40 *Das Tropeninstitut, Kalt Machen* https://wildeswissendotnet.wordpress.com/2012/10/10/kalt-machen/

41 Gisler (2008). http://www.moorevent.ch/de/geschichte/natureisproduktion/

42 Gisler (2008).

used to cool drinks onboard some of the large ocean liners that traversed between Europe and the US.[43]

In Austria, ice production was an important industry, and Zell am See in Salzburg was a key location, where production in the 1880s employed around 450 seasonal workers a year, including local farmers in need of winter work and people who travelled long distances from Bavaria in Germany.[44] In 1884, between mid-February and the end of March, 3,133 wagon loads of ice left the area, of which 1,228 were for domestic use and 1,905 bound for Germany.[45] German stakeholders, including the major company Münchener Eiswerke, based in Munich, held shares in the production of ice from Lake Zell. The company was also involved in the harvesting of snow from below the Birnhorn Glacier and ice from Lake Griessensee, where the company built three large ice houses, with two more in Hochfilzen. All transport was carried out by rail, which was the only alternative for the long-distance transport of ice on land.[46]

In Germany, natural ice was harvested and produced all over the country, from Schleswig-Holstein to the Alps, and in normal years the country was almost self-sufficient.[47] In Picture 1-2 below we see ice being produced at Lake Rummelsburger on the River Spree in Berlin. The company Norddeutschen Eiswerke owned the rights to ice production at this location and was the largest producer of ice in the Berlin area.[48]

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43 Fischer-De Santi, *Ein eiskaltes Geschäft, auf der Webseite des Oldtimer Club Feldschlösschen* https://www.oldtimerclub-feldschloesschen.ch/brauereigeschichte/historische-geschichten-details/

44 Müller (1995), pp. 783–786; *Chronik, Eisrennen am Zeller See*. https://www.thumersbach.at/eisrennen/html/eisdecke.html

45 Destinations in Austria included Vienna, Linz, Wels, Lambach, Redl-Zipf and Hallein, and in Germany, Munich, Ulm, Stuttgart, Karlsruhe, Heidelberg and Frankfurt am Main.

46 Müller (1995), pp. 793–794.

47 Berdrow (1896), in Zeitschrift „*Gartenlaube*"- Ausgabe 47. https://www.berlin-eisfabrik.de/Geschichte/Natureis.html

48 Ibid.

Picture 1-2. Ice production at Lake Rummelsburger near Berlin.
Source: Teltower Kreisblatt (18 September 1886), p. 554.[49]

In Germany, natural ice production was industrialised and was soon controlled by large companies. In 1896, Norddeutschen Eiswerke employed up to 1,200 people who produced ice in the company's various ice plants in the Berlin area.[50] When the winters were mild, imports of ice increased markedly, most of it from Norway.

In France, as in Germany, natural ice production became industrialised in the 19th century with the construction of large ice ponds and ice houses.[51] In the early 1800s, Paris was known for the ice house at Saint Ouens, which stored ice from the Seine and the Canal Saint Denis.[52] An improved road network permitted widespread transport of ice by horse and cart, and when the railways were expanded in the late 1800s, long-distance transport shifted to the railways, causing a fall in the price

49 *Teltower Kreisblatt* (18 September 1886), p. 554. https://www.berlin-eisfabrik.de/Geschichte/Rummelsbg.html

50 Ibid.

51 *Histoire de l'eau à Hyères, La glace de la nature*. http://www.histoire-eau-hyeres.fr/616-histoire_glace-pg.html. AcovitsotiI-Hameau (2005), Historical Provence Paper 220.

