

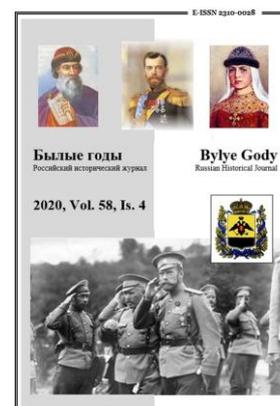
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The Auerbach Dynasty of Engineers and the Development of Mining in Russia in the second half of the XIXth – early XXth centuries

Igor A. Tropov ^{a,*}, Sergey I. Podolskiy ^a, Sergey V. Lyubichankovskiy ^b

^a Saint Petersburg Mining University, Russian Federation

^b Orenburg State Pedagogical University, Orenburg, Russian Federation; Samara Federal Research Center Russian Academy of Sciences, Samara, Russian Federation

Abstract

The article examines the role of representatives of the Auerbach dynasty of engineers in the development of mining in the Russian Empire in the second half of the XIXth – early XXth centuries. For the first time the main directions of Auerbach's professional activity – science, rationalization, entrepreneurship and public education – were comprehensively researched. On the basis of archival sources and published materials, it has been proved that A.A. Auerbach and V.A. Auerbach, as representatives of the Russian engineering and technical intelligentsia, played an extremely important role in the development of scientific knowledge about mining, in the improvement of mining production, in the formation and development of stock corporations in the Urals and southern Russia, in the popularization of mining education and in the solving of social issues associated with the protection of the interests of mining workers. It is shown that the representatives of the Auerbach dynasty of engineers were characterized by the following features: a high level of education, exceptional diligence, the ability to achieve a set goal, a desire to combine scientific achievements and production practices, an openness to everything new and advanced, a readiness for critical understanding and the use of foreign experience in the development of mining, taking into account changes in the conjuncture of the Russian economy, and a significant personal contribution to the development of science, engineering and technology in mining. Scientific works and practical developments made by A.A. Auerbach and V.A. Auerbach became an important basis for the further development of mining in our country.

Keywords: mining, mining engineer, mining industry, coal mining, mercury production, stock company.

1. Introduction

The second half of the 19th – early 20th centuries became a time of rapid, though internally contradictory, development of the Russian Empire economy. The growth in the number of industrial enterprises and active railway construction, as well as the need to rearm the army, resulted in an increase in demand for metals in the post-reform years. This, in turn, contributed to the development of mining (or, as it was often called at that time, ore mining), which was defined in the famous “Encyclopedic Dictionary” by F.A. Brockhaus and I.A. Efron as the process of “converting” ore into metals ([Encyclopedic Dictionary, 1893: 258](#)).

The relevance of turning to the history of the Auerbach dynasty of mining engineers is primarily due to the role played by representatives of this family in the industrial development of Russia, in particular, in the discovery and development of new mining deposits, the introduction of new production methods, the creation of new jobs, etc.

* Corresponding author

E-mail addresses: tropov_ia@pers.spmi.ru (I.A. Tropov), podolskiy_si@pers.spmi.ru (S.I. Podolskiy), svlubich@yandex.ru (S.V. Lyubichankovskiy)

In this regard, we would like to mention that our study does not purport to create detailed biographies of the outstanding mining engineers of the Auerbach dynasty. The study of the activities of these individuals allows us to comprehend the historical dynamics of mining development in Russia taking into account the role of the subjective factor and, in a broader context, creates the necessary and favorable opportunities for deepening the understanding of the main trends, achievements and contradictions of the industrial development of the Russian Empire at the stage of the bourgeois modernization of the country. It also provides a deeper understanding of the role of a particular individual in large and significant historical phenomena and processes.

In addition, the relevance of the research is due to modern realities in the development of mining in Russia, which, having gone beyond the mainland zone, urgently requires the development of technological equipment for deep-sea mining and the use of “sparing” methods of mining (Yungmeister et al., 2018: 216–221). As production tasks become more complex, the requirements for those who are called upon to provide solutions at a high professional level increase, i.e., there is increased demand for the quality of “human capital”, which stimulates us to pay closer attention to the historical experience in the training of engineering and technical personnel related to mining.

