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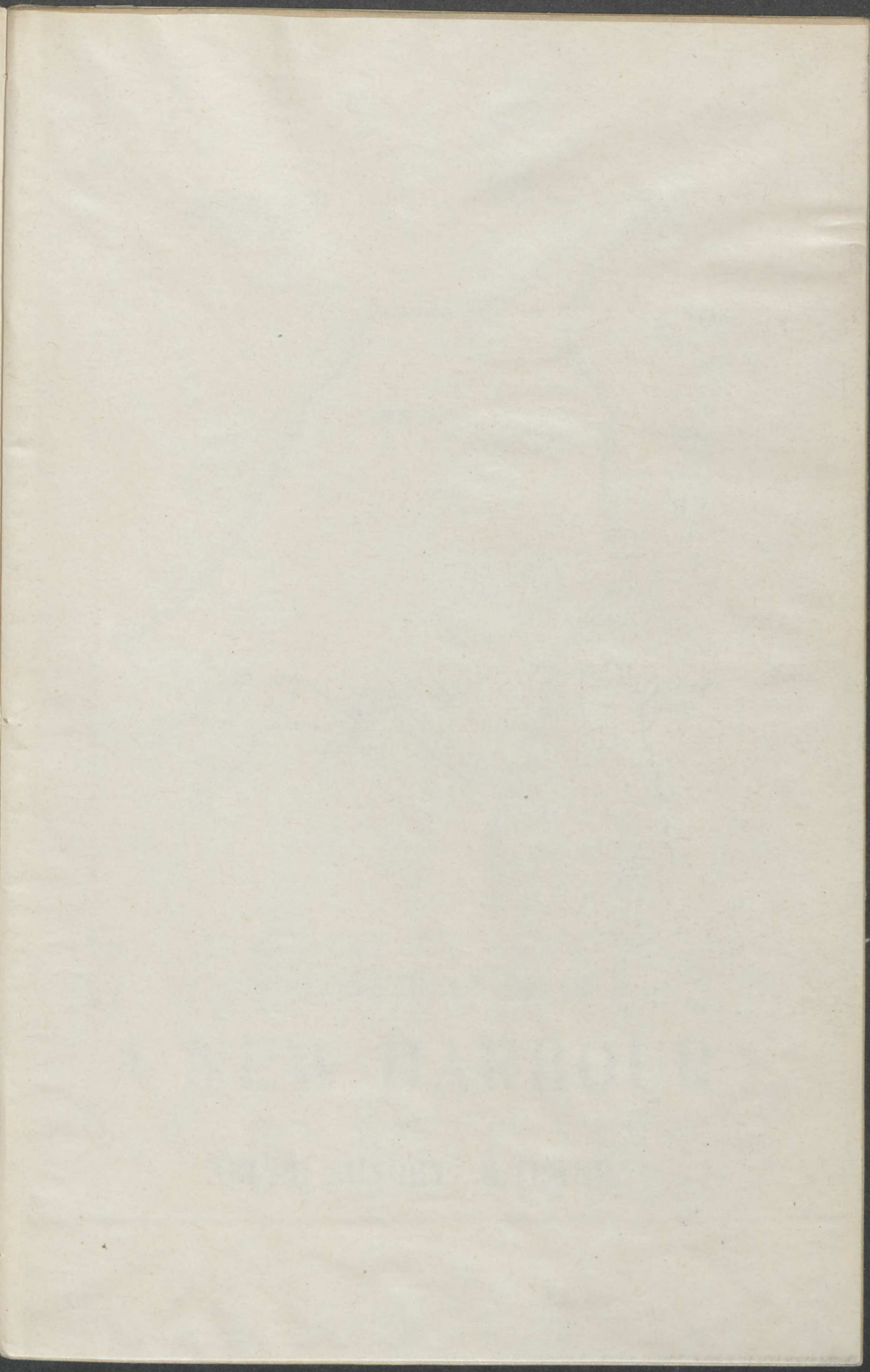
The Construction of a
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Søndby. Jütland

