

Stanislav Južnič \*

## Gruber's machine-ship: Early machine boats in Habsburg Empire

### (1) Introduction

In 1698 Denis Papin constructed the first steamboat at the Holy Roman Empire. He eventually achieved favorable result with Savary's steam engine on board. Did any Central European continue his achievements to pave the way for the success of the Western inventors Joffroy D'Abbanas, Fitch, Rumsay, and Fulton? Many Papin's followers were simply forgotten and Gabriel Gruber<sup>1</sup> was just one of the best among them.

Gruber was trained at the first-rate tradition of the Jesuit Rudjer Bošković who visited Ljubljana at least three times. Gruber arrived to Ljubljana on June 4, 1768 and next year began to teach at the college. Nobody was surprised when Gruber was hired to build Ljubljanian canal already as a very young thirty years old expert between March 9, 1771 and December 10, 1777. He even directed the navigation on the half of the Habsburg's rivers between June 4, 1772 and May 1, 1781. His head office was at the provincial Carniolan capital Ljubljana. At the same time he taught at the Ljubljanian mechanical school instructing craftsman and also ship's captains. He managed the best ship modeling department of all Habsburg Monarchy.

We researched Gruber's technical achievements to commemorate the bicentenary of his death. As a navigational director he caught the opportunity to construct his machine ship model in his late thirties. His work on machine ship is well documented at Styrian *Landesarchiv*. We claim that he was one of the forgotten predecessors of the later steamboats. He was not just an extremely able physicist but also developed the rare ability to hire the very best available experts for his navigational projects.

### (2) Early Viennese steamboats

Among other duties Gruber had to provide up to 1000 km long distance transports along the Sava River from Ljubljana area to supply the army encamped at Zemun (*Semlin*) near Beograd. He used sailboats for his job but upstream navigation always caused troubles to his engineers.

The Empress Maria Therese widely supported Gruber's upstream navigation improvements. On August 1, 1777 she issued a patent stimulating better ship building. She approved the Gruber – Hepe<sup>2</sup> hardwood designs borrowed from the Hepe's native Rhine River experiences. They used oak and other hardwoods, and practiced their superior physics and mechanics knowledge.<sup>3</sup>

Many expert and less expert candidates saw their opportunity in Empress' support of the better upstream navigation research. The Habsburg monarchy did not have an Anglo-Saxon capitalistic structure necessary for quick transformation of such ideas into business and therefore quite different state-regulated approaches were used.

At the end of 1778, few months before Gruber made "machine boat" model, Maria Theresa received the "Anonymous" letter of the foreigner living in Leopoldstadt. The "Anonymous" entitled his French pamphlet "*Mémoire sur la remorque des Batteaux par les machines à feu*". It was certainly not unusual to use French language for such research. French was recognized as the universal language

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\* Scientific Research Institute of the Slovenian Academy of Science and Arts, Ljubljana, Slovenia; emails: [stanislav.juznic-1@ou.edu](mailto:stanislav.juznic-1@ou.edu), [stanislav.juznic@fmf.uni-lj.si](mailto:stanislav.juznic@fmf.uni-lj.si).

<sup>1</sup> Gabriel Gruber (\* 1740 Vienna; † 1805 Saint Petersburg).

<sup>2</sup> Johann Matthias Hepe (Hopp, \* Mainz).

<sup>3</sup> Neweklowsky, 1952, 50.

of diplomacy. In technical world Frenchmen were still highly esteemed although after their hard times during the Seven Years War French artillery was forced to copy some better Habsburg ideas.

Some rumor spread about the pamphlet author's real identity. The Empress knew who he was and she eventually disliked the invention because she heard bad news about the author's doubtful morals.<sup>4</sup> The author, probably of French origin, described himself as "not having the honour to be Empress' employee".<sup>5</sup> The court salary was usually pretty good and "Anonymous" missed it. He missed the connections necessary for the eminent Schönbrunn Court job.