2. Materials and methods

The specificity of the subject and the entire problematic of this study required us to address a wide range of historical materials. An important place among them is occupied by the scientific and scientific-publicistic works of A.A. Auerbach, the Managing Director of the joint-stock company, “Mercury and Coal Business of A. Auerbach & Co.”, and his son, the mining engineer, prominent scientist and practitioner, V.A. Auerbach. The specificity of these works consists in a combination of a strictly scientific style of presentation with the use of reporting materials on the direct participation of the author in the development of mining in a certain period of time. This creates favorable opportunities both for the considering of the changes that have taken place in the production and technological process, and for the assessing of the personal contribution of representatives of the Auerbach family in ensuring scientific and technological progress in mining.

A valuable source for the problem under study was the office-work materials stored in the funds of the Russian State Historical (RGIA. F. 23 – “Ministry of Trade and Industry”; F. 37 – “Mining Department”; F. 54 – “Bogoslovsky Mining Joint-Stock Company”), still mainly unpublished. The addressing of such office-work materials as orders of the Mining Department, its official correspondence with other departments and organizations, directions, characteristics and recommendations issued to Auerbach mining engineers, attestations and other documents of the Mining Institute made it possible to identify and characterize not only the main milestones of the biographies of the Auerbach family representatives, but also the goals, nature and main results of their activities carried out under the instructions of management, scientific, educational and commercial structures.

Ego-documents are of great importance for the analysis of scientific research and the practical contribution of our protagonists to the development of domestic mining (for example, the memoirs of A.A. Auerbach about his role in the development of the coal industry in Russia in the late 1860s and 1870s, the Secretary of State A. A. Polovtsov’s diary with records of visits to the Bogoslovsky Mountain District, etc.). For all the subjectivism of ego-documents, they allow one to “see” a particular person from an unexpected angle and to record such features of this person and daily activities that cannot be gleaned from other sources.

In the field of methodology, we adhere to a theoretical approach, according to which the activities of various actors in the historical process – from distant eras to modern “digital civilization” – are directly or indirectly interconnected and determined by the socio-cultural structure existing in a particular era (Shestakova, Polanski, 2018: 412–417). The research methodology is based on the basic principles of historicism, objectivity and consistency. These principles aim at studying the role of the individual in the historical process in a dynamic dimension, and are based on a critical understanding of the available range of sources, taking into account the totality of historical facts in their contradictory interconnection and interdependence.

The objectives set in the study led to the use of a combination of methods in the work. The main one was the biographical method, or the method of “life stories” reconstruction, which, according to the British historian Paul Thomson, is an interpretation of a variety of autobiographical evidence, but “not in isolation, but in conjunction with quantitative information about social changes” (Biographical method, 1994: 52).

The historical-genetic method was widely used in this research. It made it possible to identify the features of the scientific-experimental and organizational-production activities of mining engineers of the Auerbach dynasty at different periods of their lives in close connection with a specific historical era.

The comparative analysis method was implemented by identifying common features and particularities in the scientific and practical activities of A.A. Auerbach and his son, V.A. Auerbach.

The historical-typological method allowed us to identify and study various directions, forms and methods of daily scientific and production activities of Auerbach mining engineers, as well as to characterize the main stages of their activities in the development of mining in Russia.

3. Discussion

Despite a fairly significant amount of scientific literature on the history of mining in Russia, the question of the role of specific specialists, including engineering personnel, in the development of this branch of the national economy has been touched upon only occasionally and fragmentarily.

In the pre-revolutionary period, works in the form of “dictionaries” and “sketches” prevailed and the authors (mainly mining experts or local historians) provided quite extensive information about the natural and geographical conditions and the economic and statistical indicators of the state of a certain area (okrug, county, etc.). The authors of such works sometimes wrote about manufacturers and workers, but very rarely touched upon the issue of engineering and technical personnel in manufacturing (Chupin, 1867; Belov, 1896; Golubev, 1900; Fertner, 1909). Perhaps the only exception was a substantial article devoted to the main stages of A.A. Auerbach’s life, published the next year after his death by another prominent scientist, specialist in the field of mining mechanics I.A. Time (Time, 1917: 182-195).

