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Peculiarities of Stylistic Evolution of Mid-19th — Early 20th Century St. Petersburg Industrial Architecture*

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***Abstract*—The article analyses stylistic peculiarities of St. Petersburg industrial architecture during the period of eclecticism. On the examples of the most important objects in this area of construction we can see a stylistic phenomenon — the domination of the so-called "brick style" with features of historicism. A stylistic transformation is traced in the periods of Art Nouveau and neoclassicism; the origins of constructivism anticipating the emergence of the avant-garde are discovered.**

***Keywords*—industrial buildings; rational tendencies; "brick style"; historicism; Art Nouveau; neoclassicism; constructivism**

I. INTRODUCTION

Industrial architecture is a colossal layer of architectural heritage of St. Petersburg – Russia's largest industrial center. The priority tasks of industrial construction of the second half of the 19th century included the development of new types of spaces, the development of structures of large-span ceilings and frameworks, and the search for optimal lighting options. The tendencies that have marked the beginning of the principles of modern architecture have originated and formed in this industry in the era of eclecticism.

II. THEORETICAL BACKGROUNG OF THE RESEARCH

The fundamental works on the history of St. Petersburg architecture [1], [2], [3], [4] only briefly highlighted the architectural and artistic aspects of industrial architecture. There is no overall picture of the stylistic evolution of this peculiar area, which depended not only on functional and constructive factors, but also on the general cultural context. The study of the development process of this phenomenon's specific examples can help to create an overall picture of its evolutionary development.

III. EARLY STAGE (1850–1870): "BRICK STYLE" AS THE RATIONAL BRANCH OF ECLECTICISM

Against the background of the complex and diverse architecture of eclecticism, industrial architecture looked modest, giving preference to the most rational direction - the "brick style", which had formed here much earlier than in other regions. Its prerequisites were already outlined in the architecture of utilitarian facilities: New Holland wood storages, New Admiralty covered berths, workshops in the Arsenal on the Vyborg side, and others.

The outer walls of the first multi-story frame buildings of textile manufactories of the 1840s-1850s — Novaya, Okhtinskaya, Torshilova, Mitrofantevskaya - were also built of red unplastered bricks. The proportions of these buildings were designed in the spirit of classicism, but ignoring order and plaster, homogeneity and rhythmicity of facade composition indicates new trends.

The first example of the most complete embodiment of the "brick style" was the buildings of the Curtain factory at the Petrograd embankment. They were built in the mid-1850s and designed by the first director of the Institute of Civil Engineers (ICE) R.B. Berngard, one of the most consistent adherents of this style. I.S. Kitner calls such constructions as the flour mill and the gas plant exemplary, "their facades represent an excellent type of factory architecture, where the brick perfectly corresponds with its purpose" [5].

It was the graduates and teachers of the Institute - the educational institution, combining solid engineering and architectural training — who became the most active participants in industrial construction.

Bernhardt's competence in engineering embodied in such unique structures as gas holders of the Main Gas Plant at the Obvodnoy Canal. "Fig. 1"They were colossal brick cylinders, hollow inside with sparse narrow arrowslit-like windows designed to store light gas and had been used before the

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emergence of electricity. Towers up to 20 m in height and up to 40 m in diameter were covered with metal domes from original mesh-ribbed metal structures that was as a prototype for the spatial systems of ceilings for concert halls and sport arenas [6].

Fig. 1. Gasholder on the Obvodny canal.

Utilitarian brick buildings for the most part had a gothic character. The typical examples are the buildings of the Chernorechenskaya paper mill, the complex of the Main Water Station, the buildings of the K. Siegel factory, the ironwork shop of the Izhora factory, the water tower and the firing tower of the Obukhovsky factory.

All the buildings of the main station of city water pipes, occupying a vast territory on the bank of the Neva river in front of the Tavrichesky Palace, can be called a museum of the "brick style." The dominant feature is the octagonal water tower designed by I.A. Merz and E.G. Shubersky (1859-1863) [7]. With a height of about 50 m., stylized in the Romanesque architecture, it resembles a medieval keep. Monumental volume, expressive outline, rich plasticity of the red brick walls emphasize the tower's dominant role in the Neva skyline. When viewed from a distance, it engages into a spatial interaction with the Smolny Cathedral. "Fig. 2"

Fig. 2. Water tower of the main water supply station.