The anonymous proposal-writer reported about his long time work on upstream navigation at the Danube River banks in Viennese suburbs. He spent quite a fortune on his research during the last two years; between the lines one could read that he did not obtain any state support. His last success at least partially resolved the problematic distribution of the steam engine power to the rotation of paddle wheels. He did not clearly explain the site of his wheel: did he prefer horizontal or vertical axe position? He begged the authorities for considerable sum of money because he wanted to try the ship of navigable dimensions with Newcomen's steam engine on board. He certainly planed a pretty big boat to carry the heavy engine. The Anonymous knew the Habsburg Monarchy circumstances very well and he begged for particular Newcomen's machine which was used at Banská Štiavnica (Schemnitz) mine for several decades. Gabriel Gruber was also familiar with that mine because his university teacher Poda and his own stepbrother Tobias Gruber published descriptions of the Joseph Karl Hell's<sup>6</sup> machines of Banská Štiavnica Mine. Joseph Karl Hell was the elder brother of the famous Jesuit astronomer Maximilian. Their father Mathias Cornel Hell was the descendant of the old craftsman family. The ice formation at the valve of Joseph Hell's pump recently stimulated a lot of interesting research. The famous Erasmus Darwin published his opinion but Tobias Gruber rejected him.<sup>7</sup> A half-century later the effect was described in terms of Joule – Thomson expansion.

For many years Maria Therese supported the Banská Štiavnica mine school and employed there the best professors available. In spite of her great care for that Slovakian mine, she agreed to give an expensive Banská Štiavnica Newcomen's engine to Anonymous disposal! It's oblivious again that she must have known the "Anonymous" real identity and he certainly had some influence at the court.

Maria Therese confessed that Banská Štiavnica miners did not need Newcomen's engines at that very moment.<sup>8</sup> "Anonymous" was certainly aware of that when he made his proposal. The first Newcomen's engines were transferred to Banská Štiavnica at Joseph Karl Hell's teenager time and he was in his late seventies during the "Anonymous" proposal, probably to old to help at the negotiations considering the proposed steamboat.

Joseph Emanuel Erlach<sup>9</sup> was the son of the Viennese Karl's Church designer Johann Bernhard Erlach. After his London studies he accompanied Potter<sup>10</sup> and his assistant Pierre Sabathery from England to Vienna in July 1720. The Englishman built the very first Habsburg Newcomen's steam engine for 6000 gld at the mineshaft Königsberg near Banská Štiavnica. Erlach himself built the steam engines in 1721/1722 at Cassel and in 1722/1723 at Vienna. The Habsburg experts were very well informed about the British inventions, although Erlach's mine pumps did not influence the development of upstream machine navigation directly. Joseph Karl Hell eventually used Potter's design of 1733/34 for his own steam engine built at Banská Štiavnica in 1758. Gabriel Gruber's Graz professor Poda (1771)<sup>11</sup> described Hell's success and analyzed other Habsburg monarchy steam engines. Gruber

<sup>4</sup> Hinkel, 1995, 121.

<sup>5</sup> "...pas le bonheur d'être employé au service de Leur Majestès Impériales et royales..." (Kurzelscheiner, 1928, 69–71).

<sup>6</sup> Joseph Karl Hell (\* 1713; † 1789).

<sup>7</sup> Poda, 1771; Darwin, 1788; Gruber, 1791.

<sup>8</sup> "...Autorisent gracieusement les Départements respectives à me prêter deux des cylindres provenant des machines à feu, qui ont existé ci-devant aux mines, et qui y sont actuellement hors d'usage..." (Kurzelscheiner, 1928, 70).

<sup>9</sup> Josef Emanuel Baron Fischer von Erlach (\* 1693; † July 29, 1742).

<sup>10</sup> Isaac Potter (\* 1690; † 1735).

<sup>11</sup> Hollister-Short, 1978, 13, 20, 29, 39; Hoffmann, 1974, 118; Kurzelscheiner, 1928, 71; Kurzelscheiner, 1929, 74, 82; Hinkel, 1995, 181.

got to know the steam engines during his student years and eventually noticed the steamer's navigational applicability.