The problems of the industrial and technical development of pre-revolutionary Russia were not forgotten by subsequent researchers. However, in the works of Soviet scientists, they mainly considered the problems of completing the industrial revolution in the country in the 1860s–90s, the processes of monopolization in the mining industry, the degree of its dependence from foreign capital, the dynamics of production, and changes in the number of workers employed in the mining industry, the peculiarities of their financial situation and the struggle for their rights (Lyashchenko, 1952: 145-147, 152-153, 157-161; Strumilin, 1966: 80-81, 93, 483-484; Shukhardin, 1982: 85-108).

In modern Russian historiography, there is still interest in the analysis of general phenomena and processes in the history of mining in the second half of the 19th – early 20th centuries. In particular, the problems of the production and consumption of mineral fuels in the Russian Empire in the context of the world economy’s development are productively investigated (Dyakova, 1999). Academics turn to the history of industry congresses of entrepreneurs (Bessolitsyn, 2016), trying to assess the role of entrepreneurs and the technical intelligentsia as actors in the country’s modernization (Actors, 2016: 86-95, 105-110). Along with this, academic works appear in which the rich potential of the anthropocentric approach is used, attempts are made to assess the role of a particular individual as a reserve and impulse for the development of a particular sphere of social life. Some academic articles exist about the student life of the Mining Institute graduate P.N. Wrangel (Afanas’ev, Voloshinova, 2017) and the outstanding mineralogist, “the father of Russian crystallography”, N.I. Koksharov (Rudnik et al., 2019). A biographical feature article about A.A. Auerbach (Dzyubinsky, 2016) was published relatively recently. Foreign historiography also deals primarily with achievements and contradictions in the development of mining (Miller, 1967: 257-268) and social aspects of the history of the mining industry’s development, mainly about the living conditions of workers (Wynn, 1992; Kuromiya, 1998).

However, in general, the contribution of representatives of the Auerbach family of engineers to the development of mining in Russia, with rare exceptions relating only to certain aspects of their activities (Zablotsky, 1999; Chekushina, Peretokin, 2009; Kaimakova, 2012; Afanasyev, 2013), has still not been studied.

4. Results

The abolition of serfdom in 1861 and the subsequent process of the modernization of the country’s economy had a contradictory effect on the state of mining in the Russian Empire. In a number of localities, primarily in the Urals, enterprises based on the use of forced labor experienced a crisis, but in general, there was a gradual increase in industrial production in the country. So, for example, if at the beginning of the 1870s the extraction of iron ores in the country did not exceed 50 million poods per year, then by the beginning of the 1890s the annual production of ores was already about 120 million poods, and by 1913 – was over 581 million poods. Mining enterprises in the South of Russia showed particularly high growth rates (General Survey, 1915: 166–167).

A notable revival in the industry has resulted in an increased demand for specialists in the field of the exploration, extraction and processing of minerals, and such specialists who would be both qualified theorists and practitioners.

One such extremely active and energetic specialist in mining was Alexander Andreevich Auerbach (1844–1916), who came from a family of noblemen.

The Auerbachs originated from the German merchant Jacob, a native of Saxony, who settled in Russia in the middle of the 18th century. Alexander Andreevich was his great-grandson and belonged to the Tver branch of the family (the family estate was located in the Korchevsky district). He was born on February 12, 1844, in the city of Kashin, Tver province, and was the second son in the family. His parents had nothing to do with mining – his father, Andrei Andreevich, served as a city doctor, and his mother, Anastasia Fedorovna (from a rich family of Saratov landowners, the Berkholts), supervised the upbringing of his sons at home and was fond of literature and writing (Chekushina, Peretokin, 2009: 85-86).

However, the Auerbach family included prominent geologists and mineralogists. The first mining engineer in this dynasty was Ivan Bogdanovich (1815–1867), who taught at the Petrovskaya Agricultural Academy and at the Imperial Constantine Land Survey Institute in Moscow, and was the keeper of the

mineralogical cabinet of Moscow University (Zablotsky, 1999: 87). Apparently, he instilled an interest in the searching for and processing of minerals in his grand-cousin.

