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New sources, new look — the Ostrodzko-Elblaski Canal / Poland: About the network origins of its inclined planes

(1) The Project

The Ostrodzko-Elblaski Canal / Poland has originally been located in the far east of the Prussian state. The canal should link the upper part of this province — the so-called Oberland — with the Baltic Sea harbour of Elbing. That's why it was originally called Elbing-Oberlandkanal or simply: Oberlandkanal. As I am talking about the building time in the middle of the 19th century I am going to talk about the Oberlandkanal.

Thanks to the enthusiasm of many civil engineers the public is provided with quite a lot of books on engineering subjects. These presentations are often concentrated on facts and dates. Due to the Polish historians Stanisław Januszewski (2001) and Artur Magnuszewski (2003) we have got a splendid overview over the technical features of the Ostrodzko-Elblaski Canal. They have recollected facts and dates. Their reports represent the actual state of knowledge.¹

What we don't know is: How has this canal system been worked out? How did the acting people achieve and communicate their knowledge and their experiences? What are the results and how can they be qualified?

What I try to do is to reconstruct the process of achieving knowledge and decision-making by re-reading the archive sources, which haven't been regarded up to now. This presentation is part of an ongoing research work. Its objective is to re-write history on the basis of an analytic and critical approach by close reading.

(2) Background stories

Inclined planes have been the forerunners of ship locks. There were simple inclined planes in Egypt, in China and in the Greek antique. We know about simple inclines in the Middle Ages in the Netherlands. And we know about an advanced system in Italy at the Brenta canal dating from around 1480.

During the second half of the 18th century, during the take off of the industrial revolution and the canal mania different schemes of inclines were built in England, followed by copies in France and in Silesia around 1800–1810.

There were two main reasons for not to build locks: (1) Vertical boat lifts or inclined planes should be much cheaper than expensive lock buildings.² (2) Boatlifts don't spoil valuable canal water.

All the traditional canal inclined planes were built for small boats with a load up to 6 tons maximum. There was only one bigger scheme in America.

[The Morris canal] was completed in 1831 between Newark and Phillipsburg (where it connected with the Lehigh Navigation and Delaware Canal by means of an outlet lock and cable ferry which crossed the Delaware River). The Morris Canal enjoyed its first full

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¹ Stanisław Januszewski: *Kanał Ostródzko-Elbląski* (Wrocław 2001); Artur Magnuszewski: "Pochylnie Kanału Elbląskiego – niedoceniony zabytek techniki", *Gospodarka Wodna*, no. 9, 2003, p. 384–389.

² For the history of vertical ship lifting, please regard: E. Schinkel: *Ship lifts in Germany / Schiffs-Hebewerke in Deutschland* (Essen 2006); Schinkel: *Schiffslift. Die Schiffs-Hebewerke der Welt. Menschen – Technik – Geschichte* (Essen 2001); David Tew: "Canal lifts and inclines: with particular reference to those in the British Isles", *Transactions of the Newcomb Society*, vol XXVIII (1951/52), p. 35–58; David Tew: *Canal Inclines and Lifts*. (Gloucester 1984); Mike Clarke, Hans-Joachim Uhlemann: *Canal lifts and Inclined Planes of the world* (Horsham 2002).

boating season in 1832. In 1836, it was extended to Jersey City. Its total length, including navigable feeders, was 109 miles. During the 1850's and 1860's the original inclined plane water wheels were replaced with more efficient water turbines.³

The Morris canal had been built for sectional boats:

The original design of the canal allowed for boats of 25 tons (...). By 1860 the canal had been progressively enlarged to allow for boats of 70 tons. (...) Between 1848 and 1860 the original overshot water wheels that powered the inclined planes were replaced with more powerful water turbines. The original iron chains used for towing the plane cars also were replaced with wire cables.⁴

Beside locks there were 23 inclined planes. Based on a tour in America between 1833 and 1835 the French civil engineer and economist Michel Chevalier (1806–1879) had published the scheme in his book “Histoire et description des voies de communication aux États-Unis” (1840–1842).⁵

The use of inclined planes had already become common in railway transport. The knowledge about them had been widely distributed by the reports of travellers. The most comprehensive study written in German by C.v. Oeynhausen and H.v. Dechen “Schienenwege in England 1826 und 1827” (1829) had been translated into English under the title “Railways in England”.

