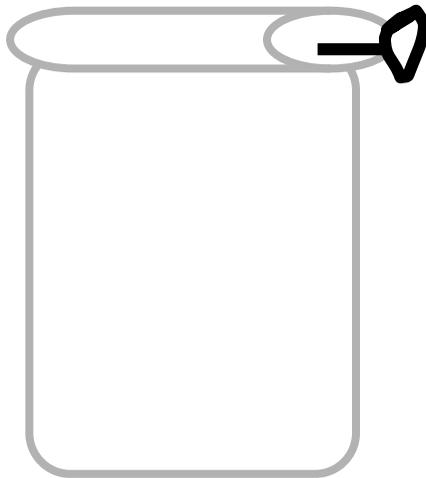


The History of
“Smoked Norwegian Sardines”



Acknowledgements

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Foreword

The History of “*Smoked Norwegian Sardines*”: Norwegian Canning Museum, Stavanger

The story of “*Smoked Norwegian Sardines*” began in Stavanger nearly 120 years ago. On the business side, Carl Frederik Kolderup has covered the subject fully in his publications in *Blad av Hermetikkindustriens Historie* Vols. 1-6. But the technical side of the story, which tells of all the would-be inventors who made “the sardine story” possible, is found only in fragments – in old newspapers, journals, patent descriptions, and in grandchildren’s memories and grandfather’s escapades. The technical story of the canning industry is thus in danger of being forgotten.

Jørg Hviding has already made an important contribution to the subject when he offered to write *Kappløpet om Falsmaskin* (*The Race for the Seaming Machine*), which was published in 1994 for the Norwegian Canning Museum. In that booklet, he tells of the development of sardine can and the machines used to seam them.

In this second volume, Hviding relates the history of “Smoked Norwegian Sardines”. Here he deals with other important issues, including the Norwegian Sardine and its smoking process. In the first part of the book we follow Torkjel Aarestad’s early attempts to smoke brisling in (the street in Stavanger) Øvre Strandgate, up to Stavanger Preserving’s mass production and marketing of sardines all over the world. In the second part, he tells of the attempts with different types of smoking kilns to produce the best product.

Jørg Hviding is very well qualified to tell this story. He was employed at the Hermetikkindustriens Laboratorium – later Norconserv, from 1948 until his retirement in 1990.

He is also responsible for the invention of several machines which are still in use in the sardine industry, and has also been involved with the building up of the Norwegian Canning Museum from its inception.

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Introduction

Smoking of food such as fish and meat is, along with salting and drying, by far the oldest way of preserving food. The preservation is achieved by reducing the water content of the food so that (for example) the bacteria that cause the decay are inhibited. The best keeping properties come about when fish and meat are dried over an open fire because smoke contains formaldehyde, which has a preservative action on food. Today, what is known as smoking is a combination of salting and drying as well as smoking.

At the beginning of the nineteenth century, Napoleon's devastation of Europe was at its worst. He had a great deal of difficulty in keeping his soldiers alive and in fighting condition, not only because of the musket fire of the enemy, but just as much because of food poisoning. So he offered a reward of 12,000 francs to anyone who could find a technique for preserving food for a period of time. The French chef, Nicolas Appert (1749-1841), won the prize and is considered these days to be "The Father of Canning". He showed experimentally that foods could be preserved for a considerable period if they were put into ceramic or glass containers, carefully sealed and then covered in a vat of boiling water.

Nicolas Appert (1749-1841) demonstrated that foodstuffs could be preserved for a comparatively long time if they were boiled in a vat of water in sealed containers. It is for this reason that he is considered "The Father of Canning".

Appert started a number of factories in France for the production of canned meat and vegetables. However he did have considerable difficulties with the ability of the products to stay in good condition, and undertook a number of experiments to improve this state of affairs. This resulted in the invention of the autoclave (pressure cooker), for which his son, Raymon Chevalier Appert, was granted a patent in 1852. The autoclave made it possible to "boil" – and thus sterilize – foodstuffs at a temperature higher than 100 °C so that all the bacteria were rendered harmless.

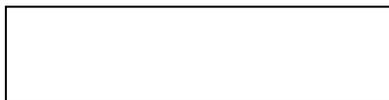


(Photograph: Norwegian Canning Museum)

Nicolas Appert published his results in his famous book *L'Art de conserver pendant plusieurs années Toutes les substances Animales et Végétales* (*The Art of Conserving all animal and vegetable substances for several years*). It is worth noting that Appert discovered this 30-40 years before Louis Pasteur (1823-1895) demonstrated that rotting and fermentation were caused by living micro-organisms, which can be destroyed by heat.

What today is known as “Brisling Sardines” – originally called “Smoked Norwegian Sardines”, is produced from warm-smoked brisling, *Clupea Sprattus*, which is put into a can and covered with olive oil or tomato sauce*. The can is sealed, and can and contents are sterilized. The technique of production is characteristically Norwegian, and has remained almost unchanged since the development of the product nearly 120 years ago.

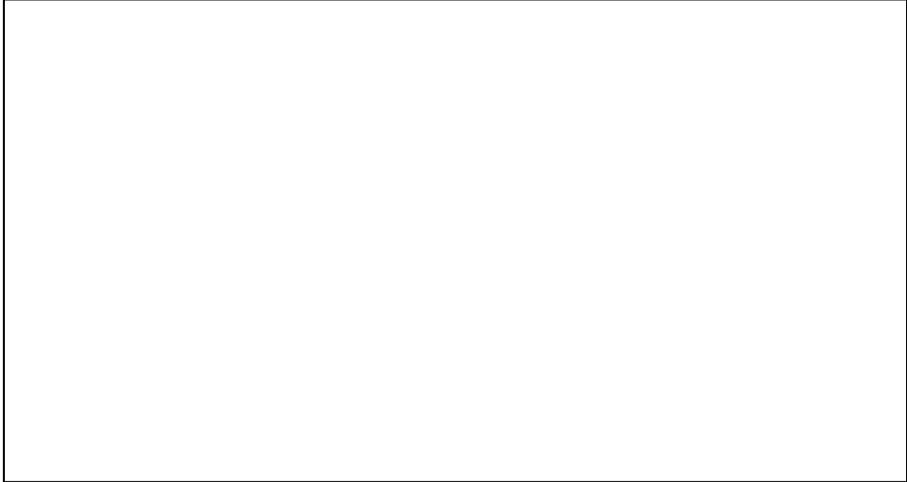
Norwegian “Brisling Sardines” should not be confused with French, Spanish or Portuguese sardines – hereafter called “French Sardines”. These derive from the sardine *Clupea Pilchardus*, which is found in the Mediterranean and elsewhere, and is very similar to Brisling in size and shape. French sardines are not smoked, but were originally boiled in oil before being packed in flat rectangular cans (similar to the Norwegian sardine cans), covered with olive oil, sealed and sterilized.



Brisling, “*Clupea Sprattus*”, is caught in the fjords of southern Norway, in the Baltic, and in the North Sea off the coast of the British Isles. It can be between 7 and 14 cm. long depending on its age of between 1 and 5 years. Brisling and mussa (small herring) are outwardly quite similar, but can be distinguished from each other by stroking a finger along the lower side. Brisling has sharp barbs. Mussa is smooth. (Photo: Tidsskrift for Hermetikkindustri.)

The Sardine, “*Clupea Pilchardus*” is caught in the Mediterranean, the Bosphorus and the Sea of Marmora. It is between 8 and 16 centimetres long depending on its age of between 1 and 5 years. There is also a slightly larger type of sardine in the Atlantic Ocean.

* Other sauces, including chili, salsa, and mustard, and soya bean oil, have been introduced since the original Norwegian version of this booklet was printed.



*The stages in production for “French Sardines” consisted originally of: Decapitation, Cleaning, Salting, Air-Drying, Boiling in oil, Cooling, Removal of fins, Packing in cans and Sterilizing. The picture shows Boiling in oil.
(Photograph: John Gunnar Johnsen)*

The method of production for “French Sardines” has been developed and changed a number of times over the years. Today the fish are placed in the cans raw, boiled and dried in special steam chambers, before olive oil is added, and the cans sealed and sterilized in an autoclave (pressure cooker).

The sardine industry in the above-mentioned countries started at the beginning of the 1820s, and over the course of the next 50-60 years built up a considerable market for its canned sardines both in Europe and in the U.S.A. Production was of the order of 80 million cans per year. However, 1880 was the beginning of a period of some 30 years when there were fewer fish to be caught, and so the French sardine industry lost a large share of the market, to the advantage of – amongst others – the Norwegian sardine industry.

Part 1 *“The Story of the Sardine”*

The first canning factory in Norway, A/S Christian August Thorne*, was based at the town of Moss. At the beginning of the nineteenth century, the processing and preserving of fish in Norway was concentrated on the salting of winter herring and brisling, the smoking of spring herring, and the preparation of anchovies from brisling.

This activity took place mostly in the areas around Bergen and Oslofjord. Herring was exported to Russia and the Baltic countries, while salted brisling and anchovies went largely to Sweden and Germany, and again to the Baltic port cities.

In 1841 Chr. August Thorne set up the country’s first canning factory in Drammen (outside Oslo). The main production items were canned meats and vegetables for the sailing ships, since scurvy and beri-beri were somewhat of a scourge at that time. This was particularly for sailors who could be out on the high seas for long periods.

Thorne also experimented with a number of delicacies, such as canned capercaillie (both cock and hen), and hare. In 1846 he moved his activities to Moss, where he considered that he would have better access to meat and vegetables, and not least brisling for the production of anchovies.

It is interesting to read about Thorne’s efforts to learn about canning and food production. After many setbacks he was able to serve as an apprentice with a French cook at the Royal Danish Kitchens of King Christian VIII at Copenhagen.

This was before the discovery of sterilizing, and so the cans were boiled only at 100°C. Thus the shelf life of Thorne’s cans were quite limited. After a comparatively short time, more than a third of the production was spoiled.

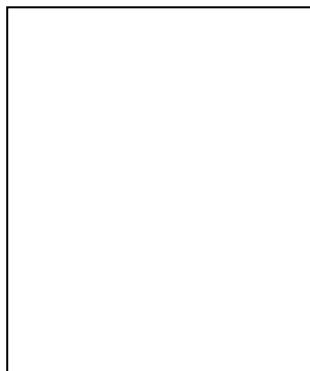
With the assistance of the Royal Department of Internal Affairs, Thorne was later able to come to a larger meat-canning factory in London. It was here that he learnt about sterilizing and canning in an autoclave at between 110-115°C.