Merz is the author of another expressive structure - the ironwork (armor) shop (1874 -1875). The building is located on the territory of the old Izhorsky factory founded at the time of Peter I's rule. The characteristics of the workshop resembled an exhibition building: having three spans, with an elevated middle part, covered with metal arched trusses. The semicircular sidewall of the building is decorated with a giant fan-shaped stained glass window resembling a peacock tail. The constructivist solution of the facade is transformed here into an impressive decoration.

E.G. Jurgens achieved the expressiveness of the malt house of the Kalinkinsky brewery (1875-1876) using little decorative means. Massive brick walls, separated in accordance with the steps of cast-iron columns, small windows and meager decorative elements accentuate the greatness and modesty of the composition.

IV. The Transformation of the "Brick Style" Under the Influence of Art Nouveau and Neoclassicism (1890s–1900s)

We can trace the evolution of the "brick style" on the example of such a large industrial complex as the Nevskaya Paper manufactory on the Sinopskaya Embankment, founded in 1833 by the industrialist and banker L.I. Stieglitz. The buildings of the manufactory hold an important place in the landscape of the Neva. In the Neva prospect, the diverse composition of the factory complex expands frontally along the embankment, in contrast with the delicate forms of the Bolsheokhtinsky bridge and the outline of the Smolny Cathedral. The earliest preserved building on the site dates back to 1850 (engineer L.V. Glam). His modest solution and proportions resemble the brick factories of Manchester seen in F. Schinkel's drawings. The features of the late "brick style" manifests itself in the images of other 1880's and 1890's buildings (P.S. Kupinsky, L.L. Petersen): the stained-glass window, the lightness of the walls, the variety of facade patterns and the dynamics of the outline, the introduction of delicate intensive brick decor, and the widespread use of metal decorations. "Fig. 3"

Fig. 3. Nevsky spinning mill.

The "brick style" retained its positions in the industrial architecture during the development of the Art Nouveau style, gradually expanding the range of compositional and stylistic methods of industrial buildings. In this area, Art Nouveau acquired a strictly rationalistic character, while neoclassicism acquired simplified modernized forms.

In the early 20th century the emerging rational principles were developed by such architects and civil engineers as L.N. Benois, A.F. Bubyr, N.V. Vasilyev, N.V. Veryovkin, A.I. Dmitriev, A.I. Zazersky, Vas. A. Kosyakov, R.I. Krieger, F.I. Lidval, F.F. Lumberg, R.R. Marfeld, E.F. Meltzer, O.R. Munz, L.A. Serck, V.V. Schaub, L.V. Shielling, K. K.

Schmidt, L.L. Schreter, F.S. Yasinsky and others [8]. All these features laid a foundation for new trends in architecture.

New frame structures, previously hidden inside the mass of bricks, became the most important form-building means. The improvement of multistory frame building tectonics in accordance with the real loads meant the search for the optimal organization and illumination of huge internal spaces, the rhythmic organization of the facade, making brick, metal and reinforced concrete properties "aesthetic".

This time is marked by a significant increase in the scale of industrial construction and its active role in the development of new forms and structures, a romantic attitude toward technology associated with the aesthetic ideals of society, the influence of Art Nouveau concepts. The consistent trend in improving the functional and constructive framework coincided with the uniform approach to the solution of architectural and artistic problems. Unlike civil architecture, there was not much variety and stylistic diversity. The main line of decoration was the "brick style" discovering new spaces and constructions.

Art Nouveau introduced specific features to the traditional "brick style", contributed to the liberation of the architectural language from historical reminiscences. The range Art Nouveau semitones in the early 20th century industrial architecture is very wide — the late "brick style", Rational Art Nouveau, "Northern Art Nouveau", "proto-constructivism".

The stylistic transformation became a phenomenon born in the logic of the previous "brick style" and absorbed the new architectural and artistic possibilities of Art Nouveau. Usually it manifested in emotional coloring created by the contrast of large surfaces, the picturesqueness of the outline, the exposure of engineering elements. The influence of the founder of the industrial architecture Peter Berens is very noticeable [9].