Looking upon the Oberlandkanal I'll concentrate on its inclines as one of its most significant structures of technique.

(3) Telling history

The general idea for the Oberlandkanal had been under discussion since several decades; some say since the 18th century. Its purpose was to bring especially wood from the Oberland down to the Baltic Sea harbour of Elbing. Detailed planning started around 1830. The experienced dyke inspector Georg Jacob Steenke (1801–1884) had been officially involved since 1837. But it is said that on the demand of the Elbing town administration he had been working for the scheme since the early 1830s.

Digging the cut started in 1844. But even at this time the Prussian Ministry and the responsible consulting commission (“Ober-Bau-Deputation”) in Berlin had not finally decided on project section no. 6. Section no. 6 was the key canal section. Ships had to be lifted (or lowered) about 100 m

- either with 45 ship locks, built in wood (lift height: approximately 2,50 m), or
- with 30 massive locks, built in stone (lift height approximately 3,80 m).

But Steenke had proposed an alternative. Four inclined planes could replace 30 lock chambers. Building costs would be lower.

What kind of inclined planes did he propose? I found out that he had presented a model to the central building administration in Berlin. But it remains unknown what the model looked like.

What we know is: (1) Steenke had been a student at the famous Prussian Building Academy (“Bauakademie”) in Berlin. The catalogue of the Bauakademie library shows that it contained the important hydraulical literature in German as well as in English and in French. So Steenke knew the hydraulic literature including Chevalier's description of the Morris Canal inclined planes. This scheme might have served as a model for Steenke's proposal. (2) In 1846 Steenke had made a journey through the Netherlands and Belgium. If he had seen an Inclined Plane, it would have been one for small boats only.⁶ Continuing this journey through some southern states of Germany, through Austria and Silesia Steenke studied the actual hydraulic structures.

But there was news from America. There were ongoing achievement works at the Morris canal and especially at its inclined planes. Nobody knew the details.

³ Ex: *Homepage National Canal Museum Easton / USA*.

⁴ Ex: *Wikipedia*, “Morris canal”.

⁵ In addition to that Steenke mentions an article by Förster in the *Wiener Bauzeitung*; see Steenke, 1.st report, Nov. 17th, 1850; Berlin, *Geheimes Staatsarchiv Preußischer Kulturbesitz (GStPK)*: I.HA Rep.93 B, Nr. 1000. - Januszewski, p.22ff.; Artur Magnuszewski: “Pochylnie Kanalu Elbląskiego – niedoceniony uabytek techniki”, *Gospodarka Wodna*, no. 9, 2003, p. 384–389.

⁶ Details referring to this tour can hopefully be published in the near future.

How did the story go on? There is a popular legend which shortcuts the Oberlandkanal history. It was told to the pupils at school in the early 20th century and it is still told in some popular brochures for tourists. The legend tells us that first nobody had trust into Steenke's proposal. Finally Steenke went to the Prussian King. Legends don't care about details. So we don't know whether it was King Friedrich Wilhelm III or King Friedrich Wilhelm IV. As Steenke saw that he couldn't convince the King either, he told him: "*His majesty, you would be the first to have such a scheme.*" Now the King didn't hesitate any longer. He gave his permission to Steenke that he should build the proposed Inclined Planes.

