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A significant contribution of professor V .Ye. Timonov to the construction of seaports

Abstract. *Analysis of the creative heritage of Vsevolod Yevhenovych Timonov (1862-1936) - a prominent communications engineer, professor of the Institute of Engineers of Railway Transport of Emperor Olexandr I, a hydrotechnical expert, a specialist in the field of water transport, a port administrator, head of the Petersburg divission of railway transport (1899-1907), the founder and Director of the First Hydrotechnical Laboratory in the Russian Empire (1907-1920) and the Hydrotechnical Research Institute at the Leningrad Institute of Railway Engineers, a member of the Engineering Council of the Ministry of Railway Transport, Head of Statistics and Cartography of Ministry of Railway Transport (since 1907), head of the International section of the High Technology Council of the People's Commissariat of Railway Transport (since 1918), is especially important to understand the processes of development of homeland hydrotechnical science and water transport. His scientific works are devoted to the construction of ports, bridges, and lighthouses, to improvement of the conditions of navigation on the large rivers of the country, to regulation of their beds with rapids. He was the first who pointed to the advantage of mechanical excavation in improving navigable conditions on large rivers. Since 1886, V .Ye. Timonov worked at the Office of Railway Transport, while at the same time taking up construction and administrative and teaching positions. V .Ye. Timonov carried out the first works on the laying of quay-piers from rock body in the Baltic Sea (1887), organized and conducted the first dredging work (1887), explored the mouths of the Dnipro, Don and Volga rivers (1890) and defined the branches of each river for the improvement of navigation, made a draft of the rapids' parts of the Dnipro and conducted research works on one of the thresholds (1894), researched the coasts of the Pacific ocean to select the location of the Pacific port of Siberian Railway and chose a place for this port (Vladyvostok), investigated the rivers of the Amur region and proposed measures to improve them (1895), etc. V .Ye. Timonov is the founder of the original direction in the construction industry, one of the founders of the doctrine of ports, the founder of the theory of the framework of hydraulic structures, the developer of the theory of port infrastructure,*

the historian of science and technology. Vsevolod Yevhenovych occupies one of the honorary places in the world of hydraulic engineering, water, and partly rail transport. Common factors in problems, defined by him on the basis of his numerous and original works, as well as works of his students, made a significant contribution to the further development of hydraulic engineering not only in our country but also in the world. Scientific ideas of V .Ye. Timonov significantly expanded and deepened our understanding of the regularities of development of hydraulic engineering science. In the context of his original beliefs, he analyzed the previously accumulated scientific material and showed it in a new and correct interpretation. His works, his ideas, theories and views revealed unprecedented opportunities for hydraulic engineers.

Keywords: *the Russian Empire; reforms on water transport; development of a network of ports; the role of V .Ye. Timonov in the reforms of port construction*

Introduction

In the beginning of 1885, the attention of the scientific and engineering community of the Russian Empire was attracted by the article "Essay on the development of the Odesa port" of V. Ye. Timonov, a student of the 3rd year of the Institute of Railway Engineers, which was published in the journal "Engineer" (St. Petersburg) of the Ministry of Railway Transport (Timonov, 1886). As it is known at the same time, in Kyiv, there was edited the "Engineer" journal too, but of the Kyiv branch of the Russian Technical Society. The young author of the article gathered so much material during his student practice that this allowed him to draw up a brief history of the construction and development of the Odesa port. Vsevolod Timonov characterized the climatic, hydrological and geological features of the gulf, highlighted the issue of equipping important structures (reported information about the work on their construction), and demonstrated the need and ways to increase port capacity, in particular by expanding the area of the protected water and extending the harbor area.

Research methods

During the preparation of the article, chronological and comparative methods of historical knowledge, classification and systematization of historical sources and bibliographic material have been used (Pylypchuk & Strelko, 2017; Pylypchuk & Strelko, 2018a; Pylypchuk & Strelko, 2018b). The use of these methods and approaches to scientific research allowed to reconstruct the way of life and professional activity of V. Ye. Timonov in the field of construction and operation of seaports against the background of the modern era.