In 1863, 19-year-old Alexander successfully graduated from the Institute of the Corps of Mining Engineers, with promotion to the rank of lieutenant (RGIA. F. 37. Op. 45. D. 1634. L. 1-10). Biographers of the future “mercury king” sometimes do not notice the fact that after graduating from the institute, Auerbach was seconded to the Expedition for the Procurement of Government Papers by decision of the mining department (Chekushina, Peretokin, 2009: 86). Meanwhile, this was an important event for a young man. The point is that the manager of the expedition, F.F. Vinberg, was carrying out in those years a gigantic piece of work for the technical re-equipment of the enterprise for the solving of water supply problems (as one of the reasons). Auerbach was to take part in creating an artesian well, but for all the prosaic nature of such a task, it was precisely its solution that allowed Alexander to familiarize himself in detail with the process of drilling deep wells in practice (Time, 1917: 182).

After completing the work under the expedition, from 1864 to 1867 he was in charge of the exploration of coal deposits in the Samara province, having formed a reputation for his work as an inventive and diligent specialist, for which he was nominated for an award – the Order of St. Stanislav (Krasnoturinsk, 2004: 257). During that period, Auerbach had to use the mechanical hammer drilling method which was rather monotonous and difficult. Subsequently, the drilling business made a giant leap from the mechanical hammer method and rotary method to modern ones, in particular, using downhole motors (Litvinenko, Dvoynikov, 2020: 105-112).

Being passionately interested in practical work, A.A. Auerbach also showed a genuine interest in science. He was fond of mineralogy and, in particular, searching for new methods of studying minerals. On the recommendation of the professor of the Mining Institute P.V. Ereemeeva, Alexander prepared and in 1868 successfully defended his thesis on the properties and methods of studying tourmaline – one of the most interesting minerals of the group of aluminosilicates. In July of the same year, Auerbach was given the title of Adjunct Professor at the Department of Mineralogy (RGIA. F. 37. Op. 46. D. 1332. L. 1-2). Subsequently, the text of his dissertation “On the tourmaline of Russian deposits” was published as a separate book which was reprinted several times and became the basis for further scientific research on the properties and applications of this mineral (Alekseev, Marin, 2019: 8-9).

Soon after defending his dissertation, the promising young scientist was sent by the head of the Mining Institute on an overseas business trip (1868–1869), during which Alexander continued the laboratory testing of the “hardware”, or otherwise called “microscopic”, method of studying minerals which he had begun in Russia, got acquainted with the mineralogical collections of museums in Paris and Berlin, communicated with Western European scientists and published the results of his works in the “Notes of the Vienna Academy of Sciences” and in other scientific publications. During an overseas internship, he invented a goniometer – a special device for the studying of crystalline substances by the high-precision measurement of the angles between crystal faces, thereby achieving a genuine scientific and technical breakthrough in crystallography (Chekushina, Peretokin, 2009: 86-87).

The most favorable opportunities for self-realization as a scientist and teacher opened up for Alexander Andreevich. However, according to I.A. Time, Auerbach “needed more space, freedom and a wider area of practical activity” than he could get in a department, in a lecture hall or in a laboratory session (Time, 1917: 183). An energetic young man, taking into account his inclinations and the changing economic situation in Russia, closely related to the intensification of railway construction and the growing demand for coal, he decided to leave the Department of Mineralogy and concentrate his efforts on practical work in the exploration of minerals.

A new stage in his life had come. Soon after returning from a scientific trip abroad, Auerbach started serving at the Main Mining Directorate, and in 1871 was sent by the department to a French company which, in cooperation with a certain Colonel A.A. Zubov, conducted prospecting for coal, first at deposits in the Moscow region, and then in Donbass (RGIA. F. 37. Op. 46. D. 2450. L. 1-8). In the summer of 1872, Auerbach signed a contract directly with the French for the development of several promising deposits in the Donetsk coal basin, where he was to purchase or lease land and arrange mines (Auerbach, 1909: 455). However, due to disagreements with the management of this society, which demanded an abrupt reduction in estimated costs, Auerbach in the spring of 1876 refused to manage the mines further (Auerbach, 1909: 458–459, 471) and began mutually beneficial cooperation with a major Donetsk coal businessman, P.A. Karpov, and at the end of the 70s acted as a consultant to major entrepreneurs in the Crimean salt and Ural gold-mining industries (Krasnoturinsk, 2004: 257).

