1000 YEARS OF THE HARBOUR OF GDANSK

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The functioning of such a big harbour city like Gdansk required the use of advanced technology. The development and modernisation of infrastructure, maintenance of the harbour, defence against the enemies, protection from floods, water supply, and ensuring the continual work of numerous manufacturing companies — all this needed the effort of specialists, both native and foreign. The acceptance of new inventions was boosted by frequent contacts with the main foreign centres, especially with the Netherlands. So this is not surprising that also in that field the city of Gdansk before the partitions was among the leading cities in Poland, and some of the achievements made here were of the world-wide importance. Within the framework of this article, however, I can only present some of them.

Gdansk had been created, and has been developing since, as a harbour city. The harbour infrastructure included: quays, loading and unloading facilities, warehouses later called granaries, lights and navigation signs, dredgers, etc. Several numbers may constitute evidence of the harbour's quick development: the surface of water area increased from less than a hectare in the 10th century, to 23 hectares in the 17th century; in the beginning of the 19th century it was 34 hectares, in 1851–700 hectares, in 1929–896 hectares, within which was the 211 hectare sea port (at present 370 ha). The maximum depth increased from the initial 2,5 m to 7,5 m in the 19th century and to 10,5 m before the war (at present 17 m).

The main bulk commodities have through centuries been grain and timber. Unfortunately, we only have indirect data concerning the harbour's turnover between the 10th to 15th centuries. On the turn of the 13th century the yearly income of the harbour coming only from the duty taxes reached 9000 marc (ancient monetary unit) — that was twice as much as was coming from the whole region of Kujawy! Pound duty collected in the times of the Teutonic Knights, which was as high as 1/144 of the goods' worth, increased from 375.5 marc in 1390 to 6658 marc a year in 1443–1449. To this was added another tax — so called pile tax, which was

1/1500 of the goods' worth.

After coming back under Polish rule the harbour of Gdansk undergoes a period of its peak development. At the end of the 15th century 400–700 ships a year call at the port, rising to 1000–1800 at the beginning of the 17th century. The grain export reaches its record number of over 250 000 tons in 1618. The storage capacity of the 315 granaries reaches 100 000 tons.

Although wars with the Swedes cause a decrease in the turnover, Gdansk keeps its position of the biggest harbour on the Baltic Sea. In the 18th century the maximum grain export was rarely lower than 50 000 tons a year, and there were moments when it exceeded 100 000 tons. The first half of the 19th century was characterised by stagnation, yet in the second half the export of grain through the Gdansk harbour increased to equal that of the best times before the partitions. At the same time a global statistics of cargo handling was introduced. In 1886–1890 it exceeded 1 million tons a year, and in 1912 it reached 2.5 million tons. The years between the wars were characterised by a quick increase — from 1.8 million tons in

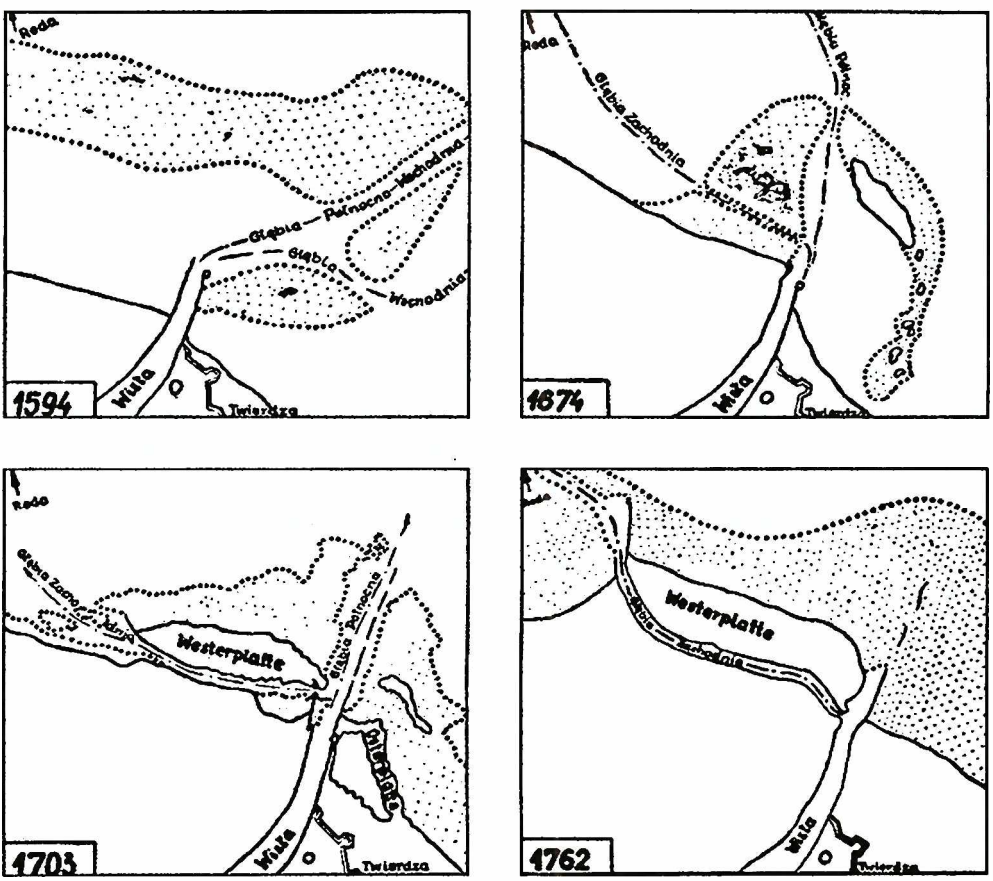

Figure 1. Changes in the harbour entrance between 1594 – 1762.

1920 to 8.6 million in 1928, and 7,1 million in 1938.

The construction of the oldest quays at the feet of the city is known from the archeological investigations. The oak beams of the carrying grid were laid on a clay and peat layer. Their sliding down into water was prevented by timber hooks, which were anchored in the dike. Mooring piles provided additional strengthening. Larger ships were stopped by special platforms built a long way into the water. Since the 13th century the quays were platforms built from flat boards supported by two rows of thick pillars. The mooring piles were 30 cm in diameter, and 3.5 meters long, and were protected from rotting by scorching. The river and channel banks were strengthened by caissons filled with clay and stones. The embankments were up to 6 meters wide.