Results and discussions

After returning from the internship in Odesa to St. Petersburg, surprised at such a productive work of the student, the professor asked him: "For what purpose did you describe the Odesa port?" Vsevolod Timonov, without thinking, replied: "To add to

the bunch of human knowledge this small branch as well. I think, Professor, that we should make descriptions of all major transport facilities. Such systematization will ease the work of future designers. Because without a retrospective there is no prospect» (Timonov, 1978, p. 170-171). Despite the lack of sufficient experience, V. Ye. Timonov correctly described the technical history of the emergence and development of a large port on the Black Sea. He saw that the end of the nineteenth century was characterized by a rapid concentration of trade, commercial and industrial capital flows in the south of Ukraine and that this process was most evident in Odesa. Further development of sea trade and, first of all, grain trade, increase of urban population, growth of industrial enterprises - all this attracted not only homeland but also world public attention to Odesa in that time. Actually, that is why V. Ye. Timonov in his work notes that the competition between America, Australia, and India, since the second half of the nineteenth century, makes to pay even more attention to the equipment of the port of Odesa (Soloviova, 2018).

V. Ye. Timonov, from his younger days, witnessed the active development of maritime trade and the development of the port of Odesa. Apparently, this circumstance played a decisive role in the fact that in the technical activity of V .Ye. Timonov a question of development of homeland water transport and, first of all, the marine one, was almost the most important. Later, scientist-engineer V. Ye. Timonov (Fig. 1) became the author of many publications, which pricelessly contributed to solving various transport issues (Sokolsky, 2016).

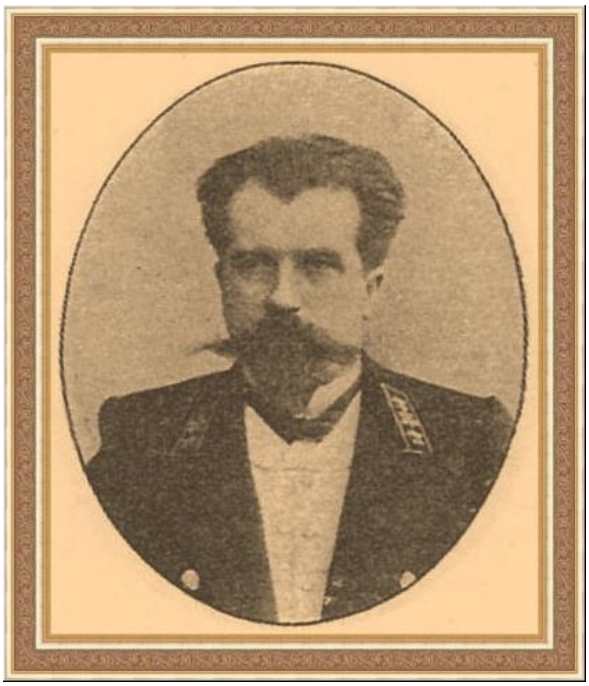

Figure 1. Portrait image of V. Ye. Timonov
(Timonov Vsevolod Yevhenovych, 2019)

Today it is clear to us that being a student V. Ye. Timonov could not make in his article a deep analysis of all the practice of construction and operation of the port, but the historical and technical research he prepared on the development of the port of Odesa was the first original work that began a series of similar works on other ports of the Russian Empire (Armiero & Tucker, 2017). All these works were published under the unique title «Description of Russian commercial ports and the history of their construction». Commission on the Arrangement of Commercial Ports of the Ministry of Railway Transport managed the process of preparation and publication of these works. It involved in the writing of «Description» a large author team of engineers-builders (Krasnoborodko, Alexeev, Tsvetkova & Zhukova, 1999). All subsequent publications of «Description» have become an excellent scientific material and have long been used in the design and construction of port facilities, and especially for the training of homeland specialists - port builders.