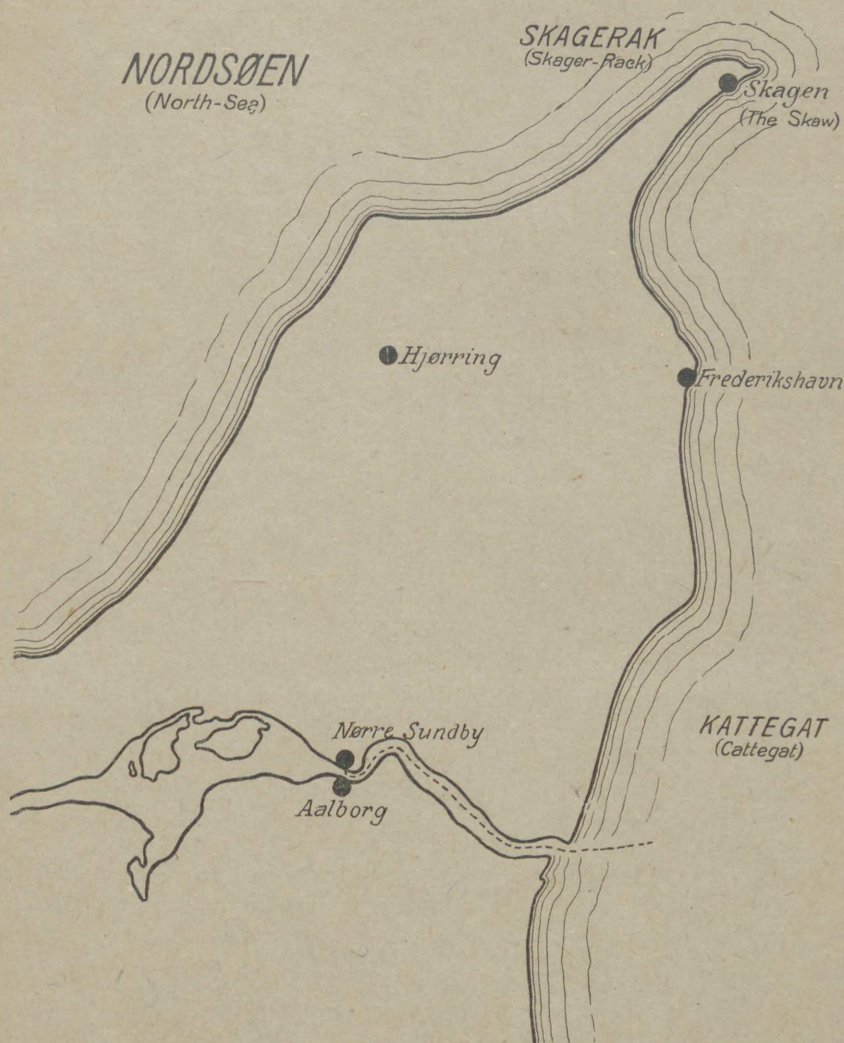
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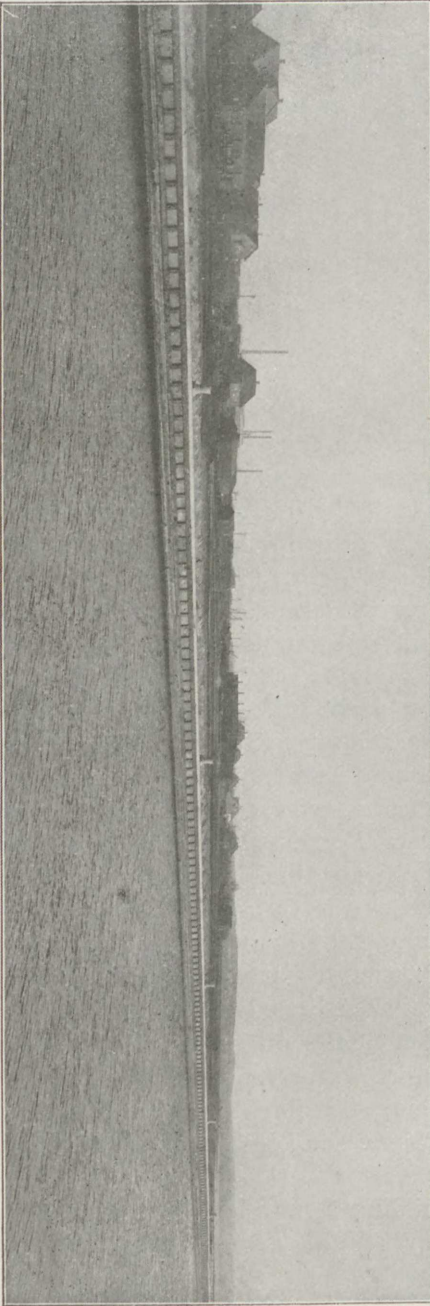
THE CONSTRUCTION OF
A NEW HARBOUR
AT
NØRRE SUNDBY, JUTLAND