52 Beamon & Roaf (1990), p. 52.

and increasing the consumption of ice. Ice from the Alps could now be offered across large parts of France at competitive prices. During the 19th century, factory production of 'artificial' ice was developed and eventually gained a significant market share in some locations. Although factory-made ice gained market shares when it became feasible, natural ice retained its importance in France until the 1920s because many customers preferred it.[53]

In the UK, large-scale imports of ice began in the 1840s, initially from the US and then, from the late 1840s, Norway. Previously, most ice had been harvested locally in the UK, but a series of mild winters caused domestic production to go into decline, unable to meet the growing demand.[54] Another problem was that ice was harvested from partly polluted natural channels. In London around 1850, the ice merchant and ice-cream manufacturer Carlo Gatti was allowed to harvest ice from Regent's Canal, close to the city centre.[55] However, the company soon began to import ice from the US and then also from Norway, which was of much greater purity than ice made from contaminated canal water. Imports of natural ice started more or less simultaneously with the expansion of the UK rail network, and fledgling importers boasted that they could deliver ice anywhere in the country within 24 hours.[56]

It was the combination of demand, import opportunities of good quality ice and good rail links across the country that encouraged the UK to import rather than produce natural ice. This was a very different approach to most other European countries.[57]

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53 Encyclopædia Britannica (2020). https://www.britannica.com/technology/refrigeration. Commercial refrigeration (and ice making) was initiated by inventions in the late 1850s. The inventions were followed by innovations in freezing and refrigeration technology which eventually made factory ice competitive with natural ice by about 1900.

54 Beamon & Roaf (1990), p. 33.

55 Kinross (1991), pp. 25–26.

56 Beamon & Roaf (1990), p. 33.

57 Ibid.

Norwegian natural ice production and trade

The so-called 'last ice age' in Norway started in the late 1840s and lasted for almost 100 years. Although small-scale exports of ice continued into the 1960s, trade had virtually stopped by the beginning of the 1930s. In February 1932, the trade journal *Cold Storage and Produce Review*[58] reported that the quantity and value of Norwegian natural ice imported into Great Britain and Ireland in January amounted to zero.[59] Norway's success in the ice export trade was undoubtedly linked to the ability to produce a quantity of natural ice far greater than domestic demand, unlike most countries in Europe, and it could therefore offer large quantities of ice for export. Norway also had a low-cost workforce and a large fleet of wooden sailing ships suitable for transporting ice, which employed seamen at low wage levels. In addition, there had been innovations in communication; the telegraph had come to Norway in the 1850s and was in operation between Norway and Europe from the 1870s, making it easier to conduct business over long distances.[60] This created a good basis for competitive production and transport that, together with better communication, laid the foundations for a major new export industry.

However, it was a British pastry chef, William Leftwich, who, according to T. J. Wiborg, first exported Norwegian ice to the UK.[61] In 1822, the Norwegian newspaper *Morgenbladet* reported, under the headline 'Trade speculation in Norwegian ice',[62] that Leftwich had chartered a vessel (called the *Spring*) to sail to a location north of Trondheim, where a cargo of nearly 300 barrels of ice (each weighing 20 centner – 2,000 lbs/907 kg) was loaded.[63] He sold the ice in London for GBP 12 a barrel. With total costs of about GBP 1,000, he made himself a nice little profit. T. J. Wiborg

58 The journal was published in 1898 under the name *Cold Storage and Ice Trades Review*. It changed names in 1911 to *Cold Storage and Produce Review*.

59 *Cold Storage and Produce Review* (18 February 1932), p. 48. In the *Cold Storage and Produce Review*, the last trace of Norwegian ice export I have found is from October 20, 1932, p. 210, when it was reported that during September 1932, 33 tons of Norwegian ice were imported.

60 Sætra (2008), pp. 61–68 in Onestad (2016), p. 46.

61 Wiborg (1914), p. 1.

62 *Morgenbladet* (11 August 1822), pp. 1783–1784.

63 *Store Norske Leksikon* (Norwegian encyclopedia) (2018). https://snl.no/quintal.

describes Leftwich as London's first ice merchant.[64] Leftwich continued this success and founded a firm that came to dominate ice imports to London for over 100 years.[65]

After this modest beginning around 1820, exports from Norway remained low until the late 1840s when they expanded significantly. After the abolition of the so-called Corn Laws in 1846 and the subsequent repeal of the British Navigation Act in 1849, Britain adopted free trade principles leading to a boom in trade which was fully exploited by ice merchants.[66] The ice trade continued to grow until the turn of the century,[67] with a peak in 1898 when a total of 553,366 register tons of ice were exported (valued at NOK 4,706,000).[68] The following year, volumes started to decline and this continued during The First World War. By the end of the 1920s, Norway's ice trade boom was over.