The Association of Rubber Products ―Treugolnik" occupying a huge territory the southern bank of Obvodnoy Canal is a complex of buildings reflecting all the stages of transformation of the "brick style". This enterprise developed for half a century (1860-1910). It absorbed the Russian-American Rubber Manufacture, which earlier absorbed the neighboring enterprise of the English joint-stock company "Macintosh". Many Petersburg architects and engineers took part in the construction of this rubber industry giant: R.R. Heinrichsen, R.A. Goedicke, E.G. Jurgens, E.A. Krzyzanowski, L.A. Serck and others.

The structural peculiarities of the buildings reflect different stages in the evolution of industrial construction. Here preserved buildings with a brick-vaulted structure, with an internal metal or reinforced concrete frame and brick walls, with a reinforced concrete ―skeleton-type" frame.

A reinforced concrete bridge over the buried river Tarakanovka was perceived as a sharp contrast with a little heavy and archaic forms of the "brick style". This 1910s building completed the frontal development of the Obvodnoy Canal. Different brick buildings along the embankment are united by a continuous facade. The strict horizontals of the buildings are set off by water towers enriching the outline. ―Fig. 4"

Fig. 4. The association of rubber products ―Treugolnik".

The facades of the Filtering and Ozonation station designed by L.A. Serck and V.V. Starostin and built in 1909-1910, which incorporated elements of the ―Northern Art Nouveau" are an example of the transformation of the "brick style" [10]. This is the first significant work of Serck – one of the most prominent designers in the field of industrial architecture. The station for water purification and ozonation was built with the use of the most advanced tech-nologies and was the largest one in the world. The facade facing the Penkovaya Street is particularly expressive: clear structural forms are almost free of decor. High hexagonal windows with a trapezoidal top act as a characteristic attribute of the "Northern Art Nouveau".

The interior spaces are designed in a light fashion, in contrast to the facades, with a brilliant use of constructive potential of reinforced concrete revealing its peculiar aesthetic expressiveness.

Serck is the author of the malt house of the Bavaria brewery on Petrovsky Island, which combines the novelty of the functional and constructive solution and the originality of the composition. The author connected a multi-tier reinforced concrete structure — a "shelf" — with three drying chambers. All parts of the building are located in a single block with brick exterior walls. The long tongs of sharply twisted outlines rise over the drying chambers. These purely decorative elements concealed the foundations of large exhaust pipes and created an expressive silhouette, introducing a shade of romantic stylization into the image of a utilitarian structure.

The Electrotechnical Factory "N.K. Heisler and Co." (1911 R.I. Krieger) [11] most vividly embodied the principles of Art Nouveau in the reinforced concrete frame building. The facade in the Art Nouveau style is characterized by a variety of windows forms, contrasting combinations of materials and an elastic curvilinear outline of finishing. The alternation of face brick and granite of different texture reveals the tectonics of the facade and provides it with decorative expressiveness. The consequent increase in the size of the windows in the upper floors creates the effect of visual relief of the masses when looking up. The volume of the composition is characterized by the

deepening upper part of the building. This decision, due to the narrowness of the street (according to the St. Petersburg rules, the height of the building could not exceed the width of the street), made possible a better illumination the production premises.

The school of Neoclassicism that determined the architectural life of St.-Petersburg in the 1910s, did not have much impact on utilitarian buildings. An example of such an approach is the State Printing House (1909–1910). The buildings of the printing house were designed by the outstanding architect and teacher L.N. Benois [12].

In addition to production workshops and warehouses, the complex included a residential building with public rooms. The main production workshop, located in the yard, is covered with large-span metal structures. The composition of the main building, facing Gatchinskaya Street, unites rationalist principles and classic features. The red brick facade with wide windows has a symmetrical-axial construction. The center is separated by a four-column portico with a pediment, extended wings are decorated with rhythmically located pilaster-strips. Having a taste for Classicism, Benoit turned here to the methods of 18th century Russian Classicism and gave it a modern interpretation. Such a decision coincided in time with the overall turn of St.-Petersburg architecture from Art Nouveau to Neoclassicism. The rare in the industrial construction of St. Petersburg example of a modernized Neoclassicism is paralleled with the works of P. Berens.