In the 1870s, Alexander Auerbach proved himself not only as a knowledgeable and energetic mining engineer and entrepreneur but also as a skillful organizer of a major regional event – the Congress of Miners of the South of Russia (Auerbach, 1909: 460–461), the founding meeting of which took place in Taganrog in June, 1874. This form of business association was intended to assist in solving current economic issues (primarily, on the procedure for transporting goods by railway and on customs duties on coal and other types of solid fuel), as well as in strengthening the position of miners in defending their interests in relations with government and public bodies (Fomin, 1908: 1; Bessolitsyn, 2016: 162).

By the end of the 1870s, A.A. Auerbach was already an acknowledged mining expert, successful entrepreneur, consultant and financially wealthy person. However, a calm and measured life was not attractive for such a strong personality. In 1879, Auerbach was offered to become a consultant at the Guardianship of the Property, Affairs and Children of S.D. Bashmakov – the former owner of the Bogoslovsky mining district, located in the Verkhoturksky district of the Perm province. In 1881, the new owner, N.M. Polovtsova, wife of the state secretary A.A. Polovtsov, offered Alexander Andreevich Auerbach a post as a manager of this mining district. Agreeing to this proposal, he shouldered the heaviest burden. It should be borne in mind that the economy of the district was at that time in a completely neglected state: local mines had not been provided with powerful pumps for pumping out water, the Bogoslovsky copper smelter was completely idle, and there were not enough workers, especially qualified ones, as well as foremen, factory installers, machinists, etc. (Auerbach, 1888: 3; Kaimakova, 2012: 35).

A.A. Auerbach was the governor of the Bogoslovsky Mountain District for 15 years, from 1881 to 1896. During that time, he not only brought the district out of economic decline, but also achieved a qualitative growth in production with a careful attitude both to the improvement of technology and production methods, and to the selection of personnel, to their training and to an increase in the standard of living of workers and technical employees. The achievements in the production activities of the Bogoslovsky Mining District enterprises are evidenced by the preserved (unfortunately, far from being in full) archival materials (RGIA. F. 54. Op. 1. D. 246. L. 1-8; Op. 2. D. 128. L. 1-16; D. 146. L. 1-3; D. 147. L. 1-3).

At the copper mines, A.A. Auerbach introduced diamond drilling, which led to a significant increase in copper smelting. The purchase of a new blast furnace made it possible to carry out not only reduction, but also oxidation processes in it, and significantly reduced the cost of copper production. Improvements in shaft furnaces increased their productivity while reducing fuel costs. The measures taken by Auerbach to improve the energy efficiency of production, as modern economists show, should be regarded as one of the most important factors in ensuring the competitive advantages of enterprises in the Bogoslovsky Mining District (Sergeev et al., 2017: 602-604). In addition, on the initiative of Auerbach, advanced equipment was issued from abroad – Siemens electric generators, Worthington turbopumps, Becker ventilators, Randt perforators etc. In 1892–1893 a narrow-gauge railway was laid, connecting the factories with the mines and with the pier. Soon, navigation was established on the Sosva and Tavda rivers, which greatly facilitated both the export of finished products and the supply of food to the residents of the region. In the summer of 1894, construction began on the Nadezhda Metallurgical Plant, which produced rails for the construction of the Trans-Siberian Railway. For the construction of this plant, Auerbach received a prize of 125 thousand rubles. (Time, 1917: 190).

Increased attention to the interests and needs of ordinary workers and concern for safety in the difficult working conditions of miners were inherent in A. A. Auerbach (Kazanin et al., 2018: 1333–1339). Auerbach transferred them to piecework wages and initiated the creation of mutual aid funds by deducting a small percentage of workers' earnings (Krasnoturinsk, 2004: 257; Chekushina, Peretokin, 2009: 88). Alexander Andreevich tried to avoid conflict situations. He patiently explained to the workers the advantages of innovation, including new ways of deepening mines. A.A. Auerbach was able not only to achieve results, but at the same time ensured high labor discipline and tolerance, and enjoyed the respect and support of workers and technical personnel (Auerbach, 1888: 5).