Two years after the publication of the monograph on the Odesa port, V. Ye. Timonov publishes his second major scientific work - the monograph "Libau Harbor" (1887) (Timonov, 1888). The author thoroughly described the past of the city of Libau and its port, characterizing the local physical and geographical conditions and the growth of cargo turnover. After a detailed analysis of the construction work in the port for about 150 years and a thorough description of the events carried out in recent years, V. Ye. Timonov stopped at characterizing a number of projects prepared by various authors for the proposed reconstruction of the Libau buildings.

In this paper, he also, as a young specialist, had not yet been able to make conclusions for the recommendations for the designers and builders of the Libau port. However, a clear elucidation in this work of the interaction of the sea and port facilities on the sandy coast made it possible for homeland port builders to assess correctly the impact of these factors on the construction of other port facilities.

The article «External structures of the Setsk port» by V. Ye. Timonov complemented the publications on the ports of Odesa and Libau (1887) (Timonov, 1887, p. 1-14). The author not only briefly described the history of the construction of fencing structures of the French port on the Mediterranean coast for 220 years but also established the great similarity of the hydrological and geological conditions of the Setsk and Libova ports. V. Ye. Timonov emphasizes in his article that in the Setsk port fencing facilities do not guarantee full protection of the harbor from sand, but still allow the use of this water area with relatively small operating costs. The experience of the builders of the Setsk port in relation to the struggle with the transfer of sand, described by V. Ye. Timonov, enriched the knowledge of homeland port builders and to some extent was taken into account in the design and construction of ports in similar conditions.

After the publication of his scientific works, especially those relating to the construction of quay-piers from artificial mass concrete, which V .Ye. Timonov himself first used on the coast of the Baltic Sea, as well as the organization of the first dredging work, he, as a young engineer, was invited for work at the Commission for

the Arrangement of Commercial Ports of the Ministry of Railway Transport. The Commission included such outstanding scientists as engineers of railway transport M. A. Beleliubskyi, M. M. Hersevanov, V. E. Liakhnitskyi, H. P. Perederii, O. R. Shuliachenko and others. Working in this commission V .Ye. Timonov participates in drawing up projects of port facilities, conducts an expert examination of a number of projects, develops a program of exploring places for the construction and development of ports, deeply studying foreign experience. Taking into account some suggestions of V. Ye. Timonov, the commission developed measures for the acceptance and testing of cement for port works.

During 4 years V. Ye. Timonov, while working in the Commission, did a variety of work: he considered projects, estimates and contracts for construction works in the ports of the Azov, Black, Baltic, White and Caspian Seas. He, as a rule, summed up all this work, participated in the drafting of port facilities. Undoubtedly, V .Ye. Timonov has greatly enriched himself in the field of homeland and foreign port construction with regard to the construction and arrangement of commercial ports, as well as the study of port affairs abroad. In his scientific works, V. Ye. Timonov cites numerous examples of irrational construction of a network of railways and waterways in western countries (Soloviova, 2018). He explains this process with stiff competition. V. Ye. Timonov constantly persuaded everyone that the construction of ports and their operation is a state-owned business. Moreover, speaking in the press, in his scientific articles, young Timonov resisted the predatory aspirations of certain groups of capitalists to take complete control of the port and other hydro-structures in some homeland coastal cities. Therefore, he published articles: «Who should build, equip and operate our ports» (1890) (Timonov, 1890), «On the role of government and private initiative in the field of equipment and operation of trading ports» (1892) (Timonov, 1892). V. Ye. Timonov advocated the transfer of the port economy, transport facilities of the country to the state, showed on the example of Western countries that the rigid competition of private farms leads to scattered railways, to the lack of monotony of buildings, to the parallelism in the functioning of the railways, etc.

On the initiative of hydrotechnical engineer M. M. Hersevanov on this issue in March 1891 a large discussion began in the state. Vsevolod Yevhenovych also took an active part in this discussion. In his reports, he strongly opposed the transfer of port and other hydraulic structures to private individuals. In these reports, V. Ye. Timonov made a number of conclusions, which subsequently had a great influence on the opinion of the engineering community and influenced the fate of homeland ports. It should be noted that, unlike railways, the construction of which had been developed the business of private companies and individuals, none of the ports of the Russian Empire had ever been in private hands.