On his return to Norway he quite quickly obtained an autoclave and went straight into production with the canning of meat. This time things went better. During the Danish-German War he provided the majority of the canned meat to the army suppliers. Later he made regular deliveries to the army and navy in Norway and Denmark, while continuing to supply the long-distance sailing ships.

* “A/S” is the Norwegian abbreviation for “Company Limited”. The company in question is usually referred to, and will be hereafter referred to as “Chr August Thorne”

*The City Mayor **Chr. August Thorne**, (1810-1886)
Thorne established the first canning factory in Norway, beginning in Drammen in 1841, with the production of anchovies in wooden barrels which were mainly exported to Sweden and Germany. Later he began production of canned meats and boiled the cans in open pans. The keeping ability was mediocre at best. In information provided to his customers in 1857 we read: “The metal cans are opened with a hammer and a knife by making a circular hole in the lid. If the sides of the can are badly distorted, and do not return to their correct shape after being pressed, they are damaged and will be replaced, or the money refunded, when the cans are returned to us unopened.”*

(Photograph: *Tidsskrift for Hermetikkindustri*)



Other Canning Pioneers

For the rest of Norway, we have to wait until 1860-1870 before we come across other canning factories. In 1866 the company Norwegian Preserving was established in Mandal, and it was followed by Christiania Preserving Co. in Christiania (Later Oslo). For a few years in the mid-1860s Th. (Thomas) A. Lyks also directed a quantity of canning production in Christiansund. In 1860 Hagtor Thorsen set up a factory at Sunde in Sunnhordland (between Stavanger and Bergen on the west coast). Stavanger itself, which was to become the centre of the Norwegian sardine canning industry, received its first canning factory in 1873.

What was common to all these early canning factories was that they had a wide range of products. They were divided into two groups: one was based largely on “meat and soup”, aimed at the country’s shipping fleet; the other was for the home market and consisted of soups and ready-cooked portions of meat, fish, game, vegetables and berries.

Thorne also canned brisling, following the example of the French sardines

The success of the French with their canned sardines was certainly the inspiration for the imaginative and creative Chr. Aug. Thorne to manufacture a similar product based on brisling as the raw material. As early as 1865 he had presented his new product at the International Fisheries Exhibition at Bergen. In a Report from the Exhibition’s Committee, we read: “*Brisling preserved in oil, from C.A. Thorne are not to be compared with French Sardines, for which they could well serve as a substitute*”.

This is the first documentary evidence to survive, for the production of canned brisling in Norway. It is not clear whether the brisling was treated in the French way, by boiling in oil, or warm-smoked, as Norwegian sardines were later.

Even though Thorne did not achieve very high marks from the Exhibition Committee for his “sardine substitute”, he continued to market it energetically. In 1866 he presented the same product at the International Fisheries Exhibition at Boulogne-sur-Mer. The Norwegian Commissioner at the Exhibition was H. Baars, of Bergen. He wrote of Thorne’s brisling: “Brisling in Olive oil, from C.A. Thorne, of Moss, and his Small Herring in oil from Christiansund, should be considered a kind of imitation of these (French) anchovies. (“sardelles”)

There is however nothing to indicate that Thorne was hindered from building up a significant market for his canned brisling.



Facsimile of “Report of the International Fisheries Exhibition in Bergen” in 1865. This is the first documentary evidence for the production of canned brisling in Norway.



Facsimile of “Report of the International Fisheries Exhibition in Boulogne-sur-Mer” in 1866.

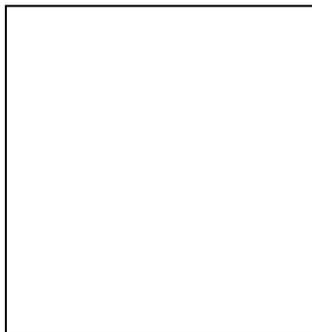
Hagtor Thorsen also canned “smoked brisling” at Sunde

At the beginning of the 1860s Hagtor Thorsen began anchovy production at Sunde in Sunnhordland. At first, he packed anchovies in ordinary wooden barrels, but after a time began to pack them in round metal cans. This was in the times before the seaming machine came into use, and the cans were made by hand and soldered together. The work was both time-consuming and difficult, and production followed similarly. However, at the beginning of the 1880s the seaming machine came on the market abroad, and in 1886 Thorsen travelled to Tøreboda in Sweden where he bought a seaming machine for round cans. Now he was well under way with production of anchovies. The machine was the first of its kind in Norway.

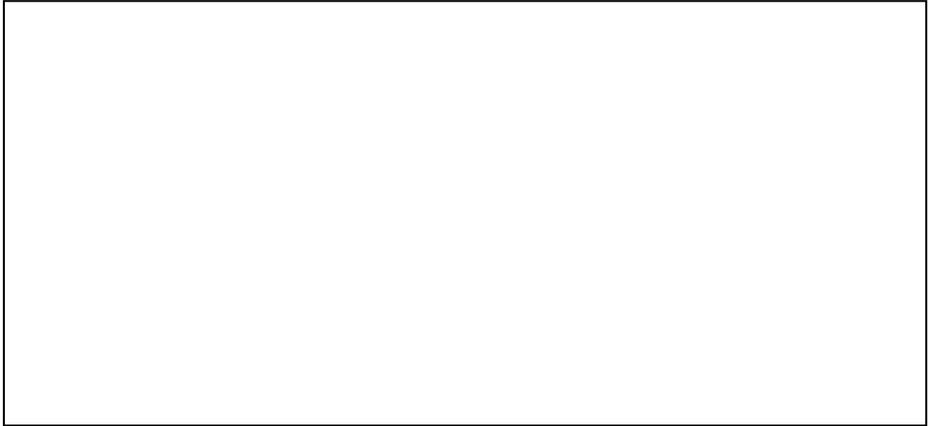
But according to the Sunnhordland historian Kristofer Sydnes, Hagtor Thorsen had also experimented with the canning of brisling. In an article in the *Stavanger Aftenblad* for 13th December 1913, Sydnes claims that Thorsen’s son Olai told him that, as early as 1866, his father had packed “Smoked Brisling in brine”. When buyers had failed to materialise, he replaced brine with olive oil. He called the product “Smoked Brisling in oil”. However, this had no effect on sales either.

It is said that Thorsen “was depressed for a day or two” over the disaster, but he then packed his bags and went to France to learn the art of canning French sardines. On his return to Norway he had with him not only the boiling pot but also the wire baskets for “frenchifying” sardines. Now he began to produce “sardines” from brisling in the French way. In 1883 he exhibited the product in London under the name of “Sprats à la Sardine”. At an exhibition in Trondheim in 1887 he received a silver medal for what he termed “Norwegian Anchovies”

As Chr. August Thorne had encountered no opposition, neither did Hagtor Thorsen. He too was able to build up a significant market for his smoked canned sardines.



*Hagtor Thorsen (1828-1906), one of Norway’s first sardine producers.
(Tiltak og Arbeidsliv i Sunnhordsland)*

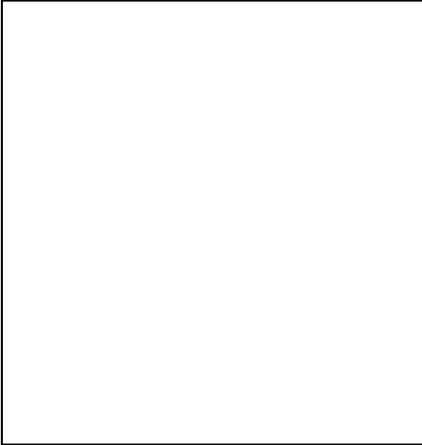


Hagtor Thorsen's factory at Sunde. Here he carried on the salting of herring, preparation of anchovies, and the production of canned "smoked brisling". Private accommodation is situated on the right of the picture. Norway Foods factory building at Sunde is built partly on the pattern of Thorsen's old factory.
(*Tiltak og Arbeidsliv i Sunnhordland*)

Smoking of "Kielersprotten" in Øvre Strandgate

The canning pioneer, Jacob Helvig, was a tinsmith and copper craftsman, as well as Stavanger's largest supplier of metal cans to the sardine industry in its early years, and a can manufacturer. He tells in the journal *Tidsskrift for Hermetikkindustrien* 1916:4 that the carpenter Torkild Aarestad (brother of the well-known temperance politician and cabinet minister Sven Aarestad), began warm-smoking of brisling in around 1875 in a small primitive smokehouse in Øvre Strandgate no. 6, (later to be Strandens Røkeri), which belonged to the widow Guri Johannesen.

He packed brisling in wooden crates to be sent to Germany, marking them "Kielersprotten". This product was well-nigh identical to the German "Kielersprotten" (sprats) which was produced in the district of Kiel, from strongly-smoked warm-smoked brisling from the Baltic. The German connection of the product gives ground for believing that a German from Wandsbeck who was on a short visit to the smokehouse in Strandgate could have had a finger in Aarestad's "Kielersprott".



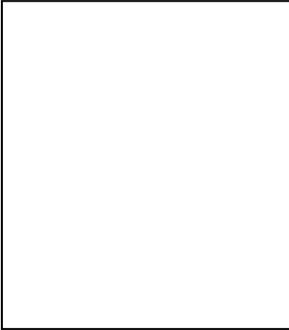
The Smokehouse at Straen

This was where Torkild Aarestad began to smoke “Kielersprut” – an activity that can be shown to be the forerunner of the Norwegian sardine industry.