The Empress Maria Therese did not pretend to be the expert for navigational problems. She forwarded the "Anonymous" letter to her secret councilor Count Franz Kolowrat on November 1, 1779, and also notified the chancellor Prince Kaunitz.<sup>12</sup>

Kolowrat looked upon the engine as too big and too heavy. He certainly knew what he was talking about: Newcomen's steam engine was not very convenient for steamers before Watt's inventions, and uneasy to propel the rotation.

The "Anonymous" did not seriously consider Watt's improvements although they were already known at Vienna. Newcomen's engine was at hand in Banská Štiavnica and Watt's lighter model was probably not so easy obtainable at Habsburg monarchy even the decades later.

The Anonymous' model was built in Leopoldstadt, the oldest Vienna suburb at the Danube Canal banks which is now *Obere* and *Untere Donaustrasse* down town.<sup>13</sup> He planed the 10 feet high cylinder. The court officers calculated that two cylinders containing altogether 100 cents of metal would suffice for the job. With the lowest price of 50 florints per cent of metal, they predicted at least 5000 fl for expenditure. It was not a small amount and therefore Kolowrat seriously suggested carefulness. Maria Theresa mentioned the extra expenses for machine transportation from Banská Štiavnica to Vienna in her letter to Kaunitz. No document tells as if they planned the water or land transport but it was certainly not an easy task to finish such heavy long distance travel considering the awful mainland roads of the time.

Even if all the details are not at our disposal, the "Anonymous Foreigner" of Leopoldstadt in 1777 and in 1778 certainly built the steamer "*Maschine ohne Pferde*" using the atmospheric Newcomen's steam engine with the wooden cylinder.<sup>14</sup> The later destiny of his steamer is still unknown. It's also not quite certain if "Anonymous" constructed the bigger steam boat with the government help at the early 1780s. Gruber certainly knew about the "Anonymous" efforts although we could only guess about their probable mutual connections.

Several men tried to solve the problem of upstream navigation at Habsburg Monarchy. The miner councilor Josef Tlustos built a 16 fathoms long and 9 feet broad ship. He left Vienna and sailed for twenty-seven days before he finally reached the Linz port on July 10, 1780. The enormous crowd awaited his expedition in Linz showing the favorable public opinion. Tlustos used the specially shaped steaks to overcome the stream of Danube, but his trial was never repeated.<sup>15</sup> He probably didn't use a Newcomen's type steam engine, which were mostly considered too heavy and unsuitable for traditional boats.

### (3) Gruber's models

Entnersfeld<sup>16</sup> of Vienna developed a boat called *Maschinenschiffes*. He received his noble title in 1765 and became a well respected self educated member of the society. He became court councilor and an active member of the Styrian Agricultural Society. The Bohemian-Austrian court office hired him in 1764 and he was ennobled a year later. As the Empress' employee he could not be identical with the "Anonymous".

In 1782, Entnersfeld was a member of the Agricultural societies in Graz, Klagenfurt, Vienna,<sup>17</sup> and Petersburg,<sup>18</sup> counselor at Passau Prince's court, and a member of Vienna Economic society.<sup>19</sup> He

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<sup>12</sup> Wenzel Anton knez Kaunitz-Rietberg (\* 1711; † 1794) was court and state chancellor between 1753 and 1792.

<sup>13</sup> Hinkel, 1995, 54.

<sup>14</sup> *Anonymer Vorschlag durch Anwendung einer Maschine ohne Pferde gegen den Fluss zu fahren*, Österreichischen Bundesarchiv, January 11, 1779; Hinkel, 1995, 121.

<sup>15</sup> Neweklowsky, 1952, 51.

<sup>16</sup> Friderich Franz Edler von Entnersfeld (Entressfeld, Entnersfels, Entersfeld, \* 1731 Vienna; † December 6, 1797 Vienna (<http://www.koeblergerhard.de/juristen/tot/toteSeite123.html>)).