Tymonov's publications, devoted to different technical issues of ports construction and organization of work of waterways, had a particular interest for port-engineers. This is evidenced by the article of V. Ye. Timonov «Characteristics of the marine construction industry and some of its tasks» (1891) (Timonov, 1891), which

describes the advanced methods on construction work at sea for its time. V. Ye. Timonov gives many interesting and instructive data on the specific features of the operation of seaport facilities.

V. Ye. Timonov paid special attention to the study of the materials used for the construction of ports (Fig. 2). In this context, V. Ye. Timonov did a lot in solving the problem of using cement. As we know, the development of industrial cement production in Western European countries had led to the widespread introduction of concrete into the practice of port-constructing works.

The use of concrete for marine structures actually initiated an era in the port construction industry. Blocks of concrete and of quarry stone masonry had become common in the homeland southern ports of the twentieth century. At the end of the nineteenth century, the construction of concrete structures in the Baltic ports began. However, in Odesa, Novorossiisk, Poti and other ports, signs of deterioration of the quality of the buildings were subsequently identified. This was explained very simply - seawater usually had a very harmful effect on concrete. V. Ye. Timonov did not ignore this important problem.

Figure 2. V .Ye. Timonov's scientific work «A brief overview of the historical development of the maritime construction business» (Timonov, 1894)

In 1889, V. Ye. Timonov made a speech at a meeting of the previously mentioned Commission, which described Portland cement procurement for port works. Vsevolod Yevhenovych proposed to change the rules that were in force at that

time on the use of cement. After all, these rules were in their time designed only for the construction of railway objects and provided for control of the quality of cement used by the contractor-builder at the site of work. In the construction of ports where the demand for cement was many times higher, these rules were not suitable. Vsevolod Yevhenovych proposed to establish control over the production of cement at the plant, to store cement in proper conditions and to check its quality before the port-building works.

In general, the Commission welcomed the proposals of V. Ye. Timonov, however, supplemented them with own recommendations regarding the use of cement and concrete in the construction works, in particular for the construction of bridges, hydraulic structures on the rivers, etc.

Construction of ports in the late XIX-early XX centuries led to the solution of many problems of port construction (Fig. 3). One of them was the study and discussion of the floating quay-piers of the system of engineer Sakhanskyi (Timonov, 1899). This engineer proposed to construct port fencing structures that would consist of empty iron boxes for the protection from sea disturbance. He suggested placing these boxes in one line, which according to the inventor, had to be in a semi-flooded state, without touching the seabed. Engineer Sakhanskyi proposed to attach these boxes to the bottom of the anchor chains, the tension of which had to be carried out by the force of buoyancy of boxes. Since the enormous cost of port constraining facilities has always been one of the most important obstacles in the development of marine port construction, the proposal of engineer Sakhanskyi was interesting not only for specialists but also for the public of the country. Therefore, the possibility of using the floating quay-piers of Sakhanskyi's system was discussed at the meetings of the Commission on the arrangement of homeland commercial ports. The reporter on this issue was V .Ye. Timonov. The young scientist made a detailed analysis of the proposal of Sakhanskyi, dismantled its shortcomings and noted that this proposal can not be applied to the practice of port construction due to imperfect design. «The Commission on the arrangement of domestic commercial ports», at the meeting of which there were M. M. Hersevanov, P. O. Fadieiev and other well-known hydropower engineers, agreed with the conclusions of the speaker V. Ye. Timonov. The speaker himself suggested that the inventor had to develop a method of attaching floating elements of the structure to the seabed, which would protect them from the effects of sea disturbance and their moving to the shore. Vsevolod Yevhenovych even published an article on «Investigation of the issue of the location of the external constructions of the port on the sandy coast in the application to the terms of Libau» (1890), which, among other things, gives a high rating to the proposals of Sakhanskyi and even gives valuable advice on the solution of this problem (Timonov, 1890, p. 61).