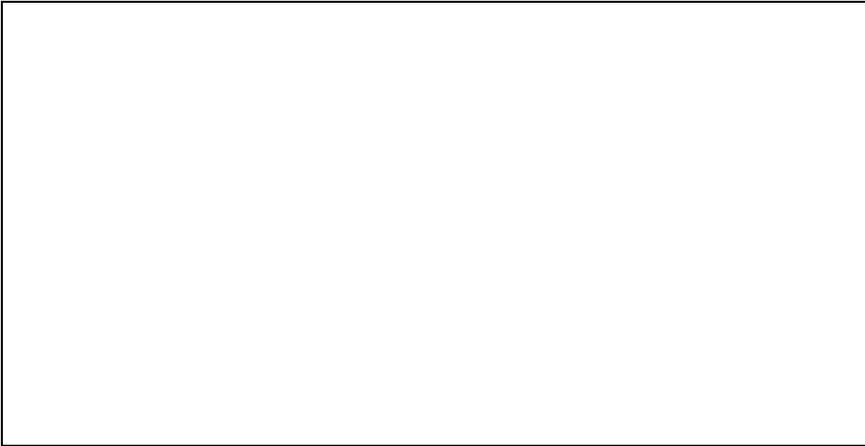
Aarestad also packed smoked brisling in flat rectangular cans which were filled with olive oil prior to the lids being soldered on. But the cans were not thereafter heat-treated, so that their shelf life cannot have been more than 2-3 weeks. They were sold on the open market for more than 40 øre each – at today’s rates about 3p (UK) or 4¢ (US) - and thus relatively

expensive. He also sent a shipment to Hamburg. Considering the transport conditions of the time, and the short shelf life, it is almost incredible that the fish could still be edible when it finally came to be used. It is not known on what grounds Aarestad handed over the activities of his factory to another Stavanger man, captain Martin Gabrielsen. He finished his seafaring career in the early 1870s, and ran a barrel factory which his family owned at Sandvigen. Today, there is a container quay just to the south of the old Concord Canning Co. sardine factory – today at Sandvigå 27. Here in 1878 Gabrielsen converted his so-called “barrel-burning works” (where barrel staves were shaped and the barrels assembled over a small fire) into a smokehouse where he continued to produce “Kielersprut” with Aarestad as his chief smoker.

The tinsmith (Jacob) Helvig gives us a good insight into the conditions at Gabrielsen’s smokehouse out at Sandvigen. He writes: *“In order for Aarestad to protect himself against the smoke, he had to lie flat on the ground and throw bark and juniper logs onto the fire. When he wanted to check that the food was adequately smoked, he had to go through a thorough procedure, and dress up like a fireman. When he was almost suffocating, he would rush out into the fresh air in order to survive. My men and I had no place to work for soldering on the lids of the cans, and had to be out in the area of the slopes around the smokehouse. The workers were provided with noisy wooden shoes, packed with straw, and which were also otherwise well-packed in order to withstand the autumn storms. The fact that under these circumstances, fingers were blue with cold, and the work delayed, should not surprise anyone.”*



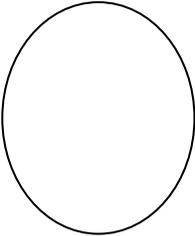
Martin Gabrielsen (1842-1912) was a ship's captain and sailed with the family's schooner to Riga and France, amongst other destinations, but finished his seafaring days as early as about 1875. He managed a barrel factory in Sandvigen where he began to smoke brisling in 1878 with Torkild Aarestad. It was sold in wooden boxes, and was called "Kielersprut". Later, in co-operation with Captain J.B. Mejlænder, Manager of the Stavanger Preserving Co., this was packed in cans and sterilized. The product was launched as *Smoked Norwegian Sardines* ("Røgede norske sardiner"). Shortly afterwards, Gabrielsen became ill and his venture with Mejlænder came to an end. The Stavanger Preserving Co. and Captain Mejlænder continued production under his own management, making Norwegian sardines famous all over the world.



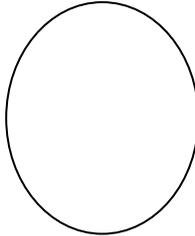
The first **Smoked Norwegian Sardines** (Røgede norske sardiner) were smoked in this warehouse in Sandvigen. This was where Martin Gabrielsen originally managed his keg factory, where there was a so-called "barrel-burning works", where the sections of the barrels were shaped over a small fire. This was converted to a smokehouse. (City Archives, Stavanger)

Stavanger Preserving Co. begins “The story of the Sardine”

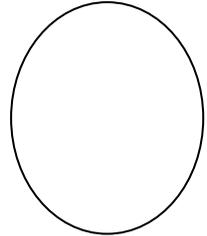
Stavanger Preserving Co. was Stavanger’s first canning factory, and was established in 1873 with the following as backers: Knud Knudsen (ship-owner), the magistrate (byfogd) Henrik Finne, Consul Lars Berentsen, the Merchants Charles Racine and E. Berentsen, and the Wholesale Merchant George William Groom. The aim was to manufacture canned food for ships’ supplies, from meat, fish and vegetables, for Stavanger’s large fleet of sailing ships. In 1870 this consisted of 610 vessels with a total compliment of 4000 men as crew members. In fulfilment of its goal, the company built its own factory in (the street) Øvre Strandgate. The factory was given the nickname “Hermeten”, and lay approximately where the “Straen Senter” building is situated today.



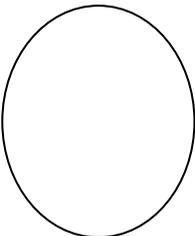
The Ship-owner K. Knudsen



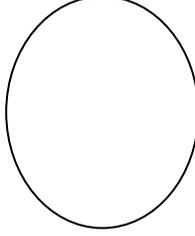
Magistrate H. Finne



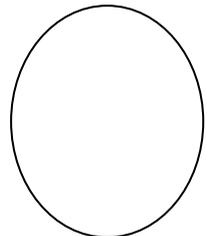
Wholesaler George William Groom



Merchant Charles Racine



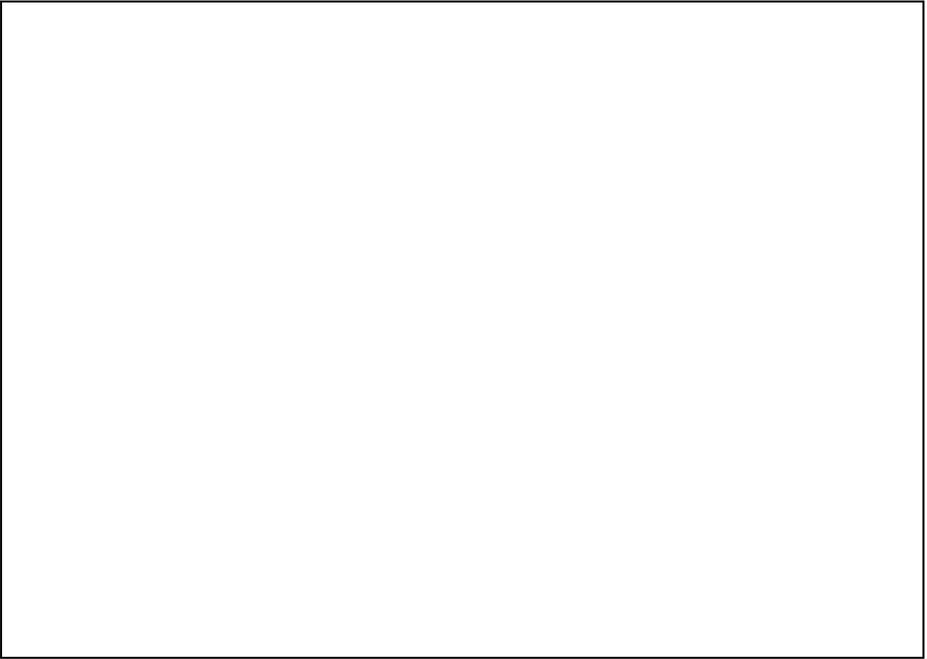
Merchant E. Berentsen



Consul L. Berentsen

The Founders of the Stavanger Preserving Co.

Ship-owner K. Knudsen, Magistrate H. Finne, Wholesale Merchant George William Groom, Merchant Charles Racine, Merchant E. Berentsen and Consul L. Berentsen. (Photo Credit: Stavanger Preserving Co. Jubilee Volume.)



Stavanger Preserving Co.'s first Canning Factory

Stavanger Canned Goods Factory, commonly known as “Hermeta”, with its staff. The factory lay in Øvre Strandgate, approximately where the “Straen Senter” lies today. (Photo Credit: City Archives, Stavanger)

In 1879 Captain Johan B. Mejlænder was co-owner in the Stavanger Preserving Co. and was employed as the Company's Manager. In an interview in *Tidsskrift for Hermetikkindustri* 1916:10, in the introduction to his 80th birthday, he tells how in a relatively short time after his employment, he met Martin Gabrielsen at the market in Stavanger. They had a chat, and Gabrielsen mentioned his smoking activities out at Sandvigen, where amongst other things, he smoked brisling, which he considered could be good business, if only it had better shelf life. “As it is now, it can only be a loss”, he said sadly.

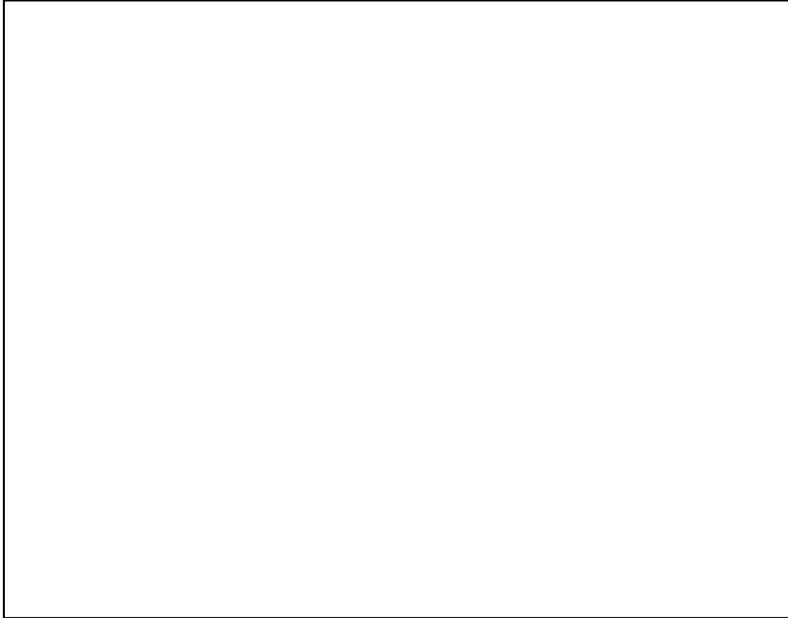
The interview is not entirely clear as to how the conversation developed further between the two seamen, with their many shared experiences. But it is not difficult to imagine that Mejlænder, as the Manager newly appointed by the Stavanger Preserving Co., suggested

boiling the smoked brisling like any other canned products. However that may be, it was agreed that Mejlænder should come out to Sandvigen as quickly as possible, and taste the smoked brisling. He came the next day, and was extremely enthusiastic about the brisling. When he left, he took with him six cans for test boiling. The Floor manager at “Hermeten”, Martin Trulsen, boiled the cans that same day. When Mejlænder opened them, 14 days later, he found to his amazement, and possibly to his surprise, that the brisling were as good as if they had been freshly smoked – if not better.