<sup>17</sup> *Die Landwirtschaftliche Gesellschaft* was established in Vienna only in 1802 (<http://www.scholarly-societies.org/cgi-bin/public/soc/>)

<sup>18</sup> *Императорское Вольное Экономическое Общество к Поощрению в России Земледелия и Домостроительства*, established in 1765, published: *Trudy Imperatorskogo Vol'nogo Ekonomicheskogo Obshestva* =

joined the Agricultural society of Carniola in Ljubljana as one of its founding members in 1767. He certainly made Gruber's acquaintance at Agricultural society of Carniola where both became very active members.

In 1770 the Agricultural society of Carniola tried the special device for rooting out the stocks. The designer was probably Entnersfeld who described and draw the similar device in 1782 for the Styrian Agricultural Society.<sup>20</sup> Entnersfeld published two articles at the Society's weekly<sup>21</sup> in 1776.

In 1779 Entnersfeld published an article about foddering and stables at *Sammlung nützlicher Unterrichte* of Carniolan Agricultural society.<sup>22</sup> He quoted the court counselor Raab,<sup>23</sup> mentioned the Holland use of salt for livestock curing,<sup>24</sup> and some Russian experiences. In 1765 Entnersfeld visited the Idrija Mine bearing a company with the professor of mineralogy and metallurgy. His companion was probably Scopoli,<sup>25</sup> an Idrija physician (1754–1769), professor of chemistry and director at the local metallurgy and chemistry school between September 23, 1763 and 1769. Scopoli became a professor of mineralogy and metallurgy at the Schemnitz (Banská Štiavnica) Mine Academy (1769–1776). Hacquet<sup>26</sup> came to Idrija only on September 20, 1776 and became an influential member of the Agricultural society of Carniola.

In 1777 Styrian Agricultural Society rewarded Entnersfeld's forestry essay and published it in 1782 together with his essay about the stoves. In 1780s Entnersfeld published books about the politics and economy and slowly abandoned his technological novelties. His career also followed the same direction. In 1791 he published an economy textbook. In 1794 he became an assistant professor of economy at Vienna University. At that time Gabriel Gruber was already in Russia and their mutual cooperation probably ended soon after 1780.

The Society backed Entnersfeld's plan and negotiated with the Graz Navigation Commission.<sup>27</sup> They did not lose any time and immediately hired Gruber to help them. Gruber had a lot of experiences with all sorts of ship models at his Ljubljanian School. He built the wooden "base" model at the first place and only later developed a more useful (and expensive) metal one. Gruber probably did not make the experiments in nature with a practical boat<sup>28</sup> as far as we could prove from the preserved documents.

The Styrian Agricultural Society secretary Karl von Haibe described the Entnersfeld – Gruber's boat to the Styrian Agricultural Society. On November 3, 1779 Haibe put forward the advantages of the new invention with comparatively cheap paddle-wheel motoring device which could be placed at the front, but also at the back of the boat. He did not consider the sideways position of motor wheel which the later American inventors preferred. Haibe listed three positive sides of the proposed "machine boat":

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*Travaux de la Société Impériale Libre Economique=Arbeiten der Kaiserlichen Freien Oekonomischen Gesellschaft. 1765–1770 (volumes 1–15), also called: Trudy Vol'nogo Ekonomicheskogo Obshestva k Pooshchreniyu v Rossii Zemledelija i Domostroitel'stva.=Abhandlungen der freyen oekonomischen Gesellschaft in St. Petersburg: zur Ausmunterung des Ackerbaues und der Hauswirtschaft in Russland. St. Petersburg–Riga–Leipzig–Mietau. In der Hartknochischen Buchhandlung.*

<sup>19</sup> Ökonomische Gesellschaft Wien (<http://www.koeblergerhard.se/juristen/tot/toteSeite112.html>).

<sup>20</sup> Umek, 2006, 6, 11, 12, 21.