TEKNISK BIBLIOTEK

Danmarks tekniske Højskole

The provincial town of Nørre Sundby, situated on the north side of the Limfjord, which traverses Jutland from Hals at Kattegat to the North Sea, has, in spite of its favorable situation with a large back country, been retarded in its development on account of its inferior harbour conditions. This difficulty is now overcome, as the town has recently built a new modern harbour; it has a main quay of 700 feet in length, and the water depth in the new harbour-basin is 24 feet. From Hals to Nørre Sundby the Limfjord is navigable for ships 24 feet deep; this distance, about 4 geographical miles, is well lighted by guiding lights, and allows navigation at all times. The »East-Asiatic Company's« large route-boats touch at Nørre Sundby for cargoes of cement from the company's own new cement factory, that uses Nørre Sundby as loading-port. The new quay is provided with railway tracks in direct connection with the railways south and north of the Limfjord. Nørre Sundby must now be considered the natural harbour for import and export for the largest part of the country north of the Limfjord. The construction of this harbour necessitated proportionately large expenses for the town, on account of the difficulties in the natural condition of the harbour-bed, which have required foundations of an extraordinary kind. As it may possibly interest others to be made acquainted with this work, we shall give a short description of the construction below.

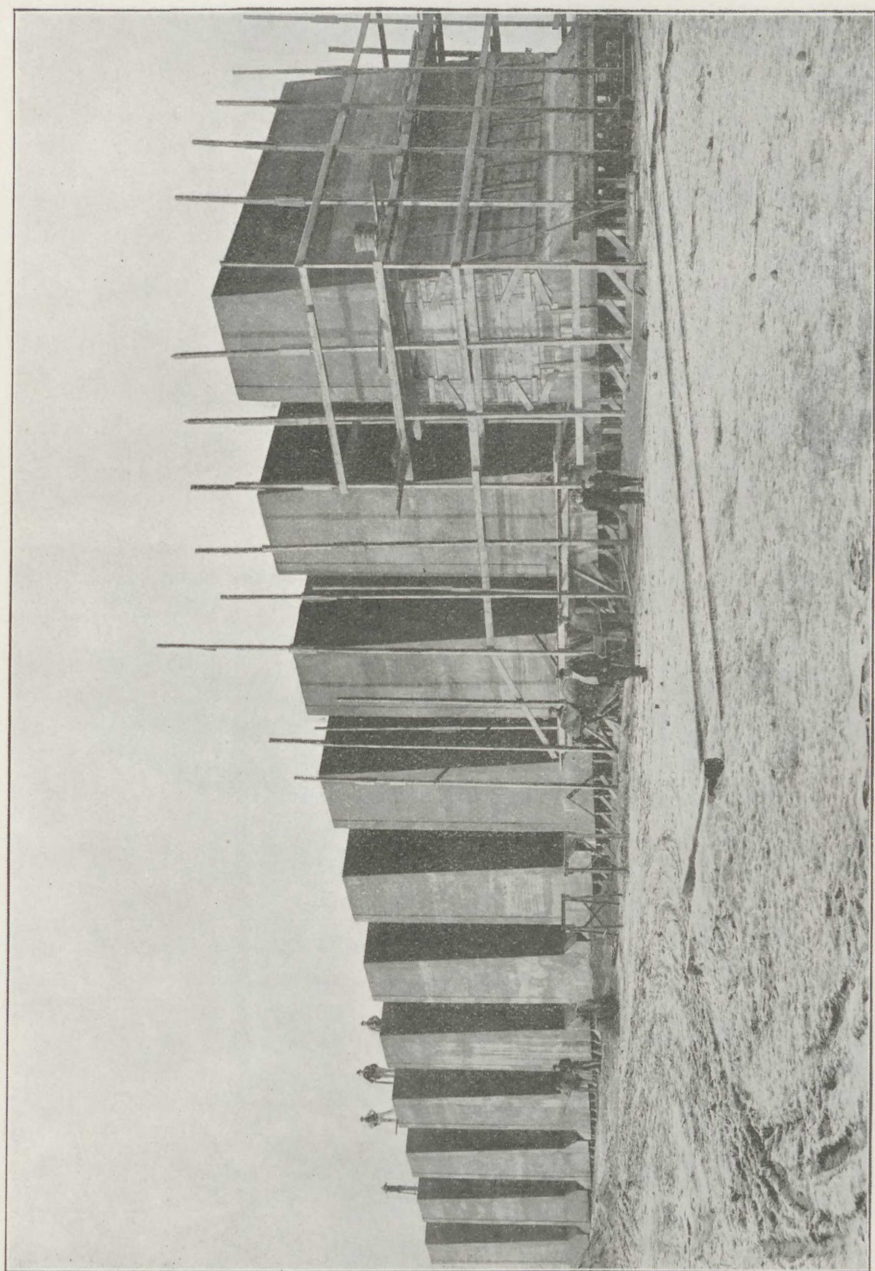
The problem consisted in building a new harbour basin with a quay 700 feet long in a water depth of 24 feet — besides about 200 feet quay on small depths — and a pier as a protection against movement in the bottom. Furthermore a piece of land had to be produced, the harbour basin excavated, as well as the entrance to