The Manager Johan G.B. Mejlænder
(1836-1920)

He was a ship's captain who had sailed far and wide with great success, finishing his seafaring career at the end of the 1870s, and becoming Manager and Co-owner of the Stavanger Preserving Co. He was fluent in several languages, and well-known to chandlers all over the world. It was that fact which was perhaps was the key to his success as a marketer of “Smoked Norwegian Sardines” around the world.
(Tidsskrift for Hermetikkindustri)





*Mejlænder visits Gabrielsen at the smokehouse at Sandvigen where he experiences a taste of smoked brisling.
(Stavanger Preserving Co. Jubilee Volume)*

Both Mejlænder and Gabrielsen were thoroughly agreed that the smoked canned brisling which lay before them was every bit as good as the french sardines that they had eaten abroad, and that it must be possible to compete with them.

So they agreed to begin a trial production together , in which Gabrielsen would be in charge of the smoking, while Stavanger Preserving Co. would carry out the boiling and the remainder of the work. In a newspaper article in *Stavanger Aftenblad* in August 1913, Mejlænder wrote as follows:

“None of my fellow partners had any information about this undertaking of mine, before I one day asked them to come to a meeting at the office. There Martin Trulsen, who was at that time the company’s Floor Manager, and who understood the principle of sterilizing, opened a dozen of the “boiled” cans of brisling which had been packed in olive oil. The oil came from the Hofman Company in Bordeaux, which at that time provided all the oil used in the packing of salmon. Messrs Finne, Berentsen, Knudsen and Trulsen himself

were all agreed that it was a fine product. It was unanimously agreed that it should be called **Smoked Norwegian Sardines** (*Røgede norske sardiner*), and it was these experimental packs which I sent in the autumn of 1879 to different places in Europe, and to Valparaiso and elsewhere, to the ships' chandlers I knew in those places. They were trial portions of between three and twelve cans, and some were included with orders for other items."

The Dispute over who should have the honour

There needs to be some addition to Mejlænder's story as to how "*Norwegian Smoked Sardines*" came to Stavanger. A highly competent writer from Stavanger – who was also the inventor of one of the first decapitating-machines – by name Edvard Andersen, has a different story. He wrote several articles in the newspaper *Vestlandet* in April 1908 and July 1913, and in *Norsk Fiskeritidende* in the same years. In these articles he maintains that one of the workers at the Stavanger Preserving Co., Kristian Eriksen, had, as an experiment, packed a smaller number of cans with smoked brisling and boiled them even before Mejlænder was employed by the Company. Kristian Eriksen confirmed this in an interview referred to in the *Stavanger Aftenblad* on 3rd July 1911.

Edvard Andersen claims - as do others – that Mejlænder came to "a table ready laid", and he has the honour only for the marketing of "The Norwegian Sardine".

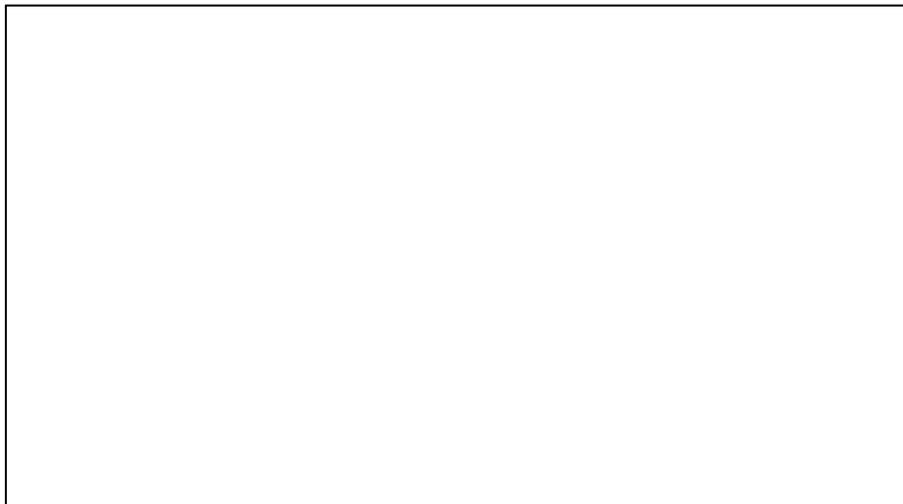
Mejlænder replied forcefully to Andersen's assertion, and the matter developed into an almighty row in the pages of the *Stavanger Aftenblad* in July and August of 1913. It is a part of history that Mejlænder's version was supported by three employees at the Stavanger Preserving Co. One of these was Martin Endresen, works manager at "Hermeten". They all affirmed that they were willing to bear witness that Mejlænder's version was the correct one.

With hindsight one must wonder why neither Mejlænder nor Eriksen is thought to have known that both Christian August Thorne and Hagtor Thorsen canned brisling like (French) sardines some 12 years before both Eriksen and Mejlænder.

However, back to Mejlænder. Having obtained the Board's consent to concentrate on the new product, production and marketing were stepped up. Gabrielsen's capacity for smoking was now too small. Moreover he was ill and the partnership was discontinued. So Stavanger Preserving had to provide their own smokehouse. In order to learn more about smoking and smoking kilns, Mejlænder travelled to Altona and Hamburg where he learnt about, in particular, *Wildhagen's chambered smoking Kiln*. Back home in Stavanger he purchased a block of land next to "Hermeten" and built a Wildhagen smokehouse as an adjunct to the old factory building. The smoke kiln would have been

the first of its kind in the country and set the pattern for all chamber-kilns which were later built by the country's sardine factories.

Now the ship was really under way, as Mejlænder would have said. Whereas in 1880 the factory produced a mere 3,000 cans, by the next year production had increased to 19,000 cans.



Wildhagen's chamber smoking kilns, at Stavanger Preserving Co.'s factory "Hermeten", in Øvre Strandgate. These were probably the first smoking kilns in Norway built specially for the "warm-smoking" of brisling and the "cold-smoking" of herring. Notice the great height of the kilns. The highest section was used for "cold-smoking", and the lower part for "warm-smoking".
(Norwegian Canning Museum)

"Smoked Norwegian Sardines" out on the world market.

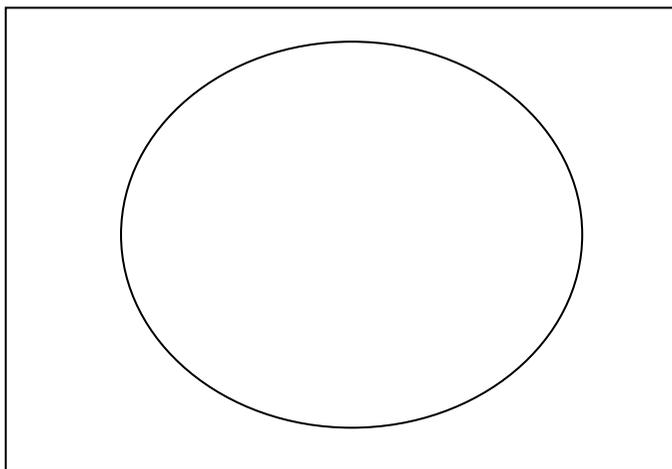
To begin with, marketing was aimed particularly at Germany, but it was rapidly extended to include France, Great Britain, and elsewhere. A few trial cans were sent to known or unknown chandlers or wholesale dealers. This method of selling proved to be effective. Indeed as early as 1880 there had been success in selling Norwegian sardines in Belfast, Hamburg, Valparaiso, Gothenburg, London, Liverpool, Gloucester, Malaga, Queenstown, Bordeaux, Altona, Paris, Rotterdam and Cette. In 1881, 13,000 cans were sold to a single importer in Hamburg, and in 1883 came the first orders from New York. Not long

afterwards Norwegian sardines were introduced to markets in Canada, South Africa, Australia and New Zealand.

Stavanger Preserving (as the company was known) also took part in exhibitions around the world. In contrast to Christian August Thorne and Hagtor Thorsen, who had experienced a somewhat lukewarm reception at exhibitions for their “surrogate sardines”, Mejlænder won both praise and medals of every kind at exhibitions – in Trondhjem in 1879, and both Melbourne and Berlin in 1880. In succeeding years Stavanger Preserving won as many as 27 different medals of which 7 were “Grand Prix” and Diplomas of Honour.

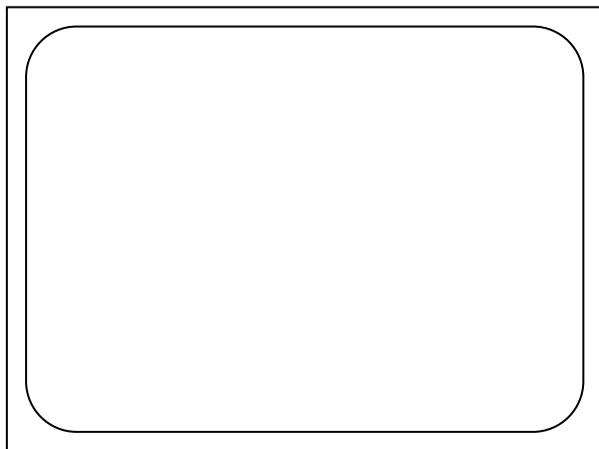
In his book *Iddisar*, John G. Johnsen describes how the first sardine cans were merely finished off with a small strip of paper on the side (“sarie”) of the can, which described what the can contained. A little later labels were used which were put on the lid of the can. The first labels were carefully made and printed on ordinary non-glossy paper. By the 1880s came the beginning of the use of small colourful artworks – “iddisar”^{*}.

In these first years the cans of sardines were boiled in open pans. In 1883 Stavanger Preserving bought a French autoclave (pressure-cooker), in which the cans were sterilized by being “boiled” at a temperature of 110°C. Most importantly, this led to a much longer shelf life, but it also cut in half the time needed for boiling. The overall result was a positive effect on quality, cost of production, and capacity of production.



^{*} A Stavanger dialect word which developed from the local pronunciation for the word for label – “iddis”

Stavanger Preserving's Collection of medals. (Norwegian Canning Museum)



*At the end of 1890 Stavanger Preserving began to decorate their labels with two crossed fish. These were designed by A.E. Jones from the London firm of Morison. **Crossed fish** was registered in 1902 as the Trademark of Stavanger Preserving.*

Captain Johan G.B Mejlænder gets the glory

Although it can still be discussed who actually developed “Smoked Norwegian Sardines”, it is beyond all doubt that it was Captain Johan G.B. Mejlænder who brought world-wide recognition of the product through his highly skilled marketing. This was the reason for his being awarded the Royal Norwegian Order of St. Olaf in 1904.