The main streets of the Right City laid out in the 14th century led to the harbour

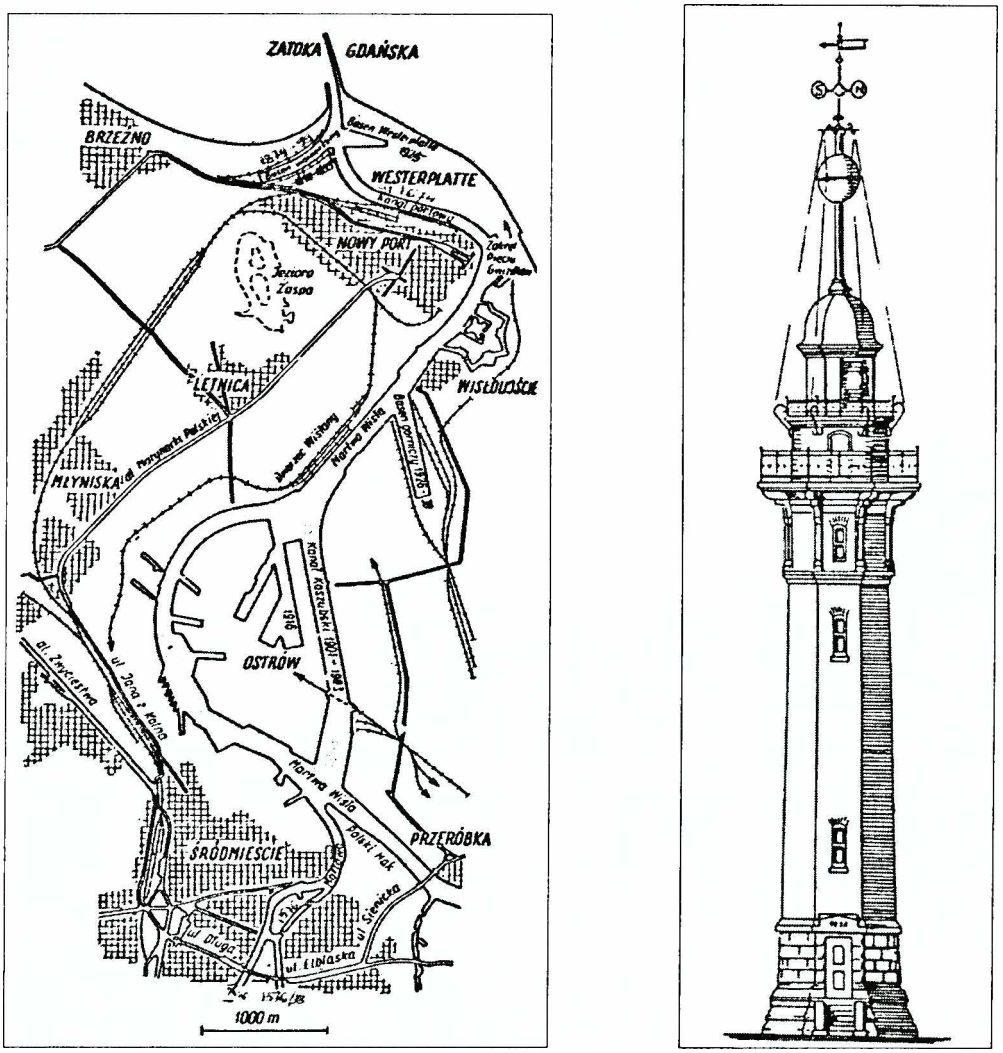

Figure 2. *The development of the Gdansk harbour (left). The Pilots' Tower – design from 1893. At the top, below the weathercock, there is the time signal ball (right).*