Figure 3. Scientific work of V .Ye. Timonov «Commercial ports of Norway, in connection with the question of the construction of ports on the Russian coasts of the Arctic Ocean» (Timonov, 1900)

V. Ye. Timonov played a significant role in solving complex problems of interaction between ports and rail transport. The end of the nineteenth century was characterized by the rapid growth of the homeland market. Different branches of the national economy of the Russian Empire were developing, railway construction was developing rapidly. The annual growth of the railway network from 1865 to 1875 reached 1.5 thousand kilometers, and from 1893 to 1897 – 2.5 thousand kilometers. From 1850 to 1880, 22 thousand km of railway lines were built in tsarist Russia, and most of the seaports were connected with the railway network.

In 1880, rail tracks reached to the Baltic Sea, in addition to St. Petersburg, to the Reval (Tallinn), Baltic, Ryha, Libau (Liepaja) ports. On the Black Sea, they reached to Odesa, Mykolaiv, Sevastopol, and Poti ports; on the Azov Sea - to Henychesk, Tahanroh, Rostov ports.

At the end of the nineteenth century rail tracks approached Vindava and Perno ports in the Baltic; Novorossiisk, Feodosia, Batumi ports - on the Black Sea; Kerch, Berdiansk and Mariupol ports - on the Azov Sea; Petrovsky (Makhachkala) and Baku ports- on the Caspian Sea. Railways also appeared on the Pacific coast.

The development of rail transport led to growth in freight turnover. Thus, in 1896 it exceeded 100 million tons and continued to increase. The work of transport on inland waterways grew. The volume of transportation for 15 years, from 1881 to 1896, grew from 14.4 million to 25.5 million tons. From 1856 to 1860, the capacity of ships reached 2783 thousand tons, and in 1886 - 1890, it was 13845 thousand tons, that is, it increased 3.66 times. During this period, the storage capacity of ships increased more than 2 times, compared with foreign fleets that visited homeland ports.

In such a situation, the engineer V. Ye. Timonov had a significant interest in complex transport problems. Yet in 1887, he published articles in which he raised the question of the construction of sea and river ports and the interaction of different modes of transport.

In a small work «A few words about the article by Meingardt titled « Mutual dependence of the Libau-Romny railway and the port of Libau» (1887) V .Ye. Timonov writes about the interaction of rail and sea transport and the need for better linking of their work (Timonov, 1887). By this time, the first place for the grain export was firmly occupied by Odesa. Grain was also exported from Taganrog, Feodosia, Novorossiisk and other ports. From the central provinces of European Russia, the black earth belt and the Volga region grain was transported by railways: Ryha-Orel (construction began in 1858), Libau-Romny (1871-1873) and Vindava-Rybinsk (1874). It crossed the country in a latitudinal direction and played a significant role in the development of the economy of the Russian Empire.

In his great work, «An essay on the development of the Libau port in connection with the question of its further improvement» (1888), devoted mainly to the history of the construction of this port and the analysis of hydrotechnical works, V. Ye. Timonov also writes about the interaction of sea and rail transport in this port (Timonov, 1888). In this paper, V. Ye. Timonov cites data that shows how, after laying in 1871 the railroad to the port its cargo turnover has sharply increased (from 1871 to 1875 – 4 times, and in 1876-1880 – 5 times). During this period, the port of Libau became one of the leading Russian ports for the export of grain, wool, flax and other agricultural products.

In the early '90s of the nineteenth century, the Russian government began construction of the world's largest railroad line, which was to connect the European part of Russia with the Pacific coast. According to the recommendation of the Ministry of Railway Transport, Vsevolod Yevhenovych became a member of the commission, under whose leadership railway lines in Siberia were built in a relatively short time. Therefore, the section of the railroad Cheliabinsk – Omsk – Novo-Nikolaevsk – Krasnoiarsk was built in 1896, Krasnoiarsk – Irkutsk – Vladyvostok – Khabarovsk – in 1897. Under the guidance of talented engineers, students of the St. Petersburg Institute of Railway Engineers, the construction of a large Siberian highway was carried out at an unprecedented pace. In this period, V .Ye. Timonov was able to resolve the issue of the location of the port on the shore of the Pacific Ocean eastern end of the Siberian Railway.