The success of Stavanger Preserving gave the canning industry a further indication that sardine production could become a profitable business. Before 1908 there were already between 18 and 20 sardine factories in Stavanger and the surrounding district, with production of around 15 million cans per year. In the following year, sardine factories mushroomed from Oslofjord in the east to Tromsø in the north. In 1915, the country had 219 canning factories, of which 48 were sardine factories in Stavanger with an annual production of 35 million cans.

In this connection it is relevant to mention that Christian Bjelland and Co. began producing sardines in 1897. The history of the Bjelland Company is fully described in the Jubilee Volume published on the occasion of the Company's 100th anniversary.*

Canning factories in Stavanger 1880-1982

The number of factories increased markedly in the years up to about 1930. Then began a period when older factories were replaced by new, larger ones, and the number dropped. In the 1960s the number was again considerably reduced. This was because deep-freezing began to come into use with the result that the raw brisling could be kept for several months. Sardine production thus went from being a seasonal activity to being a continuous year-round activity.

The energetic expansion of the youthful Norwegian fishing industry came about not least because of the shortage of fish, mentioned above, in the French sardine industry at the beginning of 1900.

Norwegian canning exporters captured the markets which the French were not able to supply. Not surprisingly, the French were less than enthusiastic over the Norwegians' use of the term "sardine" for the marketing of smoked brisling. They therefore took the

* Karl Fred. Kolderup, 1982: *Chr. Bjelland & Co A/S 1882-1982*.
Dreyer Aksjeselskap Stavanger.

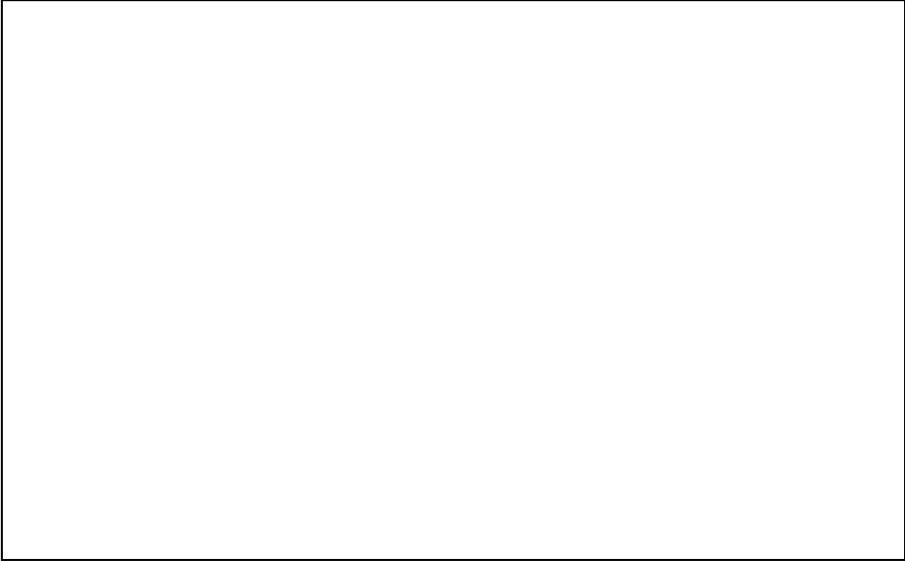
Norwegian sardine industry to court with the request that the description “sardines” should be for the exclusive use of products deriving from the Mediterranean sardine *Clupea Pilchardus*. The law suits which came before the courts between 1905 and 1915 resulted in a victory for the French. Thus Norwegian sardines had to be marketed as “Brisling-sardines”. In the U.S.A., Australia, and other non-European countries, the description “sardine” could still be used without qualification.

Part 2: The Smoking Kiln

Wildhagen’s Chamber Smoking-kiln:

Let us now return to the smoking kiln that Captain Mejlænder brought back with him from Germany. This consisted of a walled chamber measuring 75cm. wide, 115 cm. deep, and 350 cm. high. The front of the chamber was fitted with steel doors. On each of the side walls were small steel runners, made from angle iron, on which the smoking frames were placed. The fire was at the base of the kiln, and there was no place for a grate. So the burning of the wood happened without the benefit of primary draught, and smoke was efficiently produced because of the lack of air. The steel doors were divided into sections so that the tending of the fire, and the working of the kilns, could be kept separate.

Wildhagen’s smoke kiln was extra high so as to be able to be used for “warm-smoking” and “cold-smoking” at the same time. “Cold-smoking” took place in the highest part of the kiln, where the temperature was about 25°C. It was here that spring herring, for example, could be “cold-smoked” for about 24 hours. “warm-smoking” took place in the lower part of the kiln – in the upper part of this section, the so-called “cooking and drying zone”, the temperature was about 60°C. This was where the frames were put first, and were then moved down to the “smoke zone” where the temperature was about 100°C. While being moved down, the frames had to be rotated through 180° to ensure even drying and smoking of the fish. For brisling the drying and smoking process took about 60 minutes.



*Schematic sketch of a chamber kiln for warm-smoking of brisling and herring.
(Drawing by Jørg Hviding)*

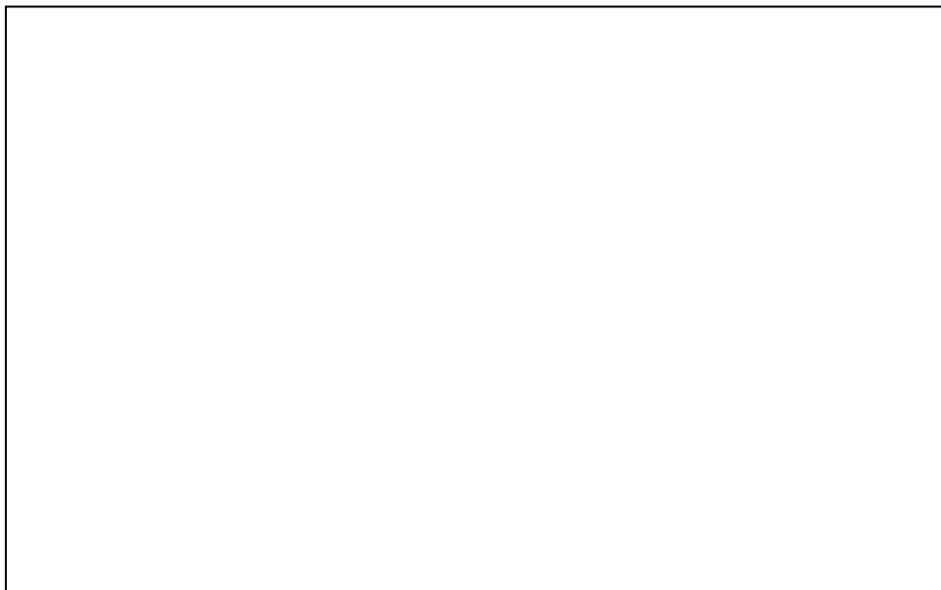
*Frame with newly-smoked brisling
(Photo: Kvinnheringen)*

In contrast to the earlier process whereby the fish were laid on wire-netting during smoking, in the Wildhagen kiln the fish were threaded on to skewers (thin steel rods 4mm in diameter), with up to 24 fish per skewer. The skewers were placed in frames, with about 30 skewers per frame.

A normal chambered smoking kiln held about ten frames, each containing between 2½ and 3 “skjeppe” (wooden crates used for delivery of the fish, with a capacity of 20 litres). It would take about one cord of oak logs to smoke 300 “skjeppe” of brisling. To increase the amount of smoke, bark could be added at intervals, or wet sawdust or juniper. This

was usually the task of the master-smoker. Later, when a milder colour was desired, only oak wood was used.

A medium sized factory in the 19th century, with a capacity of about 300 “skjeppe” of brisling per day – i.e. some 300 cans, would have as a rule between 12 and 14 chambered kilns. They were preferably built in two rows facing each other. 3-4 kilns would use the same chimney, so there could be up to three chimneys in all for the kilns. Add to this a

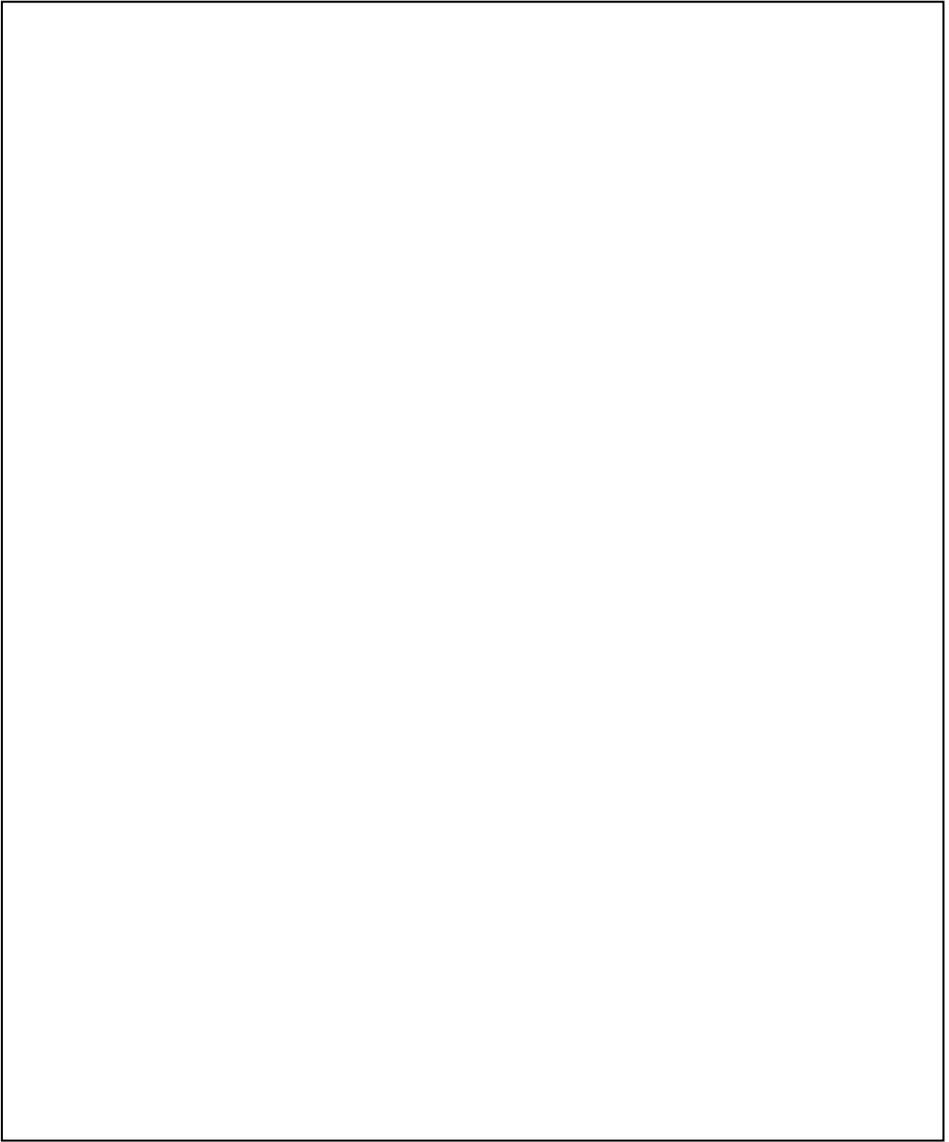


further chimney for the steam boiler, and a typical factory would have 4 chimneys in all. This fact gave the east side of Stavanger its characteristic image, and it was there, during the inter-war years, that some 30-40 sardine factories were situated.