Up to now nobody could proof this legend. What I can proof is that Steenke had to respect the official ways of bureaucracy, the so-called "Dienstweg". His letters had to be addressed to the government of the regional state administration "Regierungs-Bezirk Königsberg". The Regierungs-Bezirk gave a comment and gave it or both, the letter and the comment, to the Minister of the Prussian state ("Staats-Minister"). The Minister passed the act over to the consulting commission of the Ministry referring public building affairs (Ober-Bau-Deputation"). The commission was asked to comment the proposal. The King would have been involved at the end of a long process of problem solution and decision finding. Following the vote of the specialists the King finally approved or disapproved the proposal.

It had been the Prussian Minister of Commerce von der Heydt who supported Steenke and who gave his permission for a journey to the United States. The results should help the administration with the final decision whether to build locks or inclines planes at the Oberlandkanal. In the early discussions about Steenke's proposal the "Ober-Bau-Deputation" in Berlin had already remarked that there were no sufficient experiences about the details construction of such Inclined Planes for boats in a bigger scale. Steenke should get the chance to learn about hydraulic schemes by his own experience ("durch eigene Beobachtung genauer kennen zu lernen"⁷).

Now I was lucky to find some interesting documents:

- some preparation letters of different authorities in the Public Works administration,
- the official Instructions for Steenke, given by the "Ober-Bau-Deputation"; the member of the Ober-Bau-Deputation who supported Steenke had been Oberbaurat Severin. He had already approved Steenke's itinerary for the 1846 tour. Now he had worked out the Instruction for the tour to North-America;
- Steenkes three letters and his two reports from America addressed to the Minister of Commerce von der Heydt.⁸

Main items of the Instruction: (1) Steenke was allowed to look for an experienced man as a helpful companion. (2) Steenke should survey all details of the Morris canal achievement that is details of the canal lay out and technique, details of the boats and of the traffic on the Morris canal. In particular he should study the new Inclines in all their technical details, especially the construction of the top lock. This top lock detail makes me presume that Steenke's scheme for the Inclines might have looked like an enlarged inclined plane at the Morris canal with a top lock. (3) And if there would be time left, the Instructions says, Steenke should study further important hydro technical structures. He should study both, the technical details and the experiences with the working technique.⁹

Steenke and "Bauführer" Schmidt started their journey on September 15th 1850. This journey must have been a tremendous experience, a once-in-a-lifetime-story. At that time each crossing of the Atlantic had still been a risk. And indeed a big storm came up. The steamship "Hermann" could only slowly fight its way forward through the waves. The captain had to change the course. It took them 24 days to reach America; the Captain said that it had been one of the longest lasting crossings. The way back took them 10 days, 6 hours.

Steenke's first remarkable discovery was an article in a newspaper on board of this steam ship. He read about the new Inclined Plane on the Monkland Canal in Scotland. It replaced a lock flight and had just been opened. Ships are carried in a water filled caisson. Steenke writes to the Prussian Minister von der Heydt: "*In my eyes these are important news. First it is a wonderful proof for my idea towards the*

⁷ Report of the Königliche Ober-Bau-Deputation, May, 27th 1848; GStPK: I.HA Rep. 93 D, Nr. 705.

⁸ GStPK: I.HA Rep. 93 D, Nr. 1000.

⁹ GStPK: I.HA Rep. 93 D, Nr. 705 (May, 27th 1848).

use of Inclined Planes. Then it will do away the doubts of some civil engineers."¹⁰ Steenke announced to visit the site on his way back to Europe. And he did it.

Do we really know what travelling was like in America at that time? Achieving knowledge and the experience of technique had been closely related to the experiences of travelling. It would be fascinating to give a detail reconstruction of Steenke's itinerar.¹¹

Steenke answered all the demands of the Instruction with his first report.¹² He describes three different types of Inclines. Two of them, he remarks: "*are not known in Europe*". A decisive item may be the dry summit to avoid expensive top lock building.¹³ Steenke succeeds to get copies of the building plans.¹⁴

Besides the technical details Steenke gives only few examples for his amazement.