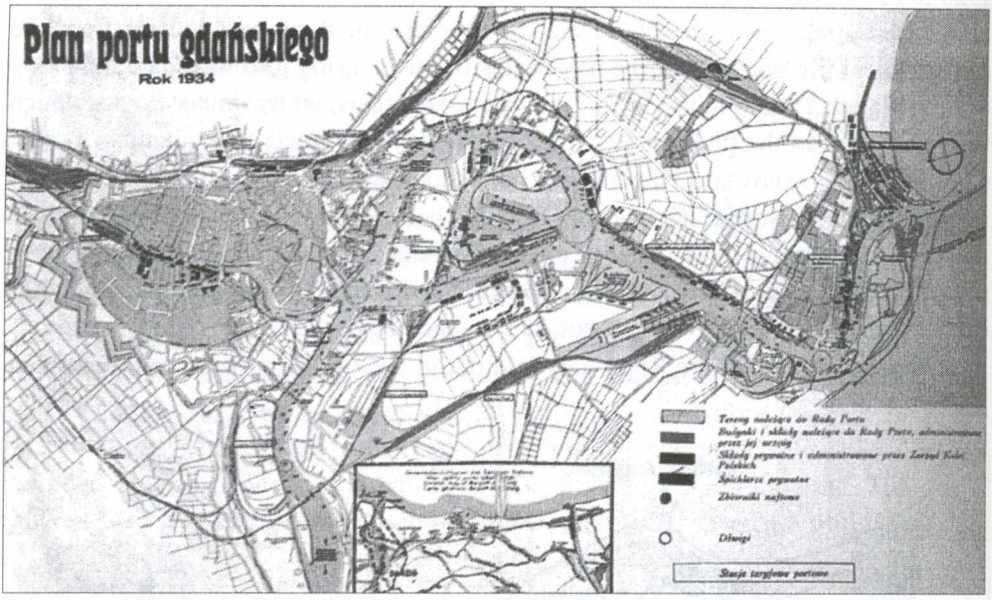

Figure 3. *Map of the Harbour from 1934.*

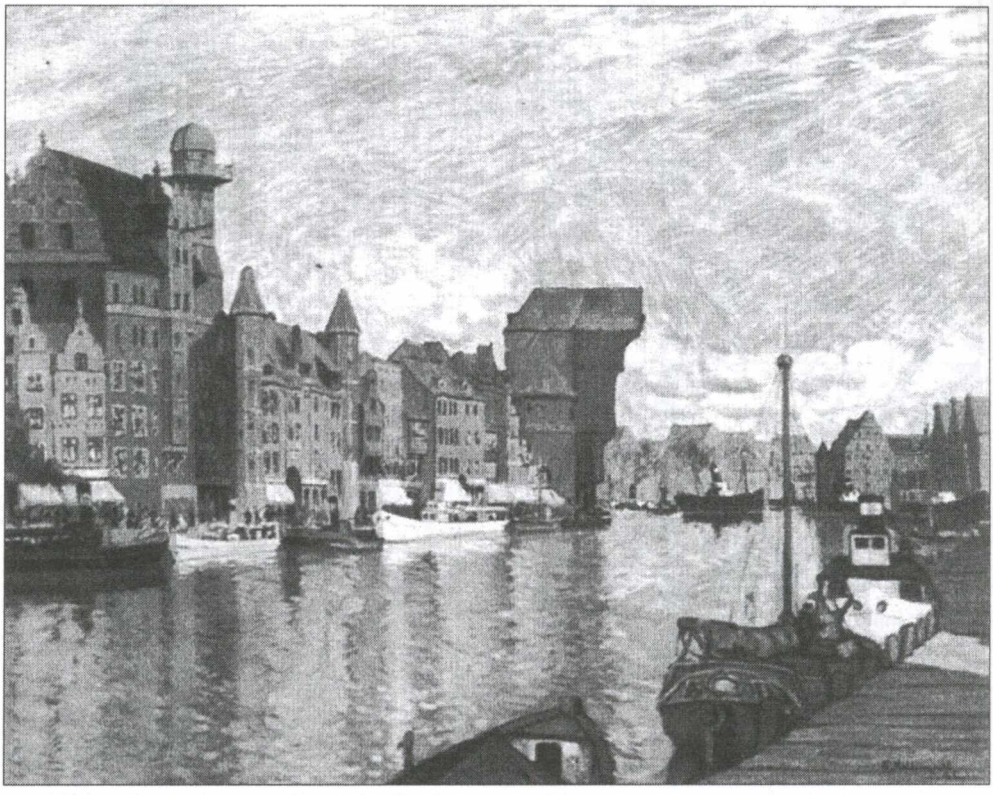

Figure 4. *The Motlawa harbour in the beginnings of our century.*

and were closed by water gates. In front of the gates the reloading piers were created. As the traffic in the harbour increased, they were gradually lengthened. In the 15th century there were: Long Quay by the granaries and Small Quay from the Cog Gate (at the mouth of Long Market) to Chlebnicka (Bread Benches Street), later lengthened to the Crane. In the 17th century it already extended to the Straganiarska (Huckster) Gate and then it got its name from the other side of the river. Today it is called Long Quay. By the Fish Market a Fishermen's Littoral was created. Also by the New Motlawa, which was dug in 1576 and dredged in 1598, and by Olowianka new wharves were built. Their total length was 3 kilometres – – 4 times longer than at the London harbour. The quays were supported by piles standing close to each other, and joined by double battens. In some places two-stage quays were built. Only in 1895 the traditional timber constructions were replaced by leakproof walls with Monier plates made of reinforced concrete. Modern quays were also created in the continually developed outer harbour and New Harbour (1879 — a new dock, since 1899 duty free), in the Emperor's Harbour (1903 — at present Cashubian Channel), on Ostrow (1916), Westerplatte (1925 — Ammunition Dock) and Wisloujscie (1938 — Miners' Dock. After the First World War prefabricated concrete constructions were used. In 1938 the Gdansk harbour had 31 kilometres of quays (including 11 km of concrete ones).

In the Middle Ages keeping the depth consisted in moving the platforms further into the water areas. The oldest information about deepening the Vistula River comes from 1421, when a special expense was assigned to it. In 1425 the Council gave over the administration and income from the Small City Scales to Peter Hildebrand. In return for this he was obliged "to make the Cog Depth by our Masters' Castle (Teutonic Knights) 5 ells (2.9 m) deep; to clean up and deepen the Boatswain's old riverbed, and to clean both banks of the Motlawa River at the expense of the city." To perform the task he was to use "(...) the ships, ropes and equipment he owns already, together with the new one we have ordered (...)". In 1550 the harbour was 3.4 m deep, and the river Vistula — 5.2 m. Since 1554 the river mouth was getting silt up as a result of disposing all the Vistula waters into Nogat through a ditch by Szpica Mątowska made by the inhabitants of the Elbląg region. This situation was finally sorted out in the years 1612–1626, yet the damage had been done. In 1581 the depth of the Wisloujscie water track fell down to 2.9 m, and in 1594 — to 1.4–2.6 m. Since that time we have precise yearly maps with the results of sounding the depth by the river mouth. The same year a Dutch specialist, Walter Clemens presented the Council with a design of a dredger. It was a heavy raft, from which a rotating scraper for combing the riverbed was lowered. The sludge, which was moved in such a way, flowed down with the current. A different type of device prepared by Simon Stevin was called "ploughing sacks". One more improvement was to use horsepower and sieve buckets collecting sand from the bottom and depositing it onto a punt. With its help within the years 1674–1675 an impressive task of digging a 600 m long, 37 m wide, and 2.5 m deep waterway from West Depth (the origin of New Port) was performed. Every dredger had two horses