<sup>21</sup> *Kaiser. Königl. Gesellschaft des ackerbaues und nützlicher Künste in Herzogthume Krain (1771–1787; 1807–1820: K.k. Landwirtschaft-Gesellschaft in Krain. Des wöchentliche Kundschaftsblatt im Herzogthum Krain), Laibach (Ljubljana, Slovenia) (1775–1776).*

<sup>22</sup> *Sammlung nützlicher Unterrichte. Herausgegeben von der kaiser. Königl. Gesellschaft des ackerbaues und nützlicher Künste in Herzogthume Krain (Laybach) 1775–1779.*

<sup>23</sup> Entnersfeld, 1779, 145. Franc Anton von Raab (\* December 21, 1722 St. Leonhard in Carinthia; † April 20, 1783 Vienna).

<sup>24</sup> Entnersfeld, 1779, 146, 150.

<sup>25</sup> Janez Anton Scopoli (\* 1723; † 1788).

<sup>26</sup> Baltazar Hacquet de La Motte (\* 1739/1740; † 1815 Vienna).

<sup>27</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Aug 33 (November 3, 1779) 1<sup>r</sup>, 3<sup>r</sup>.

<sup>28</sup> Tremel, 1946, 41; StLA, Miscellen K 393 briefe 419. Old signature: Landes Regirungs Archive, Navigations-akten im Kleinen Archiv, Sch. 473, fasc. 419.

1. It could carry a great cargo upstream without considerable trouble.
2. A ship could replace numerous men and horses, especially along the difficult soft banks of the rivers.
3. It avoided unwanted stopping and guarantee accurate arrivals.

The second statement noticed the problem of Mura (Mur) River soft banks where taking in tow was especially troublesome. The expected precision was considered particularly important because upstream sailing was certainly never on time in those days.

The bottom of the "machine boat" was not flat but shaped as a cone. Such a design was later considered unstable on the sea.<sup>29</sup> It was certainly suitable only for deep river navigation.

Haibe asked the Empress and the Styrian Land Diet for the special expert commission to explore the proposed invention. He begged the Gubernium to ask for the Navigation Commission's expert opinion and to order the test model boat sailing at the "nearby" Mura River area. The model was certainly Gruber's one although Haibe didn't mention his name. We could imagine that their planed sailing up the Mura River was not a very heavy task for the mild winter time, because Mura streams considerably slow at Graz area.

Haibe thought that the highest authorities should help the inventor because he was a member of the Styrian Agricultural Society. Entnersfeld gave the sketch of his invention to the Styrian Agricultural Society, so that the expert artist could engrave the copper-plate. Haibe claimed that Entnersfeld should hand over to the Land Gubernium the list of expected expenses for the model building.<sup>30</sup> Entnersfeld eventually selected Gruber for the job.

Gruber finished a useful wooden model before the report was mailed to Land Gubernium on November 26, 1779. The report didn't state clear enough where did Gruber make a model: in Graz, at his Ljubljana mechanical school, or elsewhere. They asked the Gubernium to accept the Gruber's model as a gift.<sup>31</sup> With the gift received the Gubernium would be forced to provide some help. We could imagine that wily Gruber himself suggested the sly gift as the best way to gain the official support.

On December 7, 1779 reporter to Gubernium claimed that the navigation director Abbé Gruber followed the order of the Waters Commission and finished the model of Entnersfeld's boat. Sauer<sup>32</sup> signed the acceptance form on the next day (December 8, 1779).<sup>33</sup> This report again didn't indicate where Gruber made his model.<sup>34</sup>

To answer the November 11, 1779 letter Haibe reported in the name of Commission on the June 10, 1780 meeting of Styrian Agricultural Society. He described the model of "machine boat" for upstream as well as downstream transport. Haibe obviously wished to use the boat at the manner Hulls,<sup>35</sup> Leopoldstadt Anonymous, and later Englishmen used their canal steamers. Haibe stated that the best ropes fixed at the back of the sailboat should be used to drive them by a machine boat. The bottom of the machine ship was shaped to a cone to diminish the resistance of the water, he stated once more.<sup>36</sup> The machine propelled a paddle-wheel and there was one additional sail. The position of paddle-wheel was again unclear and a sail was an auxiliary power supply.