Refrigeration and industrialised production of ice

One major reason for the decline in the production of natural ice was increased competition from refrigeration and factory-made artificial ice. The basic scientific and technological principles of cooling had been known since 1755, when Professor William Cullen published his 'Essay on Cold produced by Evaporating Fluids' and described his water evaporation apparatus, generally regarded as the beginning of the art of refrigeration.[69] In the period that followed, knowledge in the field

64 Wiborg (1914), p. 1.

65 Wiborg (1914), p. 1. From the *Yarmouth Weekly Standard* (11 December 1908). In Beamon & Roaf (1990), p. 46.

66 O'Rourke & Williamson (1999), p. 77. England's Corn Laws, regulations governing the import and export of grain. The Corn Laws were repealed in 1846. https://www.britannica.com/event/Corn-Law-British-history, https://snl.no/kornlover The Navigation Acts dating from 1651 were a series of English seafaring laws enacted to restrict other nations from participating in British trade. The Acts limited the right of other nations' ships to carry cargo to and from Great Britain and between the British colonies. Only ships from countries where the goods were produced, in addition to British vessels, could transport goods to Britain. https://www.britannica.com/event/Navigation-Acts, https://snl.no/Navigasjonsakten

67 Statistics Norway. Tables relating to Norwegian commerce.

68 Statistics Norway. Historical statistics of external trade (1898), Tables relating to Norwegian commerce.

69 Smith (1943), p. 101; Thevenot (1979), pp. 28, 402. Cullen was Professor of Chemistry at the University of Glasgow.

gradually improved.[70] In 1819, Robert Salmon and William Warrel took out what is said to be the first patent for artificial production of cold.[71] Commercial refrigeration was in operation from the late 1850s and developed in two main directions. The Australian James Harrison invented and patented the first vapour compression machine to be used in ice manufacturing in 1855, and in 1859, the French engineer Ferdinand Carreé introduced the ammonia absorption machine.[72] According to Roger Thevenot, these two machines were, world-wide, the only two suitable for making artificial ice in the beginning of the 1860s,[73] and both principles came to be extensively used in the coming decades.[74] In 1861, the world's first freezing works were erected in Australia to freeze meat. In 1871, the German Carl von Linde published the paper 'Improved ice and refrigeration machine' and the year after took patents in Germany and England for an ammonia compression machine.[75] The Scotsman David Boyle developed a similar machine, and from 1878 to 1888 his company delivered a total of 200 larger ice and refrigeration plants.[76] In most countries where refrigeration plants were built in the late 1800s, their first use was to produce artificial ice.[77] In Norway, the first three mechanical refrigeration plants were built at the turn of the century by Kampens Mechanical Works (in Kristiania). A few years later, a department for refrigeration machines was established at the Myren Mechanical Works (in Kristiania) and transferred to Drammen Ironworks (in Drammen) in 1912.[78] As we can imagine, from the late 1800s factory-made artificial ice became a highly competitive product and the market segment for natural ice contracted.

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70 Bruland (2022), p. 99; Thevenot (1979), p. 28.
71 Smith (1943), p. 101; Thevenot (1979), pp. 38, 76.
72 Borgnes (1968), pp. 25–26; Smith (1943), p. 103; Thevenot (1979), pp. 38, 402.
73 Roger Thevenot was Director of the International Association of Refrigeration, and the International Institute of Refrigeration (1956–1971).
74 Thevenot (1979), p. 72.
75 Borgnes (1968), pp. 22–23; Smith (1943) p. 104.
76 Ibid.
77 Thevenot (1979), p. 74.
78 Borgnes (1968), pp. 23–24.

For centuries ice had been traded in many parts of the world, used by the rich to cool foodstuffs, wine and other drinks. A turning point came at the end of the 18th century when the trade in natural ice began to increase. Europe was industrialising, the population was growing and the best way to preserve food was to cool it down. Ice became a household necessity and was in huge demand. The export of ice started in the US in the early 1800s. Across Europe, natural ice was produced and harvested on a regular basis in the 1800s and early 1900s. In the 1840s, Norway became the main ice-exporting nation in Europe and remained so for almost the next 100 years. From the late 1800s, factory-made artificial ice became a strong competitor to natural ice.