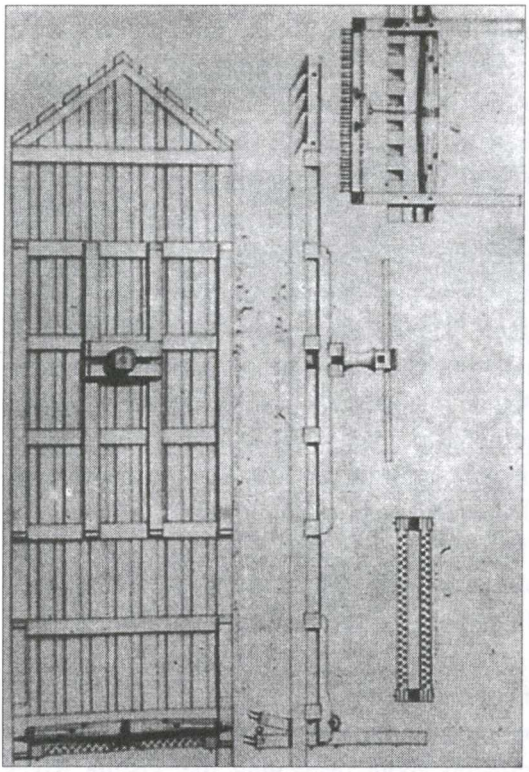

Figure 5. *W. Clemens's dredger design from 1594.*

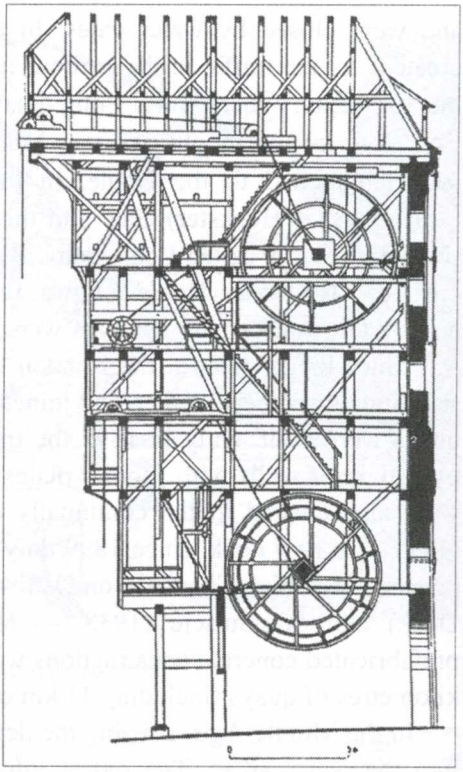

Figure 6. *The Crane construction.*

walking in the gear. Toothed wheels were transferring the power on a roller turning 24 buckets. While they were risen water was escaping through small holes in the bottom and walls. A few such dredgers were working in the harbour through all of the 17th and 18th centuries. In 1844 the first steam powered dredger was introduced.

Till the time when the main Vistula waters ran into the sea by the Wisloujscie fortress, the struggle to keep the proper depth of the harbour entrance was a difficult and expensive one. Moving sandbanks and gullies of changeable shape appeared right in front of the river mouth. To prevent the sanding up by side currents, breakwaters were built from cases drowned in the water, filled with stones, and strengthened by palisades. Since 1666 a new sandbank began to form to the left of the river mouth. It was called West sandbank (West Plaate — at present Westerplatte). In 1691, after digging up the west waterway, the west sandbank by the river mouth was lengthened, and it was equipped with a flood — gate. Due to the strengthening of the banks by wooden cases, building a water break at the river mouth, and — of course thanks to systematic dredging, it was possible to keep the depth of 2–3.3 m in the new fairway. The north exit, however, got more and more sanded up, and in 1774 it was only 1.2–1.4 m deep. The wooden flood gate cutting off the new waterway from the main current of the Vistula River was renovated in 1724, and in the years 1801–1804 it was replaced by a new, 12.6 m wide brick one. In the years 1802–1806 the banks of the harbour canal were laid with stones. The so-called east breakwater (north in

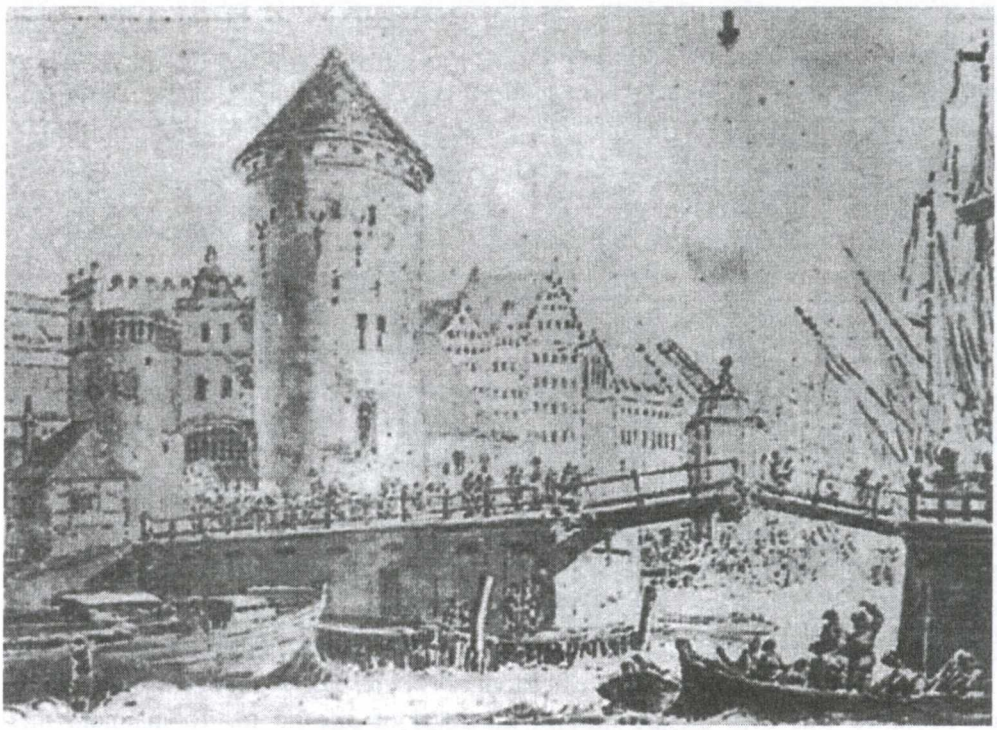

Figure 7. *Small Crane in the 18th century – marked with an arrow in the background.*

reality) was extended in 1824–1844 to an impressive length of 831 m, while the west breakwater (south) reached the length of 208 m. Both piers got a solid construction based on a timber framework and drowned cases with stones, and the tops and sides were laid with granite. The harbour was a safe yet shallow one. The depth in the new canal was 3.9 m, and in the old Motlawa harbour — 2.7–3.3 m. Larger ships had to be unloaded in the roadster.