The Styrian Agricultural Society paid 51 fl 12 kr for the metal model, after the subtraction of the taxes only 40 fl 46 kr.<sup>37</sup> Navigation Commission also provided some money.

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<sup>29</sup> Russell, 1841, 298.

<sup>30</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Nov 11 (November 3, 1779) 3<sup>r</sup>.

<sup>31</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Dec 38 (November 26, 1779) 1<sup>r</sup>.

<sup>32</sup> Wenzel grof Sauer von und zu Ankenstein (Borl Castle at Lower Styria) Baron Kosiak (\* 1742; † 1799).

<sup>33</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Dec 38 (December 7, 1779) 2<sup>r</sup>; StLA, R+K, K 83, Wasser Sachen, fasc. 34, Aug 33 (November 11, 1779) 1<sup>r</sup>; StLA, R+K, K 83, Wasser Sachen, fasc. 34, Aug 33 (August 1, 1780) 2<sup>r</sup>, 3<sup>r</sup>.

<sup>34</sup> StLA, Protokoll Buch (1779) fol. 805.

<sup>35</sup> Johnatan Hulls (\* 1699).

<sup>36</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Nov 11 (November 3, 1779) 1<sup>r</sup> (Point 1).

<sup>37</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Nov 11 (November 3, 1779) 1<sup>r</sup> (Point 3).

Gruber and his team spent a comparatively small sum, just the equivalent of the two month engineer's salary. The amount could not cover the expensive steam engine of Watt or Newcomen's<sup>38</sup> type. Even at the later Ressel's<sup>39</sup> era the steam engines were seldom developed in Habsburg monarchy and mostly imported from England. The small required amount was probably again one of Gruber's clever strokes of tactics. During his engineer career he always used the same business procedure: at the first place he offered the cheapest possible plan to gain support and frustrate undesired rivals. Afterwards as his work advanced he raised his prices because of the "unexpected" extra expenditures. Such method was usually successful but raised unsolvable troubles during his Ljubljanian Canal work.

On March 17, 1780 at the meeting of Styrian Agricultural Society they repeated the specification of the "machine boat", its use, and economy. Haibe specially mentioned important Entnersfeld's research of the pressures on the paddle-wheels. It's unknown what instrument he used, if any, for the pressure measurements. Prony<sup>40</sup> invented his famous water-speed measure-brake somewhat later, but similar design could have been known to practical engineers of Gruber's kind even earlier.

The members of Styrian Agricultural Society and other involved persons certainly expected considerable profits from the faster navigation and better transport. As landowners and merchants they welcomed a chance to make additional money.

Unlike the early American models of John Fitch and James Rumsey, Gruber engineers certainly used paddle-wheels for their "machine boat" model.<sup>41</sup> No document tells us about the position of Gruber's paddle-wheel axle. Was it horizontal or vertical?

Haibe mentioned several "machine ship" qualities. It used the fuel wood more economically. The strong iron plates protected the device from the fire. The cooking was available without the extra expenses for wood. Haibe's more economical use of wood suggests that wood was used to fuel a steam engine. Haibe suggested one could actually cook the legumes at the engine of "machine boat", which was accepted with acclamation.<sup>42</sup>

Such ideas were not really new for the friends of the French cuisine. In 1753 the Canon of Nancy Abbé Gauthier proposed Newcomen's steam machine at the steamer for navigation and also for cooking. It was certainly not a bad idea as some cooking was needed for the long distance travels in any case.