A small section of the eastern side of Stavanger, showing the Norrig factory in the 1930s. The many chimneys were typical of a sardine factory. At that time that part of the city had 30-40 sardine factories, and looked like a forest of chimneys. The picture also shows the lead-shot tower of the Stavanger metal factory. Here, amongst other items, lead-shot was produced by the “gravity method”. Tin was recovered from the metal waste left from can production.

(Photo: Stavanger City Archives)

Chamber smoking kilns produced sardines of exceptionally good quality. However the operation of the kilns was very labour-intensive with the frames requiring to be moved down and turned around several times in the course of the smoking process, quite apart from the effort of taking them in and out. The frames were heavy and cumbersome, and the workplace dark and smoky. Under such conditions the smokers had a heavy working day which could often continue well into the night. To operate 12-14 kilns required 2-3 strong men. The kilns however used only 10% of the heating capabilities of the fuel, and so from that viewpoint were extremely uneconomic.



Fish-threading at the threading tables
(Photo: Chr. Bjelland's Anniversary Volume, p.22)

A host of new ideas

The chamber kilns were thus somewhat primitive and inefficient, encouraging enthusiastic but amateur inventors to come up with improvements. The newspapers of the time tell of a long line – apparently – of epoch-making inventions relating to the smoking of sardines.

The *Stavanger Amtstidene* is able to tell us that in 1899: “*Johan Sætre has invented a drum device which eliminates the time-consuming threading work*”. An additional problem at that time was how to bring the brisling fresh to the factory. The imaginative Jacob Helvig tried to solve this in his own special way: he built a smoking facility on board a boat so as to smoke the fish where they were caught.

In the summer of 1890 he was out with his “mobile smokehouse” in Saudafjord. However, the fish failed that year and he had to come home empty-handed. Back home in Stavanger he set up the smokehouse at Møllehaugen where he smoked to order. Ahead of his time as he was, he employed a female smoker there. This was a great sensation. However the neighbours complained about the annoyance of the smoke, and Helvig had to move the smokehouse to Normannshagen. He operated the smokehouse for the rest of the season here. Thereafter the smokehouse was taken down and sold as scrap. The greatest attention, however, was paid to an announcement in *Vestland* of Jan. 14th, 1914 that a Stavanger man, Norland, had developed an automatic “*Threading, Smoking and Decapitation device*”, which, operated by one man alone, would replace 40 “*young girls*”.

Such a dramatic reduction in the workforce could make the dream come true of a mobile sardine factory which could produce sardines out at sea. It is very reminiscent of Jacob Helvig’s attempt with his mobile smokehouse. It can be mentioned here that the problem of transporting fish to the factory in good condition was solved around 1910. Groups of factories came together in different “raw-fish associations” which had their own ships and arranged the buying and transport of brisling for their own members.

There were also quite a number of suggestions for the improvement of chamber kilns. In the patent register for the years 1900-1915, 22 inventions are registered for improvements to the chamber kiln. But none of the inventions caught on. At any rate, there is no trace of them in any of the old kilns which have survived. Chamber kilns thus continued to be in use in their original form right up until the 1930s, when the continuous smoking kiln took over. But even then, a number of the old chamber kilns were equipped with electric ventilation fans.

Competition for the best smoking kiln

The Norwegian National Can Manufacturers Association* (founded in 1917) on the 1st December 1918 announced a prize for a competition to find “*Improvement of existing smoking practices for herring and brisling in canning factories*”

Entries must address the following criteria in relation to the smoking process:

- 1) **TO PROVIDE EVEN SMOKING OF THE FISH.**
- 2) **TO BE ABLE TO ADJUST THE DEGREE OF SMOKING SO THAT FISH CAN BE LIGHTLY OR STRONGLY SMOKED ACCORDING TO TASTE.**
- 3) **TO BE AS LABOUR-SAVING AS POSSIBLE.**
- 4) **TO PROVIDE THE MOST ECONOMICAL USE OF THE FUEL FOR SMOKING.**
- 5) **IF POSSIBLE, TO COMBINE A SMOKING SYSTEM WITH A SYSTEM FOR WARM AIR-DRYING.**

The first and second prizes were set respectively at 10 and 5 thousand Kroner, which at that time were significant amounts. The Assessment Panel consisted of the Factory owner Jacob Natvig, Directors O. Vaade and J.E. Danielsen, Dr. Philip R. Lund and the Engineer O.E.M. Wiig.

In an address during the national meeting of the Norwegian National Can Manufacturers Association in Bergen on the 23rd of August 1919, Wiig announced the result of the competition. He stated before a packed lecture hall that in spite of 22 entrants, the result of the competition was a disappointment. None of the entries gave a satisfactory solution to the problem, and thus the jury could not award either the first or second prize.

However, according to Engineer Wiig the three best entries did have solutions and ideas which it could be important to secure for future work on the smoking problem. These were sent in by:

Engineer Hans Bjørge, of Kristiania
Engineer Jens Rude, of Kristiania
Manager L Gogsør, of Aalesund.

The entries from Bjørge and Rude were awarded a consolation prize of 2,500 kroner each. Both gratefully accepted their prizes. Gogsør was offered 1,000 kroner for his entry, but he could not accept the offer, since he claimed that the contribution did not even cover the cost of the patent. Two years later, Gogsør built his own kiln factory in Aalesund.

The contributions fell on “stony ground”

* *De Norsk hermetikfabrikers Landsforening*

Engineer Bjørge suggested a so-called continual drying and smoking kiln where cars with fish were taken in at one end of a channel and taken out at the other, ready smoked. The cars were made of steel, with one side wall consisted of a steel plate which provided vertical dividing walls between the cars when they were packed tightly together in the channel. Dry air would then go vertically up from the bottom and down from the top between the cars. The channel was divided into sections for drying, cooking, smoking and cooling, and the temperature, speed and smoke content of the dry air should be able to be measured and controlled independently of each other. The dry air should be warmed up by electricity, but the kiln should be able to be easily adapted to other forms of energy, such as oil, gas or wood. The smoke should be produced by a separate fire (smoke-generator)

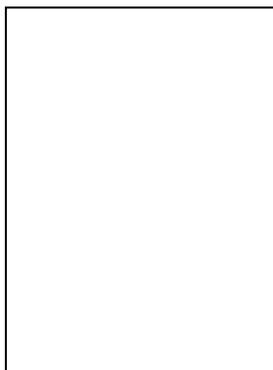


Engineer Bjørge's suggestion for a smoking kiln. It was suggested that this should be formed like a channel, with fish fed in on cars at one end, and taken out, ready smoked, at the other. The design of the channel and the cars gives a characteristic succession of smoke and hot air. The kiln was divided into three sections, drying, cooking, smoking and cooling, with extraction fans for each. The construction later proved to be the model for the horizontal Kværnerkiln which provided the final solution for the smoke problem in the sardine industry.

(Diagram: Norwegian Canning Museum)

Engineer Wiig thoroughly examined Engineer Bjørge's entry, according to his account referred to in *Tidsskrift for Hermetikkindustri* 8, 1919. However the other entries received scant mention. This can only be interpreted as that the jury considered Bjørge's entry the best, but not however good enough for first prize. The jury recommended that a new competition be advertised, but this was not done. The 21 suggestions were securely filed away and the mists of oblivion settled over the smoking issue.

It is a part of history that Bjørge's suggestion "surfaced" in a smoking kiln which Kværner Brug A/S launched 10 years later. Right up to the present this has been the solution to the smoking problem in the sardine industry.



During the national meeting of the Norske hermetikfabrikers Landsforening in Bergen on August 23rd 1919, Engineer O.E. Wiig announces the results of the competition. (Picture: Tidsskrift for Hermetikkindustri)

A variety of kilns are built

Although the involvement of the Landsforening in the smoke issue seems to have been a mere ripple, there was a lot of activity from amateur inventors in the search for an improved smoking kiln.

In the newspaper *Sunnmørsposten* for June 17th 1920, and in *Tidsskrift for Hermetikkindustri* in the same year, we can read that the manager "L. Goksør has recently had an automatic smoking kiln installed in his factory, Aalesund Sardine Co. A.S.". This was built to the same design which he had entered for the competition in 1918. The kiln was designed in a horse-shoe shape, with a channel where cars with fish were fed in at one end and taken out ready smoked at the other. In order to avoid the labour-intensive process of threading the fish on to skewers, the fish were placed on netting. The drying air was heated by electricity.

According to the interview with Goksør, the smoking kiln attracted great attention and interest in the canning industry. "The problem of smoking in the sardine industry is now solved", he said. However this was not the case.



L. Goksør's smoking kiln. This was installed at the Aalesund Sardine Co. A/S. where Goksør was manager. Despite arousing great attention, it was not widely used. (Picture: Norwegian Canning Museum)

In Stavanger, Thorvald Norland, manager with West Norway Canning Co., was also involved with the problem of the smoking kiln. This can be followed in the pages of the *Tidsskrift for Hermetikkindustri* for July 1920*. He enclosed a large chamber in which dry air was blown evenly over the fish. The dry air was heated by steam or electricity, and was recycled to save energy.

The article also mentions that Norland was applying for a so-called “world patent” for his smoking kiln, and that he was ready to deliver kilns to two factories in Stavanger, when an industrial dispute frustrated the delivery.