V. Ye. Timonov went to the Far East and there learned about the conditions of different parts of the Russian Pacific coast. He traveled all the coast of the continent from the mouth of the Amur to the Korean border and collected a huge material on the climatic, hydrological and geological features of various points. Taking into account the peculiarities of economic and strategic order, V. Ye. Timonov recommended building a new port in Vladyvostok.

His thoughts about the construction of the port in Vladyvostok, V. Ye. Timonov (by this time he received the title of professor) published in 1897 in the articles «On the choice of the place for the Pacific harbor of the Siberian railway» (Timonov, 1897) and «On the setting of the quay for commercial vessels in the city of Vladivostok» (Timonov, 1895). Despite the objections of a number of people, the recommendations of Professor V. Ye. Timonov were accepted. In Vladyvostok, a very important Russian economic center and strategic point in the Far East grew.

After returning from the Far East, Vsevolod Yevhenovych worked hard on drawing up prospects for the development of an entire group of Baltic and Black Sea ports, which demanded improvement of the interaction of rail and sea transport, and in some ports of river transport, in connection with the increase of cargo traffic flows by railways to these ports and back. This group of ports included: Ryha, Libau, Feodosia, Sevastopol, Novorossiisk, Batumi, Odesa ports.

Based on a detailed study of ports, he developed recommendations for improving their activities and sometimes justified the need to build new port facilities. So, getting acquainted with the work of the port of Odesa, the scientist faced with the fact of the destruction of the port quay-pier, which had been built intended for the processing of petroleum products. The destruction occurred as a result of the softening of fine sandy soils, which were under the external massive wall of the quay-pier. V. Ye. Timonov suggested closing these soils with a fascine mattress, and then closing it with a stone outcrop. In addition, on both sides of the massive wall at the bottom of the water area there were filled pile rows, which increased the strength of the base directly under the wall. The breakdown of the quay-pier was stopped.

V. Ye. Timonov in detail studies the practice of port operations and operational facilities in our and foreign ports. He attempts to establish standards for determining the capacity of the berth line, the territory and the water area of the ports and the required length of external restrictive structures. He raises the question of organizing special studies in this direction that is necessary in the design of new ports or the expansion of existing ones.

On this issue, he conducts an intensive discussion in the press with well-known figures in the field of construction, engineers Gnusin and Justus – and publishes several articles under the heading «On the question of determining the degree of need of existing commercial ports and their further development» (Timonov, 1897). During the discussion Professor V. Ye. Timonov puts forward a number of requirements that are crucial in assessing the effectiveness of existing port facilities: about the impact of the organization of the process of cargo operations in the port on

its capacity and methods for determining the investment required for the construction of a port with new cargo traffic flows.

On the example of Mykolaiv port V. Ye. Timonov proved to the opponents the timeliness of their demands for the removal of the berth line of the port. Position of V. Ye. Timonov correctly oriented specialists on the development of homeland ports to increase the intensity of operation of all port devices and mechanization, which was in place. V .Ye. Timonov at that time managed to establish that by improving the technology of processing ships it is possible to avoid large unpredictable costs for the construction of expensive port hydro-technical buildings (Soloviova, 2018).

In his articles, V. Ye. Timonov emphasizes the necessity of a comprehensive solution of the future cargo turnover of the planned ports, for example, Libau, Vindava and Ryha ports. The scientist-engineer considers them as points that are in a certain connecrion with each other. Therefore, in the opinion of Professor V. Ye. Timonov, before the construction of new buildings in one of the ports of this economic zone (it may be that the port has exhausted its capacity), it is necessary to evaluate the possibilities of processing a new cargo flow to the rest of the ports of this economic zones; in the presence of reserve capacities in another port, there is a new traffic flow, saving, thus, an investment.