On August 8, 1780 Sauer ended the correspondence with Styrian Agricultural Society.<sup>43</sup> On August 25, 1780 Gruber's first engineer Kunsti<sup>44</sup> reported about the model of machine boat which Gruber eventually finished on March 29, 1780.<sup>45</sup> This time he probably spoke about the metal model, as the first supposedly wooden one was completed four months later according to Haibe's report. Young George Vega's role at the development of the new ship is unclear because he was subordinated both to Gruber and to Kunsti. The descendants of Vega's family at his native Zagorica remember the family legend about the superiors hurting Vega's feelings by not paying the due honor to the projects he developed. The story is usually connected with Ljubljanian Canal, but it doesn't suit very well there because Vega was obviously still working for Gruber several years after Gruber lost his Canal job. Vega could have some extraordinary merits in "machine boat" project but lack of authorities' support forced him to live the job.

That way or another Vega certainly resigned and left for Vienna on April 7, 1780, just a week after the model of "machine ship" was officially finished. The quarrel with his boss could not be the leading motive. He was probably well aware that the golden ages of navigations work will come to their

<sup>38</sup> Thomas Newcomen (\* 1663; † 1729).

<sup>39</sup> Josef Ressel (1793; † 1857).

<sup>40</sup> Gaspar Claire François Maria Riche de Prony (\* July, 22, 1755; † July 28, 1839).

<sup>41</sup> Tremel, 1946, 41.

<sup>42</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Nov 11 (November 3, 1779) 2<sup>v</sup>, 3<sup>f</sup>.

<sup>43</sup> StLA, R+K, K 83, Wasser Sachen, fasc. 34, Aug 33 (August 1, 1780) 2<sup>f</sup>.

<sup>44</sup> Ignaz von Kunsti (\* 1748; † April 1810 Graz).

<sup>45</sup> Tremel, 1946, 41; StLA, Miszellen K 393 briefe 419. Old signature: Landes Regirungs Archive, Navigationsakten im Kleinen Archiv, Sch. 473 (August 1, 1780) fasc. 419.

abrupt end after the Maria Theresa's death. As Viennese artillery officer he soon accomplished a very successful military career.

#### (4) After Gruber

Vega's foreseeing proved true. Maria Theresa supported Gruber's work, but after her death Josef II quickly stopped all financial support. His decision proved to be a disaster for Habsburg inland navigation. After few neglected years the river navigation reached the same sad condition as before Gruber began to improve it.

Several years passed before the Count Theodor Batthyány<sup>46</sup> eventually used his boat "*Bucintoro*" for Danube River upstream transportation on September 17, 1787.<sup>47</sup> His descendant Count Ladislaus Batthyány reported a century and a half later that Theodor used no steamboat but rather four animals on movable flour with vertical axis.<sup>48</sup> In 1766 Theodor Batthyány bought the manor Gorski Kotar at upper Kolpa River and he also owned nearby manors Grobnik and Ozalj with a shipyard. He eventually supported Gruber's plans for Adriatic – Kolpa Canal and better upper Kolpa River navigation to improve timber export from his manors.

The work on upriver navigation continued outside Habsburg monarchy, especially in USA where the need for river transport was even more urgent than on Danube, Mura or Sava Rivers. The success of American inventors was quickly accepted worldwide. The first steamboat built in Prussia was 40 m long "*Princessin Charlotte*". It was launched in September 1816 for the service on the rivers Elbe, Havel, and Spree between Berlin, Charlottenburg, and Potsdam. Three decades after Gruber's model a very first steamer at the lands inhabited with his Slovene people was tried in 1818 at Trieste, where German speaking Bohemian Josef Ressel somewhat later in 1829 experimented with his screw steam boat called *Civette*. Ressel drew his first plans already as a student on May 1, 1812 and later began with experiments on the Krka River near Kostanjevica in today's Slovenia.<sup>49</sup> He might have been aware of Gruber's work, although they never met. Gabriel Gruber left for Russia during Ressel youth and even his stepbrother Tobias Gruber died in Prague before Ressel began his studies there.

Anton Bernhard of Péch (Fünfkirchen, Bač) with his mechanics Gregor Huck got a Danube patent for his steamer *Carolina* in August and September 1818. They developed a velocity of 9 km/h during their first voyage between Brigittenau and Nussdorf with 350 cents of cargo. *Carolina* was not much quicker than the walking man, but the contemporaries anyway judged her travel as a great success.