¹⁰ *The London Journal* No. 292, 1850, and the weekly *Record of Literature: Science and Art* Vol. XII, 1850.

¹¹ A wonderful description on the Boats and the traffic on the Morris canal has been published in 1860; the following excerpts concentrates on the boats and the operating of the inclined planes:

The boats are constructed in two parts, for convenience in going over the planes, and are hinged together in the centre by a simple arrangement which permits their being separated in a moment. They are open above, except a narrow passage around the gunwale, a small space at the bow, and another at the stern, where the cabin is partitioned off by a bulkhead. Midships, or where the two parts are connected, a portion of each is floored over, and on this space the feed-boxes are kept, as well as a small cylindrical stove of sheet-iron for cooking. They are from ninety to ninety-five feet long, and of about sixty to sixty-five tons burden. Their nomenclature is as varied as the orthography and tastes of their captains or owners. Among many others which struck our hero as being original, and peculiar too perhaps, were the *Bluddy Pirate*, the *Wild Irishman*, the *Bridge-smasher*, the *Larger Bier*, etc., etc.

Not the least important among the many objects of interest on the line of the canal in the high-land region are the inclined planes, of which there are thirteen in Morris County. The summit level, at Stanhope, is over 900 feet above the Atlantic Ocean; and these planes have been constructed for the purpose of overcoming the sudden and excessive changes of grade which frequently occur. This is accomplished at a great saving of time in the transit over the same extent of locking. A single track of heavy rails is laid on an incline of about fifteen degrees from the horizontal, and on this the cars containing the boats ascend and descend at the rate of six to eight miles an hour. About 75 yards from the summit a substantial stone building contains the motive power, in the shape of a water-wheel, moved by the water from the upper level, which is conducted to it through a flume. This wheel is connected with a drum, over which passes a heavy wire rope, about two inches in thickness, attached at either end to the car. The car, or cradle, is a heavy framework running on flanged wheels, and descends a sufficient distance into the water to allow the boat to float into it, where being secured, boat and car descend or ascend the slope together. From the forward end of the car the rope passes over friction rollers between the track, to and around a large wheel beneath the water, some 100 feet distant from the summit, thence over the drum and other friction rollers by the side of the track to another wheel at the foot of the plane, around which it passes and is attached to the rear end of the car. Arriving at a plane, the boat is drawn into the car in the order of its arrival, the team is unhitched, the tow-rope coiled up on deck, the boat secured to the car by hawsers, and its two parts disconnected by means of a lever which pulls out the bolt uniting the hinge. The blade of the rudder is then raised out of harm's way, and all being in readiness, a signal is given to the operative who controls the machinery in the wheel-house by a wave of the arm. The gate in the flume is raised, the wheel slowly revolves, and the boat soon reaches the summit and begins the descent. The brakes are now put on, and, resting securely on the bed of the car, the boat descends to the water at the bottom of the plane, where the impetus communicated floats it out of the car, and the tow-rope being attached to the whipple-tree of the team, which has been driven around by a by-road, it continues on its course. The time occupied in the descent is about five to eight minutes. (Ex: <http://catskillarchive.com/rrextra/abnjna.html>.)

¹² It contained of a general description of the canal scheme including boat traffic, the "Beschreibung der neusten Einrichtung einer geneigten Ebene des Morris Canals", "Beobachtungen über die verschiedenen Fahrten" and "Speziellere Beschreibung der geneigten Ebenen auf dem Morris-Canal"; *GStPK*: I.HA Rep. 93 D, Nr. 1000.

¹³ The Hay Inclined Plane in the UK (1792/3) shows a scheme without top lock as well. But one cannot decide about the details, which Steenke knew.

¹⁴ It is not known where these plans remained.