In this situation Nature itself offered help. On February 1st 1840 an ice jam caused the waters of the Vistula River to overflow into the sea through the dunes near Gorki (Hills) village. Since that moment the whole lower course of the river has become a convenient harbour of 700 hectares. It was immediately closed by a new floodgate in Plonia. The new river mouth was strengthened by breakwaters. The new breakwater, finished in 1888, and 2 km long was constructed in a way similar to that of New Port. The depth of Brave Vistula, as Wincenty Pol called it, was 6–7 m. In 1845 a dam was built to close off the old north river mouth, and a 33 m wide canal was built to pass round the old, useless now, floodgate in the New Harbour. The harbour canal was deepened to 4.5 m. The next deepening to 6.3 m (later to 7 and 8 m) took place in1879, and was connected with the construction of what is now called Wladyslaw IV dock. The canal today is 10.5 m deep. Together with this work the old floodgate was taken to pieces, and the harbour canal was widened to 51 – 75 m (135 m at present). Within the years 1890–1895 a new river

mouth was dug out between Swibno and Mikoszewo, to prevent the floods.

Two new 500 m long breakwaters were constructed to prevent sanding up: east one (today — 1600 m), and west one (today — 2000 m). A 12.5 m wide and 2.5 m deep chamber floodgate was constructed in Przegalina, together with the 1 km long canal for rafts, with an 11 m floodgate. Since 1905 a new electric Thor dredger of 170 m^3 per hour capacity was used, which more or less equalled the amount of rubble carried by the river.

The next technological achievement was deepening and widening the Boatswain riverbed, also called Scow riverbed, which took place in the years 1901–1903. On 27th May 1904 a new canal called the Emperor's Harbour (today Cashubian Canal) was opened. It was 2.2 km long, 140–230 m wide, and 7.5 m deep. 346 000 m3 of dry soil and 2.433 mln m^3 of wet soil were dredged. The quays based on thick, leakproof walls were paved with stones. 16 fender walls and 2 rows of dolphin piles were constructed. In the upper part of the canal a 150 m long turning basin was built. To meet the ever growing size and draught of the ships, in the years 1912 - 14 the canal was widened to 100 m. The waterway, together with the Emperor's Harbour and the Dead Vistula west of Ostrow were deepened to 9–10 m up to the point where the Vistula River met the sea.

The Dead Vistula part between the Polish Hook and the railway bridge was in 1904 6 m deep, and to the floodgate in Plonia 2–2.5 m. The depth of the old harbour on Motlawa was kept all the time at the level of 3.5–4.5 m. To maintain this