There were a number of other inventions relating to smoking kilns, which were also written about in 1920. Among these we can mention a design for an excellent endless chain lift, by the Chemical Engineer O. Braadlie and Engineer Aug. Svihus. Later on we find mention of a design for an electric smoking kiln, by factory owner J.M. Knudsen and Engineer Falck Jørgensen of Stavanger, and Engineer Tormod Førland from Kjemisk Industri A/S, at Sandnes. Knudsen and Falck Jørgensen's smoking kiln was built and tested by Viking Sardine.

It would appear that the other smoking kilns never materialised.

* “Norland's nye røkesystem”, *Tidsskrift for Hermetikkindustri* 1920 part 13, pp. 170-171

Norlands nye røkesystem

Thorvald Norland's smoking kiln consisted of a walled chamber in which nine cars with frames of brisling could be smoked simultaneously. It had a capacity for 300 cases - "skjepper" - (6,000 litres) of brisling per day, corresponding to the capacity of a medium-sized factory. The kiln was installed in West Norway canning Co., Stavanger, where T. Norland was manager. It was not otherwise used.
(Tidsskrift for Hermetikkindustri)

Knudsen and Falck-Jørgensen's smoking kiln had a certain similarity to ordinary smoking kilns, except that, instead of an open fire in every chamber, electrically heated air was blown into the kiln. The heated air was mixed with smoke from a separate smoke-generator. The smoking kiln was installed at Viking Sardine, Stavanger, but was not otherwise used.
(Tidsskrift for Hermetikkindustri)

Electric smoking kiln and autoclave

At the end of the inter-war period P.C. Paulsen of Stavanger, a specialist company for larger electric kilns for baking, constructed a horizontal continuous smoking kiln for Stavanger Preserving's factory, "Stromsteinen". Apparently this worked very well, but sadly was destroyed by fire after a comparatively short time.

It is interesting that all the smoking kilns that were developed during these years used electricity as the source of heat. Clearly electricity was relatively cheap at that time.

It is of further interest that the kilns mentioned were also designed to be able to dry fish with hot air, without the addition of smoke (modified French method). But brisling treated in the French manner never caught on in Norway and was only produced in very small quantities.

In this connection it should be mentioned that in the mid-1950s a certain amount of so-called “Råpakk” was produced in the Trondheim area. “Råpakk” was preferably young herring (“mussa”) packed raw in cans and cooked in them. To avoid confusion with ordinary smoked sardines, they were packed in so-called “Baby” cans. These were the same shape, but a little smaller than the Norwegian sardine can, the ¼ dingley.

“Råpakk” was also produced in later times in Norway. At the beginning of the 1980s, Norway Foods A/S installed a production line for raw-packed sardines at their factory at Florø. This was with the aim of rationalising sardine production to the greatest extent possible. The work was done under the direction of Norconserv. The production line had a lot of automatic equipment and was the most up to date production line for sardines in Norway at the time. However production had to be discontinued after only two years because the product could not command a profitable price.

Sternerovnen

None of the above-mentioned smoking kilns really solved the problem of smoking in the sardine industry. So the chamber kilns continued to be in use, with a few exceptions, right up to the beginning of the 1930s. It was then that the Engineer Sterner, works engineer at United sardine factories, Bergen, launched the first continuous vertical smoking kiln for brisling and herring – the so-called Sternerovnen. (“The Sterner Kiln”)

This had two vertical channels, and the frames were placed in at the bottom of one, and taken out ready smoked at the bottom of the other. Burning took place at the base of each channel, and oak was used as fuel. The kiln was in one way a large chamber kiln with a drying and cooking zone in the first (rising) channel, and the smoking zone in the descending channel. The first Sterner kiln was installed in U.S.F.’s factory at Florø, and then later at U.S.F.’s Bergen factory, Stavanger Preserving’s factories “Fram” and “Hermeten” in Stavanger, and Trondhjem Canning and Export Co.’s factory in Trondheim.

Sterner kilns provided a notable gain in efficiency in the smoking of both brisling and herring-sardines, and for a few years looked as though they were the answer to the smoking problem in the sardine industry. They were in use in the factories named well into the 1950s, when they were replaced by the new horizontal “Kværnerkiln”.

Sternerovnen was the first continuous smoking kiln with a reasonable success. It was installed in five factories in different places in the country and for several years seemed to be the solution to the smoking problem in the sardine industry. (Drawing by Jørg Hviding)

Kværner Brug's vertical smoking kiln

Not long after Sterner had launched his first smoking kiln, Kværner Brug A/S delivered a vertical smoking kiln (relatively similar to the Sterner kiln) to Chr. August Thorne, of Moss, in 1933. The kiln was in use until 1951, when it was destroyed by fire.

While Sterner was building 8-10 smoking kilns for different factories around the country at the beginning of the 1930s, it seems as though Kværner Brug were not having the same success with their vertical kiln. The above-mentioned kiln which was delivered to Thorne was the only one.

The horizontal "Kværnerovnen"

The lack of success with the vertical smoking kiln was enough reason for Kværner Brug to start the development of a new smoking kiln. The task was given to the company's designer, the engineer Thomas Berger. He came up with a horizontal smoking channel in

Kværner Bru's vertical Smoking kiln. *It was very similar to the Sterner kiln. Only one example was built, and there was no further use of it.*
(Drawing: *Tidsskrift for Hermetikkindustri*)

which cars with fish were placed in at one end, and came out, ready smoked, at the other. The kiln's capacity was about 250 "skjepper" per day, corresponding to about 25,000 cans of sardines. That in turn corresponds to the capacity of a 12 chamber smoking kiln.

If we compare a "Kværnerovnen" with that of engineer Bjørge, we find, as mentioned above, that they have the same characteristic design to make the draught go alternately top to bottom and bottom to top through the cars. In fact the similarity is so strong that one's first thought might be that engineer Berger had read engineer Wiig's description of Bjørge's kiln in the *Tidsskrift for Hermetikkindustri* 1919:8. Nor is that entirely inappropriate. But it must be due to very inadequate research on the part of the Patent Office that Kværner Brug was granted patent number 61686 for the smoking kiln which engineer Bjørge had invented ten years earlier.

The new Kværnerkiln provided far better working conditions for the smokers, as well as using less fuel and requiring a smaller workforce than the old chamber kilns. It thus

*The horizontal **Kværner kiln** is designed as a horizontal smoking channel in which cars with fish are put in at one end, and taken out, ready smoked, at the other. The cars are taken through the channel on an endless chain. Hot air and smoke (the waste gases from the fireplaces) are drawn in the opposite direction by a large fan. The speed of the cars can vary between 5 and 50 cars per hour. The cars and the channel are designed such that the hot air/smoke (dry air) goes alternately bottom to top and top to bottom through the cars. It is worth noting that the dry air periodically stands still in every alternate car. That is intended, in order to have a change between high and low relative humidity in the air, and prevent overly strong surface drying of the fish and thereby speed up their drying. The fireplaces are located on the outside of the kiln and the exhaust gases are conducted through channels to the discharge and middle parts of the smoke channel. The fuel used was oak wood.*

(Drawing by Jørg Hviding)

fulfilled the majority of the conditions which the Norske Hermetikfabrikers Landsforening had set on the occasion of the prize competition in 1918, and has been the solution to the smoking problem in the sardine industry right up until the present.

KVÆRNER TØRKE- OG RØKEOVNER

HORIZONTAL KILN FOR THE NORRIG CANNING FACTORY

*The horizontal **KVÆRNER KILN**. Seen in section. (Tidsskrift for Hermetikkindustri*

Although the “Kværner Kiln” constituted a very significant advance for sardine smoking, it was apparent over the course of time that the kiln was not completely perfect. The years 1950-1960 were pivotal in discussion about the quality of brisling sardines, and a great deal of work was undertaken to improve the kiln. This work was largely carried out by the Machinery Department of the Hermetikk-industriens Laboratorium which pointed out relatively large volumes of “false air”^{*} both with the cars and at each end of the smoke channel. The shortcomings were partly improved by fitting the cars with rubber strips along their edges, and double doors at the outlet end.

It became clear relatively soon in the post-war years that it would become difficult to obtain sufficient oak for fuel for the sardine industry, and that the price for it would rise quite significantly. Thus, under the direction of the Hermetikk-industriens Laboratorium, the heating of kilns has been based on sources of energy which have been the most economical in use. Since 1950 kilns have been based on both oil and gas (propane) heating. Today the Kværner kiln is heated with steam and steam generators. Smoke is produced in a separate smoke generator.

When the Kværner kiln was based on gas or oil as fuel, it has to be equipped with a smoke generator. The choice was in favour of this Norwegian generator. It produces concentrated smoke which is mixed with incoming dry air. The smoke is produced from oak chips.

^{*} “False air” refers to air which in an ideal situation would not be present, such as that introduced at each end of the channel, which is both unnecessary for, and injurious to, the smoking process.

The Kværner kiln was the solution to the problem of smoking in the sardine industry, and in the years 1934 – 1970 about 80 of them were sold, some 12 of them abroad. It is in use in almost unaltered form in the three sardine factories which are still in operation.

Kværner kilns which were supplied between 1934 and 1951. After 1951 about 10 kilns were sold, the last in approximately 1970.

In the same period of time 12 kilns were supplied to Sweden, Denmark, Finland, England, Czechoslovakia and Spain. Since the Second World War some Kværner kilns have also been supplied to Russia.

Epilogue

In the first half of the 20th century, the sardine industry was an important way of life for a number of towns and villages along the coast of Norway. This was particularly the case for Stavanger where the prevailing part of the population who had jobs worked either in “canning”, or in related industries such as crate and packaging manufacture, printers, workshops, nail and key factories, rubber manufacturers, and graphic or lithographic businesses.

The strong growth in the sardine industry and the large differences that there could be in the brisling harvest from year to year meant that there might not be enough brisling. Around the year 1908 small herring – called “mussa” – were used as raw material for sardines. In the years leading up to the first world war it was thus possible to increase the volume of production to about 100 million cans per year, for a country which in general harvested on average only 500,000 crates of brisling, corresponding to 50 million cans.

In this connection, it is relevant to mention that “sardines” which are produced from “mussa” are called “**sildesardines**” (herring sardines). These cannot be compared in taste with “**brisling sardines**” which are produced solely from brisling caught in the summer.

At the end of the 1960s came the prohibition on catching herring, and “mussa”-fishing came to an end. The situation for raw material then became precarious. It was brisling from Scotland which came to the rescue, and from about 1970 this provided a strong contribution to the Norwegian industry with enough raw material for it to produce between 100 and 170 million cans per year, depending on the state of the market. So-called Scottish brisling was collected by the sardine industry’s own freezer boats, which mostly comprised a fleet of seven ships.