The correctness of this point of view, which is currently considered as true as ABC, V. Ye. Timonov had to prove at that time not without difficulty. Subsequently, this principle of assessing the development prospects of ports of the same area was adopted in domestic port and construction practice.

Further, V. Ye. Timonov in this great article concludes the discussion that has taken place and specifies the number of concepts that make up the complex of values that characterize the economy of the port being built or expanding: the berthing port, the water area and the territory. In this article V. Ye. Timonov first introduced the term «aquatorium» to port practice, defining it with the concept of «water area of the port». This term has become a number of complex natural and technical disciplines. It establishes the main causes that affect the intensity of the mooring front, provides a method for calculating the port carrying capacity and depending on the type of cargo, the degree of mechanization, the methods of organizing cargo operations, the duration of the navigation period, etc.

Analyzing the data on the construction of the port in Vladyvostok, which had just begun to be built, and data on the already existing and intensively working port in Mykolaiv, V. Ye. Timonov had come to the conclusion about possibilities to significantly improve the turnover of the Mykolaiv port without the cost of building new berthing and coastal structures. To this end, he proposes to improve the work of mooring, coastal and floating cranes and port elevators. The scientist advises necessarily to associate all the planned activities, with the prospect of development of Odesa and Kherson ports.

Conclusions

The use of chronological and comparative methods of historical knowledge, allowed to perform the classification and systematization of historical sources and bibliographic material devoted to the life path and professional activity V. Ye. Timonov in the field of construction and operation of seaports.

It is shown that V. Ye. Timonov is the founder of the original direction in the port construction industry, one of the founders of the doctrine of ports, the founder of the theory of the framework of hydropower structures, the developer of the theory of port infrastructure, the historian of science and technology.

It is concluded that common factors in problems, defined by V. Ye. Timonov on the basis of his numerous and original works, as well as works of his students, made a significant contribution to the further development of hydraulic engineering not only in our country but also in the world.

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Вагомий внесок професора В.Є. Тімонова у будівництво морських портів

Анотація. *Аналіз творчої спадщини Всеволода Євгеновича Тімонова (1862-1936) – визначного інженера шляхів сполучення, професора Інституту*

інженерів шляхів сполучення імператора Олександра I, гідротехніка, фахівця в галузі водного транспорту, портового адміністратора, керівника Петербурзького округу шляхів сполучення (1899-1907), засновника і директора першої в Російській імперії Гідротехнічної лабораторії (1907-1920) і Гідротехнічного науково-дослідного інституту при Ленінградському інституті інженерів шляхів сполучення, члена Інженерної ради Міністерства шляхів сполучення, керівника відділу статистики і картографії Міністерства шляхів сполучення (з 1907 р.), голови Міжнародної секції Вищої технічної Ради Народного Комісаріату шляхів сполучення (з 1918 р.), має особливу вагу для розуміння процесів розвитку вітчизняної гідротехнічної науки та водного транспорту. Його наукові праці присвячені будівництву портів, мостів і маяків, покращенню умов судноплавства на великих ріках країни, регулюванню рік у їхній порожистій частині. Першим вказав на перевагу механічного землечерпання для покращення судноплавних умов на великих ріках. З 1886 р. В. Є. Тімонов був на службі у Відомстві шляхів сполучення, займаючи одночасно будівельно-адміністративні та педагогічні посади. В. Є. Тімонов здійснив перші на Балтійському морі роботи з облаштування молів з кам'яних масивів (1887), організував і провів перші землесосні роботи (1887), досліджував гирла річок Дніпра, Дону і Волги (1890) і визначав рукави кожної ріки для покращення судноплавства, склав проект порожистої частини Дніпра і провів дослідні роботи на одному з порогів (1894), досліджував береги Тихого океану для обрання місця кінцевого тихоокеанського порту Сибірської залізниці та вибрав місце для цього порту (Владивосток), досліджував ріки Приамурського краю і запропонував заходи для їх покращення (1895) і т.д. В. Є. Тімонов - засновник оригінального напрямку в портобудівництві, один із основоположників вчення про порти, фундатор вчення про будову гідроспоруд, розробник вчення про портову інфраструктуру, історик науки і техніки. Всеволод Євгенович займає одне з почесних місць у світовій гідротехнічній науці, водному та частково залізничному транспорті. Встановлені ним, на підставі своїх численних і оригінальних праць, а також праць його учнів закономірності в проблемах, розроблюваних ним, зробили вагомий внесок в подальший розвиток гідротехнічної справи не тільки у нашій країні, але й у світі. Наукові ідеї В. Є. Тімонова значно розширили і поглибили наші уявлення про закономірності розвитку гідротехнічної науки. У світлі своїх оригінальних переконань він піддав аналізові накопичений раніше науковий матеріал і показав його в новому і правильному висвітленні. Його праці, його ідеї, теорії і погляди розкрили перед гідротехніками небачені раніше широкі можливості.