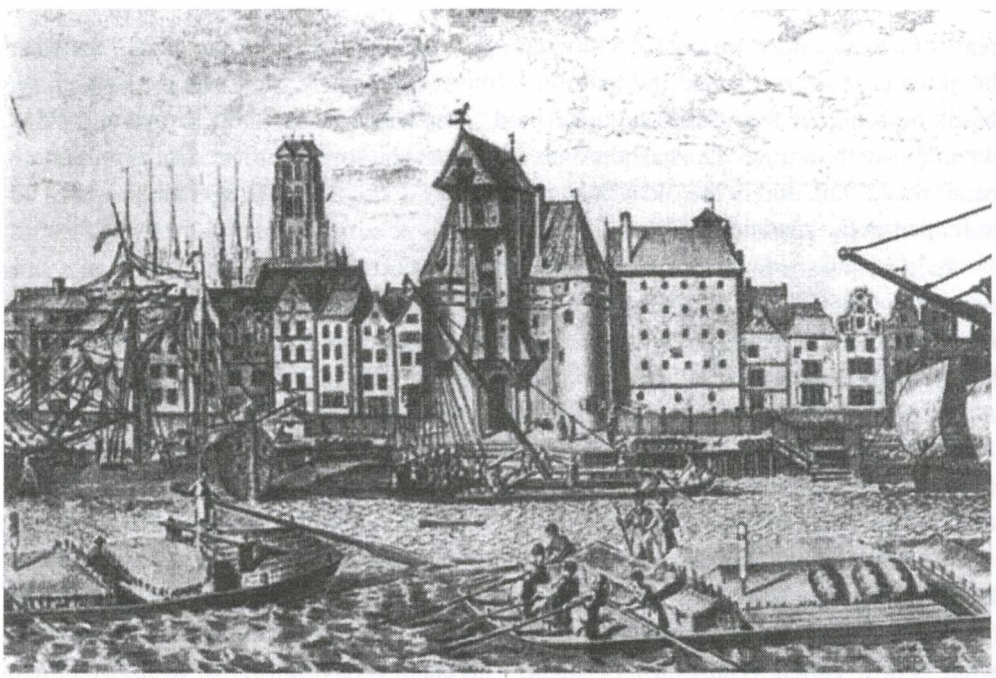

Figure 8. *The Crane is erecting a mast on a scow.*

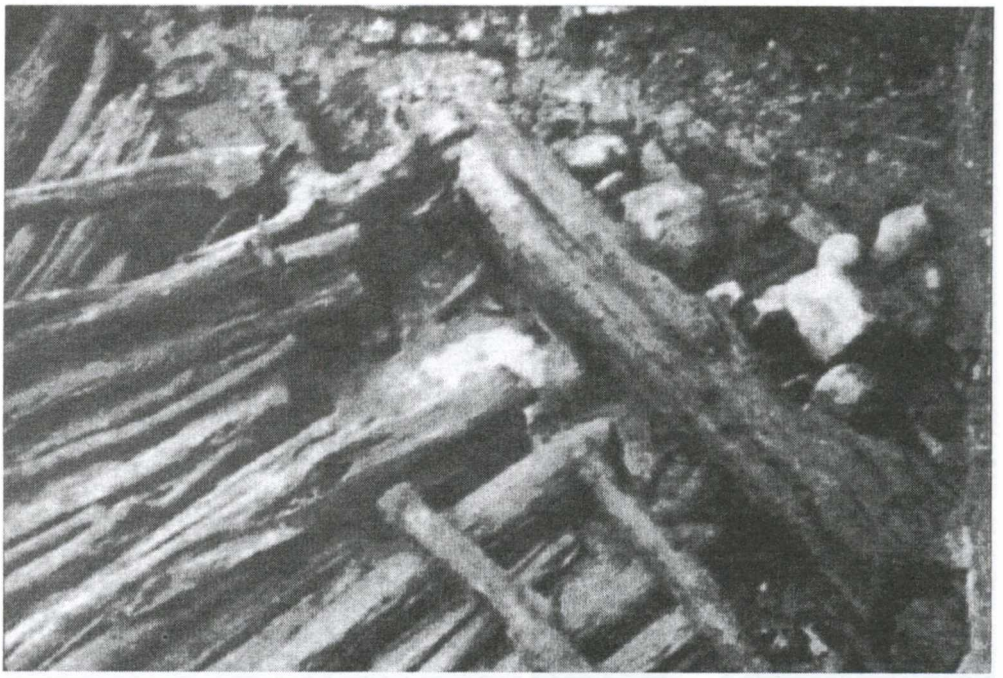

Figure 9. *Construction of the oldest quays.*

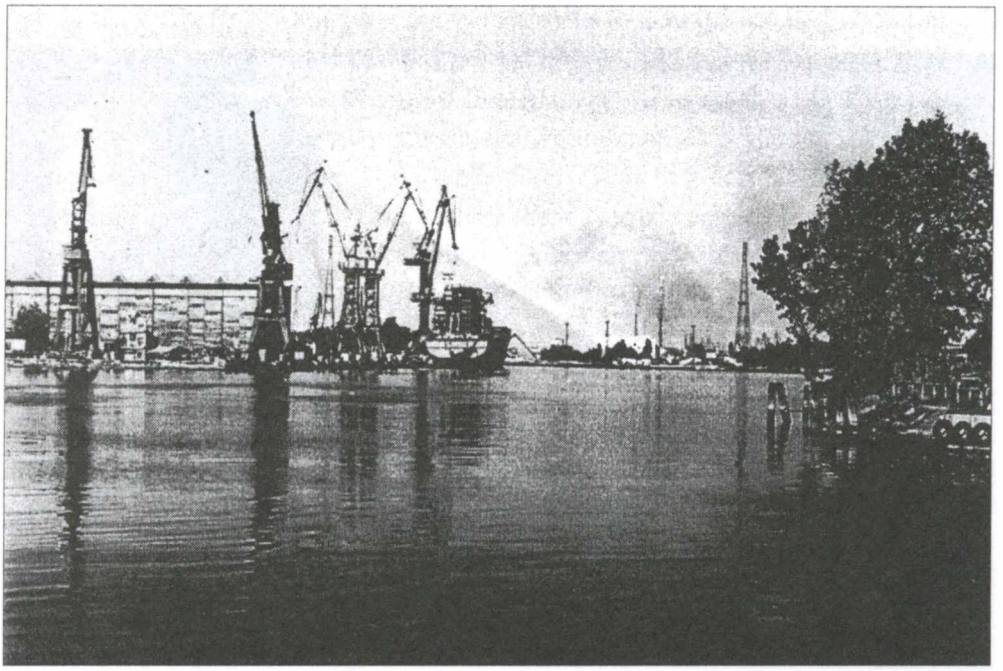

Figure 10. *The Emperor's Harbour (Cashubian Canal) today.*

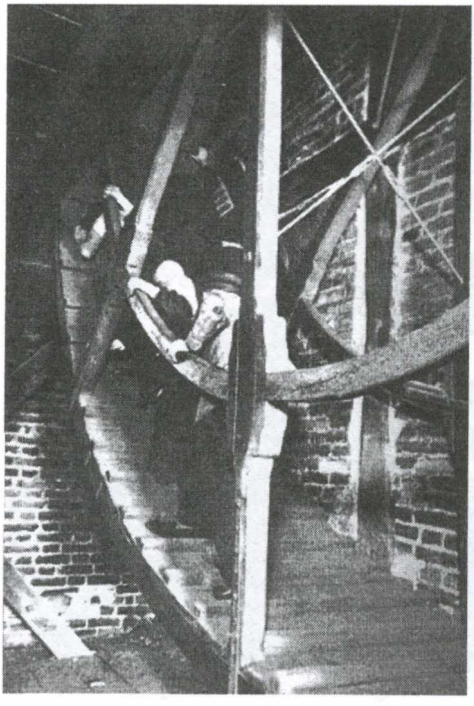

Figure 11. *People inside the Crane's drawing machine (picture taken before the II war).*

Nachdem auf geschehene Inständigkeit und zum Besten der zur See handelnden Kaufmannschaft die Veranstaltung gemacht worden, daß in Zukunft die Lichter welche bisher zu Nachtzeiten auf der Laterne des Thurms der Vestung Weichsel-Münde gebrannt, nicht weiter werden angezündet werden; sondern an dessen Stelle vom September dieses Jahres an, auf den an dem Ende neuerbauten und gegen den Mund des Wester-Tiefs in gerader Linie stehenden zween Bliesen, alle Jahre vom 24. Septembr. bis den 24. Martii, zur Anweisung für die hier ankommenden Schiffer Steinkohlen gebrannt werden sollen: Als wird solches hiemit Jedermänniglich, sonderlich der zur See handelnden Kaufmannschaft, und den nach der hiesigen Rheede bestimmten Schiffern, bekannt gemacht. Danzig, den 3. Aug. 1758.