It might be impressive — he writes to the Minister — to watch a boat with up to 30 tons load on the top of a railway wagon. But now, you watch such an Inclined Plane in the middle of a town like Newark with about 25000 inhabitants; the boats on the wagons take one street, elegant carriages, horsemen etc. take the other street which crosses the first one; nobody cares and continues his way, this is amazing.¹⁵

Amazement will be central feeling for all of Stenker's further experiences. Steenke takes the chance. He must have travelled like a tornado to see as much as he could. His itinerary through Pennsylvania, New York state and Virginia includes:

- the heavy industries around Easton,
- the Lehigh canal,
- the meeting with the inventor of the wire rope John Roebling and a visit to his wire rope factory,
- the lockport locks at the Erie Canal (work in progress);¹⁶
- touring with a steamboat from Rochester to Toronto;
- touring with a steamboat upwards the Niagara river to Queenstown (Canada) and Lewistown (America);
- the wire rope suspension bridge across the Niagara Falls (work in progress);
- travel on the Welland canal that passes the Niagara Falls to Thorold and Lockport;
- Buffalo; lake Erie and the Beaver canal: passing the villages of Silvercreek, Dünkirk and Saragossa.

Steenke reports about special boats for parcels and passengers. On board of a steamboat he travels down the Ohio to Wheeling; to Pittsburgh, Cincinnati, and Johnstown.

In Johnstown Steenke got to know another inclined plane highlight. The Allegheny Portage Railroad carried passenger trains and wagons with canal boats on them across five Inclined Planes, all of them steam operated. To enable the transport these canal boats on wagons they were cut into sections.

Finally Steenke went via Lewistown, Harrisburgh, Philadelphia, Columbia, York, and Baltimore to Washington and returned to New York where he and Schmidt arrived on December 17th or 18th.

Steenke and his companion returned on board of the steam ship "Asia". After a 10 ½ days passage they arrived at Liverpool on December 29th. Because of lack of money there they had to part. Schmidt went back to Prussia and he would have disappeared in the darkness of history. But it was him who published the first official technical report on the Oberlandkanal inclined planes ten years later.¹⁷

Steenke headed off to the North of Great Britain. He passed the famous Mennai- und Britannia Bridges; he went through Glasgow as one of the British centres for heavy industries. He visited the Monkland canal inclined planes. Then he went back via Edinburgh and via Newcastle back to London. Steenke planned to be back in Berlin at the beginning of February 1851. There is no report about this part of the journey.

(4) Questions

It took another ten years before the inclined planes on the Oberlandkanal started working.¹⁸ Why?

It has not been Steenke who had become responsible for their design, but the well known civil engineer Carl Lentze who was employed at the Board of Public Works and he was experienced in railway building. It was him who had designed the famous railway bridge across the river Weichsel near the town of Dirschau (Tczew). In 1848 Lentze had become a member of the consulting commission for the Prussian Government "Ober-Bau-Departement". So he became a colleague of Ober-Baurath Severin who had taken care for the Oberlandkanal project and who had supported Steenke with the

¹⁵ *GStPK*: I.HA Rep. 93 D, Nr. 1000 (translated by E.Sch.).

¹⁶ "These locks are undoubtedly the most beautiful and greatest lock system I have ever seen in Europe or America" (ibid., translated by E.Sch.).

¹⁷ *Zeitschrift für Bauwesen*, Jg. XI, 1861.

¹⁸ Testing passage of the first inclined plane Buchwald in August, 31st, 1860, in the presence of Minister von der Heydt.

proposal that Steenke should study canal engineering in the Netherlands, in Belgium and in the south of Germany.

We don't know anything about the background quarrels and discussions, nothing about the background of this change of responsibility. It is said that Lentze had provided some new decisive items to the scheme which differed from the American model.¹⁹ Steenke had remained the civil engineer being responsible for the whole Oberlandkanal scheme. But he had been only the well-experienced expert in Common hydraulic structures but not in modern railway civil engineering. May be it was for this reason that the responsibility for the inclined planes had been withdrawn from the traditional canal builder and given to the modern railway builder.