Ключові слова: *Російська імперія; реформи на водному транспорті; розвиток мережі портів; роль В. Є. Тімонова у реформах портобудування*

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Весомый вклад профессора В. Е. Тимонова в строительство морских портов

Аннотация. *Анализ творческого наследия Всеволода Евгеньевича Тимонова (1862-1936) - выдающегося инженера путей сообщения, профессора Института инженеров путей сообщения императора Александра I, гидротехника, специалиста в области водного транспорта, портового администратора, руководителя Петербургского округа путей сообщения (1899-1907), основателя и директора первой в Российской империи гидротехнической лаборатории (1907-1920) и Гидротехнического научно-исследовательского института при Ленинградском институте инженеров путей сообщения, члена Инженерного совета Министерства путей сообщений, руководителя отдела статистики и картографии Министерства путей сообщения (с 1907 г.), председателя Международной секции Высшего технического Совета Народного Комиссариата путей сообщений (с 1918 г.) имеет особое значение для понимания процессов развития отечественной гидротехнической науки и водного транспорта. Его научные работы посвящены строительству портов, мостов и маяков, улучшению условий судоходства на больших реках страны, регулированию рек в их порожистой части. В. Е. Тимонов первым указал на преимущество механического землечерпания для улучшения судоходных условий на больших реках. С 1886 г. В. Е. Тимонов был на службе в Ведомстве путей сообщения, занимая одновременно строительно-административные и педагогические должности. В. Е. Тимонов совершил первые в Балтийском море работы по обустройству молов из каменных массивов (1887), организовал и провел первые землесосные работы (1887), исследовал устья Днепра, Дона и Волги (1890) и определял рукава каждой реки для улучшения судоходства, составил проект порожистой части Днепра и провел исследовательские работы на одном из порогов (1894), исследовал берега Тихого океана для выбора места конечного тихоокеанского порта Сибирской железной дороги и выбрал место для этого порта (Владивосток), исследовал реки Приамурского края и предложил меры для их улучшения (1895) и т.д. В. Е. Тимонов - основатель оригинального направления в портостроительсте, один из основоположников учения о портах, основатель учения о строении гидросооружений, разработчик учения о портовой инфраструктуре, историк науки и техники. Всеволод Евгеньевич занимает одно из почетных мест в мировой гидротехнической науке, водном и частично железнодорожном транспорте. Установленные им, на основании своих многочисленных и оригинальных работ, а также работ его учеников закономерности в проблемах, разрабатываемых им, сделали весомый вклад в*

дальнейшее развитие гидротехнического дела не только в нашей стране, но и в мире. Научные идеи В. Е. Тимонова значительно расширили и углубили наши представления о закономерностях развития гидротехнической науки. В свете своих оригинальных убеждений он подверг анализу, накопленный ранее научный материал и показал его в новом и правильном свете. Его труды, его идеи, теории и взгляды раскрыли перед гидротехникой невиданные ранее широкие возможности.

Ключевые слова: *Российская империя; реформы на водном транспорте; развитие сети портов; роль В. Е. Тимонова в реформах портостроительства*

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