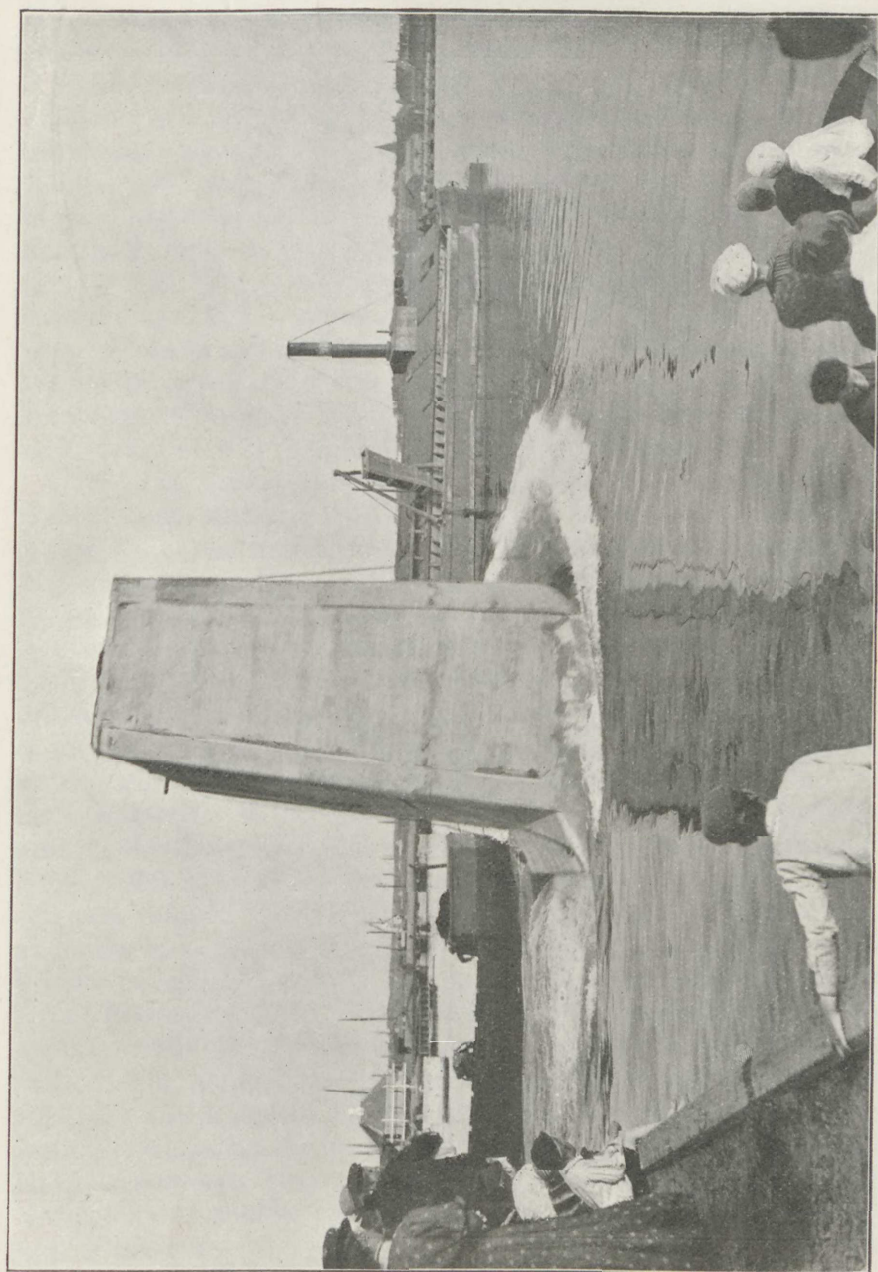


the harbour deepened. An examination of the bottom showed that not until reaching the depth of 60 to 70 feet a foundation could be in any measure secure. Above these depths the extensive layers consisted of a soft, sliding mass.

The plans, therefore, necessarily were to be directed at finding a construction, that could stand by its own weight, without anchorage, resting on a base that by its consistency would prevent a displacement; all of which had to be done for the proportionately small amount that could be provided.

In regard to the main construction, it was considered best, first to dig away the soft soil to the depth of about 43 feet, and fill up with a heavy sand foundation, upon which was erected a construction of sinking-boxes of reinforced concrete. The details of this construction are shown on the accompanying plan. The boxes are about 32 feet long, $8\frac{3}{4}$ feet broad at the top, and $16\frac{3}{4}$ feet broad at the base, the height is about 25 feet. The superstructure consisted similarly of reinforced concrete, and is closed on the top by a granite coping stone and provided





with fender work of wood, as shown on the plan. At every 50 feet is placed a mooring implement, alternately granite columns and iron rings, solidly moulded in large blocks of concrete.

The construction on the small depths consists of a quay wall of reinforced concrete on pilework. The piles are round, 60 feet in height, and mounted with ironplate as a protection against worms (Teredo). The back part of the piles is covered with plates of wood, also protected by an iron covering. The back stuffing is partly fascines in order to lessen the pressure on the front wall. 10 feet back of the front wall rammers are driven in 6 feet apart. These rammers are cast together with the piles of the front wall by a plate of reinforced concrete, and this plate is furthermore loaded down with ground fillings in order to increase the stability. On the front edge of the plate the quay wall was erected and, like the main quay, provided with granite coping stones and fender work.