V. Protoconstructivism in the Architecture of the Reinforced Concrete Structures of 1910s

The aesthetic interpretation reinforced concrete properties, having become popular in the early 20th century industrial construction, paved the path for creating a purely "constructive style." The grain elevator of the Joint Stock Company of Goods Warehouses (1911 -1912) can be considered one of the forerunners of constructivism. It is located at the head of the Obvodnoy Canal in the territory of a flour-grinding complex, the formation of which began in 1907 with the construction of a steam mill (engineer G.A. Girshson) — one of the first "skeletal" type ferroconcrete structures in St. Petersburg. Then the engineer I. Kvil built an elevator and warehouses here. The monolithic reinforced concrete structure of the elevator corresponds with the lapidary plasticity of large generalized volumes. A clear and powerful rhythm of vertical protrusions (bins) turns the facade into a folded surface. These protrusions resemble the shape of the three-edged bay window, very popular in Art Nouveau. However, unlike Art Nouveau there are no artistic forms. The original image full of brutal expression created purely by utilitarian means. ―Fig. 5”

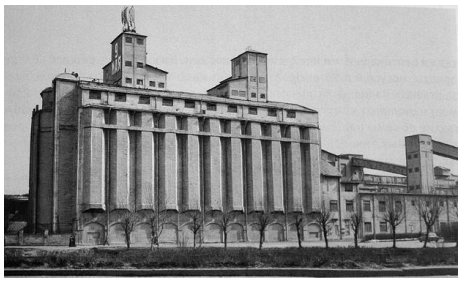

Fig. 5. Elevator on the Obvodny canal.

VI. Retrospectivism of the Post-revolutionary Period (1918s–1920s)

In the first years after the revolution, during the civil war, the fund of industrial buildings remained almost unchanged. Industrial construction was limited only to single objects, the construction of which started during the wartime and which were necessary for life, such as the Petrograd Mechanical Bread Factory and the ―Utkina Zavod” power plant, later renamed to ―Krasny Oktyabr”.

Industrial architecture of Petrograd these years was marked by Neoromantic development with a search for an archaic kind of style. They continued the post-revolutionary line of retrospective interpretation of the late "brick style." Perhaps, such a phenomenon can be explained by the traditions of romantic progress that formed in the pre-revolutionary period.

The architecture of the first production facility — the Petrograd Mechanical Bread Factory on Malaya Mitrofanevskaya Street (1915-1916, 1918, architect L.V. Schmeling, engineer N.N. Nagel) is one of the best examples of "gothicism" in industrial Art Nouveau. Progressive technology is combined here with a retrospective artistic interpretation.

Petersburg architects, who loved classics and who were also heavily influenced by P. Berens industrial architecture, got an opportunity to realize their unrequired professional potential in utilitarian buildings. An example of such a monumental architecture with a neoclassical shade was the Krasny Oktyabr Power Plant (1914-1916, 1920s) by architect A.A. Ohl [13].

Another structure of an energetic type was built in the same style: the main step-down substation of the Volkhovskaya Hydro-Electric Power Station (1923-1926). The main author of this first-born of Soviet power engineering - Volkhovskaya Hydro-Electric Power Station - architect O.R. Munz, also designed the main lowering substation in Leningrad. The exterior of the substation, which evokes associations with the Romanesque architecture of northern Italy, represents a new version of the brick style. This is a vivid example of the Neoromantic school. The power of large volumes, massive red brick walls and towers with arches, archaism of stylistic forms and the novelty of their interpretation highlight the stern dramatic nature of the architectural image. The substation consists of two buildings — for high and low voltage, located at an acute angle and

connected by a junction with the control panel. The main building from the side of the Polyustrovsky Prospekt is separated into parts by three elevated risalits with triple arched niches. The motif of triple arches passes on the heavy rectangular tower. The rhythmic variety of facades is set off by many types of windows — arched, rectangular and round, making up different rows of different scales. Plastically wrought brickwork is combined with cut stone inserts. The substation of Volkhovskaya Hydro-Electric Power Station has become a brilliant continuation for the traditional "brick style." –Fig. 6"

Fig. 6. The main substation of the Volkhov hydroelectric plant.