Figure 12*. The notice about starting the functioning of the navigation lights in 1758. The position of the lights is marked with arrows.*

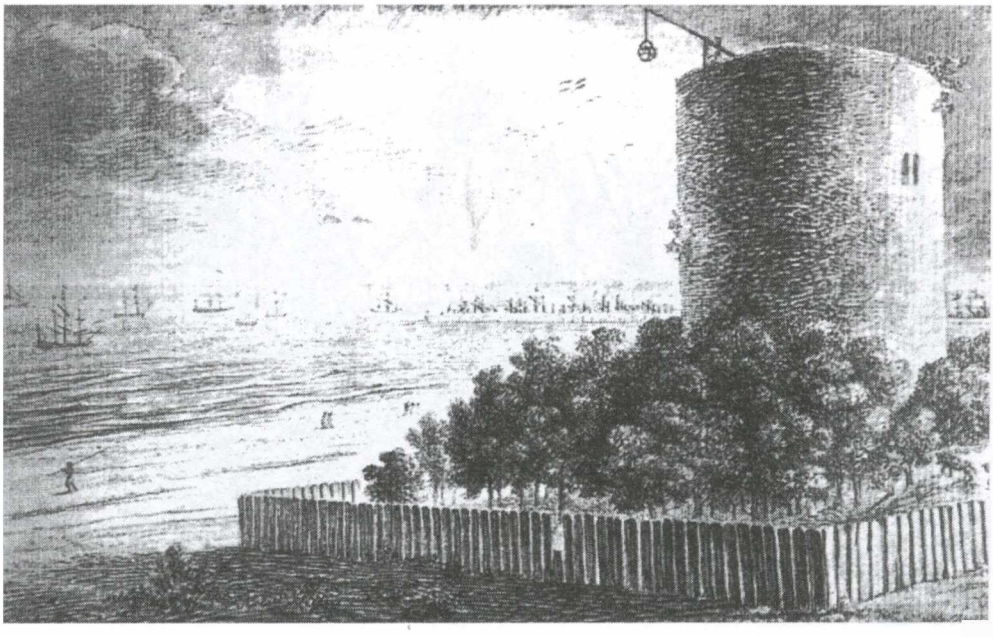

Figure 13. *The Lighthouse in New Port in 1774.*

situation it was necessary to employ several dredgers, and to clear the Radunia Canal every year. In 1916 a 7.1–7.5 m deep submarine base pool was built on Ostrow, and in 1925 a 9 = 10 m deep Ammunition Dock was built on Westerplatte. In the years 1927–1935 an 8 10.5 m deep Miners' Dock was also built.

To navigate safely navigation lights and lighthouses are necessary. Some lights within the city existed already in the times of saint Adalbert. The oldest lighthouse known in that region was built in 1482 in Wisloujscie. On top of a 23 m high tower a fire was made, which was visible even from the distance of several kilometres. In 1593 Antoni van Obberghen added a wonderful spire on top, and a more sophisticated device was installed in the lighthouse. Among the bills from those times we can find the following positions: "for covering the lighthouse with shining brass – 152 fines, covering the lights with copper — 15 fines, 11.5 fines payable to master Herman Benning for cleaning and polishing the lighthouse". Marton Csombor noted down in 1616: "In the fortress (...) on top of the tower there is such a huge lamp that 8 people could enter it at the same time". At the sides of the fortress there were two tall wooden poles, on which metal dishes were placed. The dishes were filled with oil, and were lit at dusk. Since 1640 the city also maintained a lighthouse on Hel peninsula. It was a 20 m tall mast, on top of which a steel basket full of burning coal was hoisted. After the new entrance way to the harbour was opened the necessity for keeping the lighthouse in Wisloujscie diminished. In 1758 it was replaced by two new ones, placed on the other side of the river, and working as leading marks. Their appearance came with the following announcement:

"In response to the petitions, and for the wellbeing of the merchants working at sea it has been decided that in the future the lights that have, up till now, been put on on the Wisloujscie tower, will no longer function. Instead of them, starting in September, we will put on the lights on the two lighthouses standing at the end, and immediately in front of the West Depth. Every year between 24th September and 24th March hard coal will be burnt to show the way to the coming skippers."

The bigger of the lighthouses called in German die Bliese was made of brick, and the light was placed 18 m above the ground. In 1817 the coal was replaced with the light of wax candles, intensified by reflectors. In 1819 gas lanterns were introduced. In 1837 there were two lighthouses working – the old lantern and a new one, with the light 20 m above the ground. The distance between them was 82 m. Beginning with 1860, lamps with rape oil were used. Ten years later kerosene lamps were introduced. The lighthouse keeper worked with 7 lamps whose light was intensified by parabolic concave spherical mirrors, 53 cm in diameter. In 1894 a so- called Pilots' Tower (Lotsenturm) was built. It had electric lamps placed 30.3 m high, supplied by their own dynamo. It was the first electric lighthouse in the whole German territory of those times, copied after the American lighthouse in Cleveland. Its light had a range of 13 nautical miles (24 km). On top there was a so-called time ball, whose fall every day at exactly 12 noon marked the time. The lighthouse functioned till 1984. In 1896 the old lighthouse from 1758 was taken to