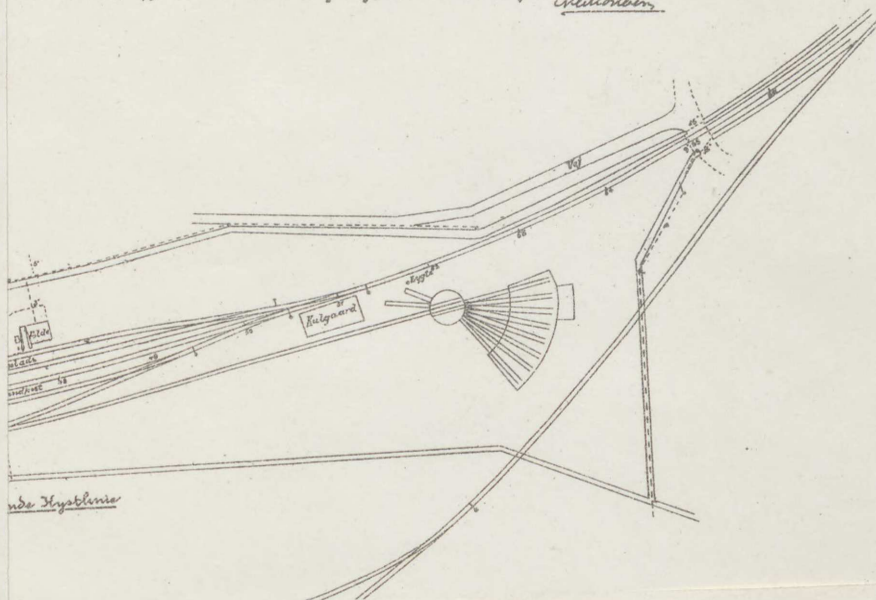
The work was executed in this way. First a dredger dug out the harbour basin down to 24 feet depth, and furthermore a channel in the quay line about 43 feet deep, with a bottom breadth of about 40 feet. This channel was filled with sand, that was given an overheight of 12—16 feet so as to compress the underground. The body of sand was left to settle for a few months, while the sinking boxes were being constructed. These were made on shore and were launched through stocks built for the purpose, after which they were towed to the quay foundation and sunk in place by filling them with water; afterwards they were filled with sand, and refilled with the same material. Before the cases were adjusted, the overheight of sand in the foundation was dug away, and the bank was carefully levelled with shingles, so that the boxes rested on a perfectly smooth and even surface. The concrete boxes were placed somewhat high, as it was to be expected that the foundation would give way a little by the increased weight. The boxes stood as long as possible, before they were joined, that they might work independently of one another. The joining was arranged so that long canvas bags filled with cement mortar were sunk in the notches of the corresponding sides, by which means complete closeness was obtained. After the joining of the boxes the quay wall was ultimately built above water, and a continuous groove made above every box joining to avoid crevices by a possible irregularity in the placing of the boxes. To protect the quay from under currents a belt of stones and shingles was placed before it. This belt is 7 feet wide and 1 foot in diameter. The work was completed exactly as planned, with no mishaps worth

mentioning. It was commenced in July 1907, and finished in November 1908. The whole enterprise was contracted for by *N. C. Monberg, C. E.*, and the firm of *Christiani & Nielsen*, specialists in concrete constructions, Copenhagen.

Nørre Sundby Municipal Harbour Committee.

til Skrivelse af 20/3 1907 til Oberpresidenten Byråds Samfundvalg.

Memoranda



Borresundby Sarns Herivelse.

Sanhedrin til Skrivelse af 20/3 1904 til Oberamtshj. Byråds Sammenvalg. Mellon