Thus in the years after the second world war the Norwegian sardine industry had relatively good years. But then came the change. After a comparatively good year in 1973, with production of a good 180 million cans, by 1975 production had sunk to half of that figure. That covers a whole series of events such as the people’s “No” to the Common Market, a diminishing supply of raw material and increasing prices for raw material, explosive increase in salaries (because of the oil story), unfavourable rates of exchange and so on. The slide merely continued with the result that one factory after another either went bankrupt, or had to suspend operations.

In February 1981 the surviving factories agreed to establish a common company which resulted in the establishment of Norway Foods Ltd. A/S which took over the factories which were still “alive”.

Later the sale of sardines went even lower. Norway Foods Ltd. A/S have thus seen the necessity to concentrate on the production of **brisling sardines** from summer-caught brisling, which because of its excellent taste commands a profitable market price. The sales volume today is around 30 million cans and the number of sardine factories in Norway has been reduced to three.

But Stavanger is still the capital of the canning industry with the central administration, warehouse and port of export for Norway’s only sardine producer, Norway Foods Ltd. A/S, as well as The Norconserv Foundation (which includes the earlier Hermetikkindustriens Laboratorium and Norway’s specialist Canning School, today the Næringsmiddelteknisk skole), and the country’s only surviving factory for the production of cans, Skanem A/S (formerly Stavanger Bliktrykkeri & Maskinværksted).

The Norwegian Canning Museum, where amongst other things the history of the Sardine Story is told and documented, is also situated in Stavanger.

Chronological Summary

- 1810 The French cook, Nicolas Appert, discovers the art of preservation.
- 1830 Production of canned sardines begins in France.
Sardines are cooked in olive oil before being packed in cans.
- 1841 Chr. August Thorne of Moss begins the production of anchovies and, later, canned products in round cans.
- 1865 Chr. August Thorne exhibits “Brisling packed in oil” at The International Fisheries Exhibition in Bergen.
- 1866 Hagbart Thorsen of Sunde produces “Smoked Brisling in Stock” and “Smoked Brisling in Oil”.
- 1875 Torkild Arrestad of Stavanger smokes brisling and sells it locally and in Germany as “Kielersprut” (Sprats)
- 1878 Martin Gabrielsen of Stavanger builds a small smokehouse at Sandvigen where he, and Torkild Aarestad as master smoker, continue production of “Kielersprut”.
- 1879 Martin Gabrielsen and the factory manager Johan G.B. Mejlænder of the Stavanger Preserving Co. begin co-operation for the production of smoked sterilized brisling. The first-mentioned smoked the brisling and the other concerned himself with the sterilizing and marketing. The product is sold as “Smoked Norwegian Sardines”.
- Stavanger Preserving Co. wins its first medal for “Smoked Norwegian Sardines” at the fisheries exhibition in Trondhjem.
- 1880 Mejlænder installs a German chamber smoking kiln at Stavanger Preserving’s factory “Hermeten” in (the street) Øvre Strandgate in Stavanger.
- Stavanger Preserving Co. wins a gold medal for its sardines at fisheries exhibitions in Berlin and Melbourne
- 1881 The sale of sardines explodes onto the world market. 13,000 cans are sold to one company in Hamburg.

- 1918 The Norske Hermetikfabrikers Landsforening announces a prize competition for “Improving the present smoking techniques for herring and brisling in canning factories.”
- 1919 Engineer Hans Bjørge suggests a horizontal smoking kiln. The kiln was used as the model for the “Kværner kiln” which came 15 years later.
- 1931 The first “Sterner kiln” was installed at United Sardine Factories in Bergen.
- 1933 Kværner Brug’s vertical smoking kiln was installed in Chr. August Thorne’s factory in Moss.
- 1934 The first horizontal “Kværner kiln” was installed at E.M. Nielsen Moe’s factory at Kråkøy outside Fredrikstad.
- 1950 Experimentation with freezing, and freezer storage of raw sardines by the Hermetikindustriens Laboratorium.
- 1957 Frozen raw sardines are used industrially by Chr. Bjelland & Co. A/S.
- 1963 Chr. Bjelland & Co. A/S take delivery of the first freezer ship for freezing sardines at the fishing grounds.

Patents relating to threading, smoking, and decapitation before 1916.

Up to the end of 1916, 66 patents were taken out relating to smoking or allied operations such as threading or decapitation. 60 of these were inventions of people who lived in Stavanger. This shows the important role that Stavanger had in the early days of the sardine industry.

Item	Title	Owner	Place	Date	Pat. No.
Threading	device, threading	Norland	Stvgr	04.12.1916	27481
Threading	device, apparatus	S.S.C.	Stvgr	14.03.1910	19937
Threading	automatic device	Endresen	Stvgr	29.01.1917	27609
Threading	fish on metal wire	Helliesen	Stvgr	29.05.1899	07327
Threading	metal wire	Inter. Harpun	Stvgr	25.03.1901	09306
Threading	rods for smoking	Tjaaland	Stvgr	14.03.1909	18824
Threading	rods for threading	Tjaaland	Stvgr	07.03.1910	19914
Threading	threading device	Andersen	Stvgr	23.08.1897	05624
Threading	threading device	Ommundsen	Stvgr	16.10.1899	07623
Threading	threading device	Helliesen	Stvgr	28.05.1901	09532
Threading	threading device	Finne	Stvgr	06.04.1908	17575
Threading	threading device	Bjelland	Stvgr	29.06.1908	17828
Threading	threading device	Bache	Stvgr	08.03.1909	18712
Threading	threading device	Irgens	Bergen	13.04.1909	18825
Threading	threading device	Berggraf ?	Stvgr	25.01.1915	25446
Threading	threading device	Berggraf	Stvgr	25.01.1915	25447
Threading	threading device	Berggraf	Stvgr	25.01.1915	25448
Threading	threading device	Halleland	Stvgr	01.02.1915	25479
Threading	threading device	Norland	Stvgr	04.12.1916	27480
Threading	threading machine	Schive	Stvgr	12.10.1914	25119
Threading	threading of fish	Andersen	Stvgr	07.02.1898	06015
Threading	threading of brisling	Olsen	Stvgr	13.11.1899	07724
Threading	threading of fish	Harpun	Stvgr	25.03.1901	09306
Threading	threading of fish	Bøe	Stvgr	06.05.1912	22194
Smoking	device	Romsøe	Stvgr	03.12.1906	15826
Smoking	device – apparatus	Finne	Stvgr	08.11.1909	19429
Smoking	device – apparatus	Jacobsen	Stvgr	27.12.1909	19639
Smoking	device – smoking	Moe	Stvgr	30.11.1908	18380
Smoking	apparatus – hot air	Oftedal	Stvgr	27.02.1911	21248

Item	Title	Owner	Place	Date	Pat. No.
Smoking	preserving app.	Leach	—	02.11.1883	—
Smoking	basket for boiling	Gaustad	Kprvk	28.08.1916	27236
Smoking	smoking kiln	Oftedal	Stvgr	23.01.1911	21060
Smoking	smoking kiln	Lundberg	Kprvk	27.09.1915	26265
Smoking	smokingchamber	Mejlænder	Stvgr	09.07.1900	08511
Smoking	smokingchamber	L.B.F.	Stvgr	27.09.1909	19371
Smoking	smokingchamber	Olsen	Bergen	27.02.1911	21249
Smoking	smokingchamber	Evertsen	Stvgr	02.07.1917	28053
Smoking	smokingchambers	Tønnesen	Stvgr	20.06.1910	20219
Smoking	smoking of fish	Sætre	Stvgr	26.02.1900	08073
Smoking	smoking of fish	Repenning	Stvgr	09.07.1900	08502
Smoking	smoking of fish	Bjelland	Stvgr	24.09.1900	08703
Smoking	smoking of fish	Birkedal	Stvgr	03.04.1905	13969
Smoking	smoking of brisling	Helvig	Stvgr	03.01.1910	19680
Smoking	smoking of fish	Thunem	Stvgr	26.08.1918	29037
Smoking	frying apparatus	Oftedal	Stvgr	02.12.1912	22833
Smoking	frying apparatus	Oftedal	Stvgr	23.12.1912	22880
Cutting	cutting off heads	Larsen	Stvgr	07.03.1910	19915
Cutting	cutting off heads	Furø	Kprvk	26.04.1909	18864
Cutting	cutting off heads	Knudsen	Stvgr	10.01.1910	19709
Cutting	fish cutting machine	Norland	Stvgr	31.07.1916	27147
Cutting	fish cutting machine	Norland	Stvgr	31.07.1916	27148
Cutting	head cutting	Kielland	Stvgr	05.08.1907	16645
Cutting	cutting machine	Tjaaland	Stvgr	28.05.1897	06133
Cutting	cutting machine	S.P.	Stvgr	07.03.1898	06081
Cutting	cutting machine	Andersen	Stvgr	03.07.1899	07407
Cutting	cutting machine	Haagensen	Bergen	22.07.1907	16589
Cutting	cutting machine	Kielland	Stvgr	05.08.1907	16645
Cutting	cutting machine	Tjaaland	Stvgr	06.04.1908	17576
Cutting	cutting machine	Malde	Stvgr	17.08.1908	18014
Cutting	cutting machine	Lende	Stvgr	17.08.1908	18015
Cutting	cutting machine	V.S.P.	Stvgr	22.04.1912	22153
Cutting	cutting machine	Jenssen	Stvgr	31.03.1913	23177
Cutting	cutting machine	Norland	Stvgr	09.08.1915	26158
Cutting	cutting machine	Norland	Stvgr	27.11.1916	27464
Cutting	splitting of fish	Kloster	Stvgr	26.04.1915	25812
Cutting	cutting, heads	Jacobsen	Stvgr	12.02.1912	22018

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Norwegian patent no. 61686, “Røke eller tørreovn”

The “Fish Pier” in Stavanger where the “Raw material men” have their supply boats unloaded. The canning factories came here very early in the morning to collect the day’s “raw material”. The brisling was transported in “skjepe-boxes”, which contained fish mixed with ice. The boxes were quite low and contained only one “skjepe” (20 litres) of brisling. This was to save the fish from damage from crushing. The boxes had one handle on the short end so that they could be more easily handled by one man. Today all brisling is frozen in blocks while the fishing boats are out in the fishing grounds. They are then transported to cold stores on land where they are stored until needed.

(Photo: State Archive)