The architectural image of the three subsidiary step-down substations on the Vyborgskaya and Petrogradskaya sides and Vasilievsky Island, built by the mid-1920s (architects V.A. Shchuko and V.G. Helffreich), is similar in nature. These small structures have large monumental forms. The character of the image of these buildings is defined by schematically transformed elements of the order. The strict geometry of volumes with insertions of glass strips bring it very close to the principles of Constructivism, but while Constructivism gives priority to horizontals, this object is characterized by vertical lines [14].

Soon enough, the Neoromantic searches in industrial architecture gave way to Constructivism. This was not a new phenomenon for the St. Petersburg industrial architecture. Here, in the pre-revolutionary period, its basic principles were born, and even the term "constructive style" was used regarding the first reinforced concrete utilitarian buildings of the beginning of the century. The origins of this phenomenon are found at the turn of the century in St. Petersburg, mainly in industrial buildings of the pre-revolutionary period, which had characteristic features of Constructivism.

VII. Conclusion

Thus, tracing the stylistic evolution of industrial buildings in St. Petersburg-Petrograd throughout the late 19th - early 20th centuries, we can conclude that in the period of eclecticism, this sphere of construction was a stylistic phenomenon: it was dominated by the so-called "brick style" and almost employ the numerous of methods of historicism.

Stable rational tendency, that became obvious in industrial architecture in the earliest examples of the "brick style" formed in the end of the 19th century 4 main branches: rational variations of Art Nouveau and neoclassicism, "brick style" transformations and protoconstructivism. The late interpretation of the "brick" style remained stable in industrial architecture until the 1920s.

The transition to reinforced concrete structures, which already started in the pre-revolutionary period, caused the emergence of constructivism, which later matured in the form of vivid and impressive avant-garde designs that concluded the "golden age" of industrial architecture in St. Petersburg-Leningrad.

References

[1] B. M. Kirikov. St. Petresburg architecture of the end of the 19th – beginning of the 20th centuries, St. Petersburg, Kolo, 2006.

[2] V. G. Lisovskiy. St. Petersburg architecture: Three centuries of history, St. Petersurg, Slavia, 2004.

[3] A. L. Punin. St. Petersburg architecture of the middle – second half of the 19th century, St. Petersburg, Kriga, 2009.

[4] A. L. Punin. St. Petersburg architecture of the end of the 19th century, St. Petersburg, Kriga, 2014.

[5] I. S. Kitner. "Brick architecture", Zodchiy, 1879, No. 12, p. 139.

[6] B. M. Kirikov, M. S. Stieglitz. "Rudolf Bogdanovich Bernhard", Petersburg of the German architects: From Baroque to Avant-Garde, St. Petersburg, Chistiy List, 2002, pp. 173–176.

[7] M. S. Stieglitz. Monuments of St. Petersburg industrial architecture, St. Petersburg, Beloye I Chyornoye, 2005.

[8] Architects-builders of St. Petersburg: refernce book (written and compiled by A.M. Ginzburg, B.M. Kirikov. Edited by B.M. Kirikov), St. Petersburg, Piligrim, 1996.

[9] A. O. Stepanov. "About the industrial architecture promyshlennom zodchestve", Zodchiy, 1915, No. 12, pp.119–123, No. 13, pp. 131–138.

[10] L. A. Serk. "Ozonation of water in connection with the construction of the St. Petersburg ozone-filtering station", Works of the 1st Congress of Russian Architects, St. Petersburg, 1911, pp. 385–407.

[11] "On R.I. Krieger's buildings", Zodchiy, 1916, No. 13, pp. 130–131.

[12] V. G. Lisovskiy, Leontiy Benua, St.Petersurg, Beloye I Chyornoye, 2003.

[13] M. S. Stiegliz. St. Petersburg industrial architecture, St. Petersburg, Neva, 1997.

[14] A. M. Zorina, O. V. Chernova. "Buildings of power structures of the first stage of the city Tram", Petersburg Readings-97, St. Petersburg, 1997, pp. 534–537.