Traditionalists against modernists?

May be that there have been concurrences even amongst the members of the consulting commission "Ober-Bau-Departement"? Controversies between the traditional canal builder Severin and the railway civil engineer Lentze?

And what about Steenke's knowledge and the experiences, which he took with him from America? His reports ended in the archive without being printed or enlarged.

(5) Results between old answers and new questions

There is no one-and-only-history. The objective or even the idea of some kind of a faithful reconstruction or imagined ideal history does not really make sense without discussing their implications and exclusions. There is no "point of nowhere" — point of view. That is why history writing has to be aware of the chances and the limits of method.

Up to now the Oberlandkanal history writing has concentrated on the printed sources. They were concentrated on technological facts. One typical feature of these printed sources is the avoidance of personal experiences and communication processes although they have influenced the development. This is the ground on which legends may grow.

Traditional writing of history often ignores these processes. The result is some kind of closed history. So in addition to the look for new sources it might be useful to re-read those somehow closed histories. They have to be re-opened under a new point of view. Close reading of the traditional canal histories as well as studying new sources in the same way may be an appropriate option to engage an innovative process between old answers and new questions. The draft above on the inclined planes of the Oberlandkanal tried to present an example for a critical approach.

As it had been shown the inclined planes of the Oberlandkanal have been developed on the basis of a broad and international technical knowledge. Steenke once claimed that he had studied about 300 locks before he came to America. So he was able to compare. The scheme as it had been finally realized had been some kind of a problem solution by a low tec system. Waterwheel power had been well known since many centuries. The innovative power systems of the time had been systems on the basis of water pressure and steam.

The development of the inclined planes itself had been based on a complex communication process. It has been dependant:

- of the hierarchies and the structures of Prussian bureaucracy — "Dienstweg", as it is called in German, and
- of the human factor, that is the wide field of mysterious relations among the acting people.

That is — by the way — why biography research may be another appropriate method to accomplish the traditional history of technique. In canal books and especially in popular descriptions of the Oberlandkanal for tourists Steenke has been upgraded to some kind of a hero. But, in fact, we know nearly nothing about him. As far as I know there are no personal documents, and there is no estate, only one prominent obituary. Three years ago I have rediscovered some semi-autobiographical statements within the earliest description of the canal by Bernhard Ohlert from 1862.²⁰

¹⁹ See note 17, *ibid.*

²⁰ Obituary, see: *Zentralblatt der Bauverwaltung* 1884. — There has been a hint by K. Siehr towards personal papers ("Familienpapiere"), but it couldn't be verified yet; K. Siehr: "Steenke, Georg Jacob", *Altpreußische Biographie. Herausgegeben im Auftrage der Historischen Kommission für ost- und westpreußische Landesforschung von Christian Krollmann, fortgesetzt von Kurt Forstreuter und Fritz Gause*, Band II (Marburg/Lahn 1967), p. 692.

At last the benefit of looking for new sources and presenting new research. It is not only to destroy a legend like the one how Georg Jacob Steenke got the King's permission to build the inclined planes. Today the passage of the Inclined Planes with one of the tourist ships is a highlight for each visitor. The Inclined Planes of the Oberlandkanal system are the most prominent features of a very complex scheme with an Anglo, European, American background. Its history illuminates the difficult process of early industrialization in a non-take-off province of Prussia. Together with its history of surviving up to now, I think, that the Oberlandkanal scheme deserves the global status of a UNESCO World Heritage Monument.

— E. Schinkel: "Bernhard Ohlert ärgert sich, wandert an den Oberland-Kanal und trifft den Erbauer Johann Georg Steenke (1862). Mit einer vollständigen Wiedergabe der Wanderbeschreibung im Anhang", *Mitteilungen des Canal-Vereins* 24 (Rendsburg 2004), p. 48-75.