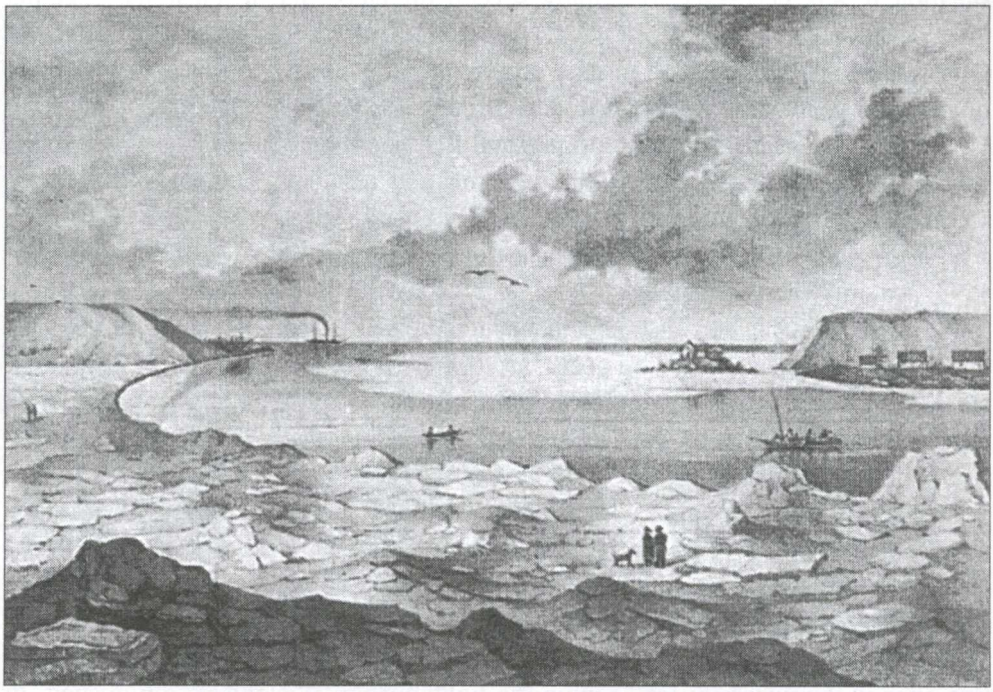

Figure 14. *The Brave Vistula in 1840.*

pieces. Before the war its recollection was the name of Bliesenstrasse, at present called Wysoka (High Street). The lights at the top of breakwaters at the entrance to the harbour are working till this day. The strongest navigation light of the Polish seashore is the new lighthouse in the North Harbour, which has a range of 25 nautical miles (46.3 km).

The oldest harbour crane by the Motlawa River, at the outlet of Szeroka Street, existed already in 1367. In the years 1442–1444, in spite of the Teutonic Knights' resistance, it was replaced by the new Crane, which survived up to our times, and was the largest one in the medieval Europe. A set of two huge foot drawing drums was installed in the monumental gates. They were 6 and 6.5 m in diameter, and were powered by the weight of people walking inside. With the help of these drums it was possible to lift up to 2 tons to the height of 27 m, or 4 tons up to 11 m. In the 19th century the ropes were replaced with chains, and brakes were added. In 1941 (!) pulley blocks were added to simplify the start — up. The main function of the Crane was to reload the wine barrels, from which the neighbouring littoral was called Wine Littoral, and erecting masts on the Vistula ships to enable them to sail back against the current.

When we look at the map of Gdansk from 1615, apart from the main Crane we can also see two smaller ones, working foe the shipyard on Brabank (Old Shipyard Street) and Kepa (Olowianka sandpit). In 1610 a so-called Back Crane was erected on Unicorn bastion. The fifth crane, called Small Crane, worked by the iron scales

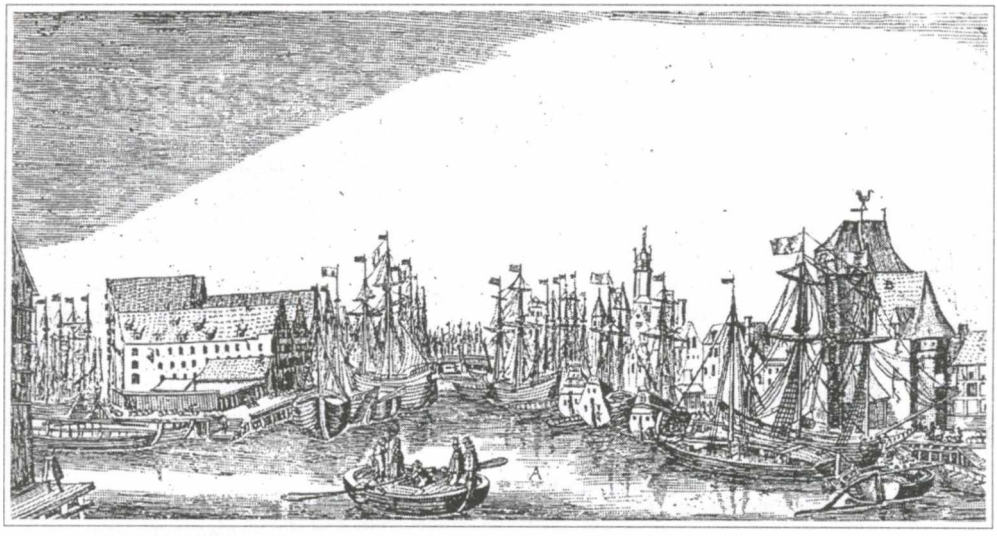

***Figure 15**. Harbour on Motlawa river in 1617.*

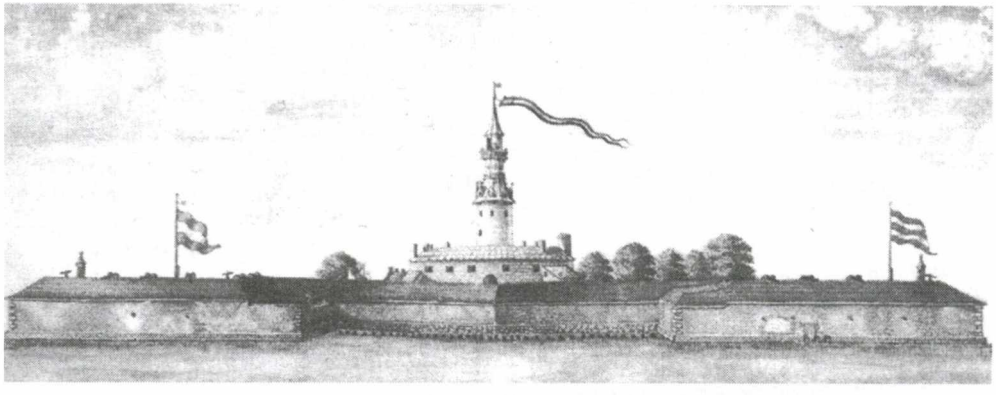

***Figure 16.** The Wisloujscie Fortress with the Lighthouse Tower in 1673.*

on the Island of Granaries. The sixth one was owned by the Lastadia shipyard. In the 19th century steel cranes like the two preserved by Szafarnia Street, appeared. In 1929 the Gdansk harbour had 86 cranes with hoisting capacity ranging from 2 to 100 tons. In 1914 the Schichau shipyard bought the largest hammer crane. It was 57 m tall and its hoisting capacity was 250 tons. After 1945 it was dismantled and taken away to Leningrad.

Translation: Anna Kucharska