The owner Frenchman Meras knight of St. Leon and the designer Philipp Henri de Girard built the engine for their steamer "*Duna*" near Prater on October 12, 1823. They planed a journey to Pesth. She was bigger than *Carolina* and carried 1000 cents of cargo. Both boats fulfilled the expectations of the Emperor's decree issued on November 11, 1817 and the Minister gave each of them 15 years of Danube River sailing patent privileges. Bernhard eventually soon ran out of money and his patent was legally closed in 1819. Meras St. Leon's heirs had better luck and used his patent as a foundation for their new Steamboat Society in 1823.

The Vienna privileged Danube "*Dampfshiffahrts Gesellschaft*" was established in 1829. The steamer *Franz I* left Vienna for Pest in 1830. On September 13, 1837 "*Maria Anna*" provided a room for 250 passengers between Vienna and Linz.

A century after Gruber's model the society *Consortium für Dampferfahrten auf der Mur* was established in 1880. Their steamboat *Kübeck* weighed anchor at Vienna, and carried on upstream the Mura River. She anchored at Radgona on June 13, 1887 on her way to Wildon and Graz.<sup>50</sup>

The new era of steamers began, but the Central European inland transport was eventually quickly replaced with the more convenient railroads. It's hard to say why the Gruber's successful navigations projects and other efforts were abandoned so easily although the similar work was carried on in England or Holland in spite of railroads. The Habsburg Monarchy's rivers were as good as others and

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<sup>46</sup> Theodor Batthyány (Bačani, \* 1729 Németh Ujvár; † 1812).

<sup>47</sup> Gilfillan, 1936, 77.

<sup>48</sup> Gilfillan, 1936, 77; Hinkel, 1995, 121.

<sup>49</sup> Murko, 1971, 141, 152–153.

<sup>50</sup> Tremel, 1946, 46.

in some aspects Danube was the best of them all. But the financial circumstances did not stimulate Habsburg inland navigation after Gruber's time.

In 1796 Adamić<sup>51</sup> considered Gruber's old projects again. He wrote to the Count Laval Nugent about the Kolpa River navigation from Brod na Kolpi down to Karlovac. He also thought about the great road from Brod na Kolpi to Rijeka. For those projects he founded "King's Hungarian Society for the River Navigation and the Drava – Sava – Kupa – Adriatic Canal". In 1800 Adamić was one of the founding members and shareholders of the Society for the building of road later called Luisiane. Adamić put King's Hungarian Society for the River Navigation again into life under the presidency of Prince Dietrichstein, as he reported to Nugent in July 1822. Although Adamić never met Gruber, he carried on his ideas.

## (5) Conclusion

Gruber, Kunsti, and Vega's work in Styria proved to be very significant. They used new techniques, Holland books, and recent inventions to attain the old goal of comfortable upstream navigation. They crowned their efforts with machine boat models. Primary Josef II backed Gruber's work, but after his mother's death he abolished Gruber's Navigation Directory and terminated the financial support for the Mura River and other inland navigation works. George Vega certainly predicted those events and hurried to get a more secure Viennese artillery job. The Mura River navigation work was brought to standstill for many years and even Gruber himself was forced to plan his own emigration. After four more years in Ljubljana he left for Russia and eventually become a Jesuit General few years later. He hardly ever returned to his native Habsburg lands. He was never again involved so deeply in machine boat experiments although he successfully continued his work as Russian professor, engineer, architect, and, last but not least, the General of Jesuit order.

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<sup>51</sup> Andrija Ljudevit Adamić (\* 1767 Rijeka; † 1828).

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## Abbreviations

StLA – Steiermärkischen Landesarchiv, Karmeliterplatz 8, Graz.

R + K, K 83, *Kommission in wassersachen* (= *Navigationskommission* = *Commission for navigation* = *Waters Commission*)

A. Kusti, Familia, K1 H1.

Protokoll Buch (1774–1780).

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