One of the burning issues that worried the best representatives of the technical intelligentsia in Russia was the question of training personnel for the mining industry. In order to solve it, projects and charters of mining schools were developed in different parts of the empire, and a public initiative, with the support of entrepreneurs, sought to open these special educational institutions that combined general education and vocational training of students (Mokeyev, 2015: 986-989).

In October, 1884, on the initiative of A.A. Auerbach, a four-year Turin Mining School was opened to train “skilled mining foremen and apprentices”. In the first year, 26 people were recruited. Afterwards, the number of applicants ranged from 20 to 70 people annually (Kaimakova, 2012: 38-39; Afanasyev, 2013: 71). Auerbach continued to consider the Turin Mining School an outstanding achievement in his life many years later. Speaking on October 24, 1909, on the occasion of the 25th anniversary of the school, he noted that its creation brought “the greatest benefit” to local residents, whose children, thanks to the education they received at the mining school, “were not only pulled out of poverty, but became useful and efficient workers” (RGIA. F. 54. Op. 1. D. 182. L. 2-6).

Of course, to ensure all the innovations and improvements in the economic and socio-cultural life of the district, considerable funds were required. Auerbach was well aware of this and did not miss an opportunity to apply to the high-ranking owners of the mining district for additional financing of the projects he was developing. So, during a gala dinner on July 7, 1885, on the occasion of A. A. Polovtsov's staying in the Theological Mountain District, Auerbach, judging by the diary records of the secretary of state, managed to convince his high-ranking guest that the use of underground riches “still requires very significant costs” (Polovtsov, 2005: 368).

In the last quarter of the 19th century, in the economic life of the Russian Empire, including mining, a new form of the organizing of entrepreneurial activity began to actively spread – joint stock companies. In order to ensure the further functioning of the enterprises of the Bogoslovsky mining district, on the basis

of the charter adopted on December 8, 1895 (RGIA. F. 54. Op. 1. D. 3. L. 1-19), the Bogoslovsky Mining Joint-Stock Company was formed, the managing director of which was A.A. Auerbach. He did not stay in this position for long and left it in 1896 due to disagreements with the Polovtsov couple, who were major shareholders, but were burdened by the loss of their former influence on the state of affairs in the mining district (Time, 1917: 184).

After completing his service in the Theological Mountain District, A.A. Auerbach took up a new direction with great energy. At the beginning of 1885, he opened his own mercury business. A few years earlier, a deposit of mercury ores had been discovered in the Bakhmutsk district of the Yekaterinoslav province. In order to attract financial resources for the acquisition of 500 acres of land and for the construction of a mine and a plant in this area, on the initiative of Alexander Andreevich, the “A. Auerbach and Co. Mercury Production Partnership” was created in the same year.

Having carefully studied foreign experience in the production of mercury, the partners were able in record time – by the end of 1886 – to ensure the creation of a mine equipped with a steam engine of the latest design for lifting ore, and the construction of a plant. As is widely known, dusty waste that appears in the course of the functioning of the mining and processing industry always poses a serious threat to the environment (Isakov, Lytaeva, 2017: 37). At the enterprises of Auerbach, this was fully taken into account: here they used improved furnaces for the roasting of the ore created; according to the project of A.A. Auerbach (Time, 1917: 189-190), dust and soot were subjected to additional secondary processing (Chekushina, Peretokin, 2009: 89). The organization of mercury production established by him and the attentive attitude to the social and everyday issues of workers and specialists employed in production received the high regard of contemporaries (Mercury Plant, 1891: 1087–1089).

In the first ten years, the production of industrial mercury steadily developed: while in 1887 just 4,000 poods were received, in 1897 this had grown to – 37,600 poods, which made it possible not only to meet the needs of the Russian economy, but also to organize the export of mercury abroad (Time 1917: 190). However, in 1895, the “Partnership ...” faced financial difficulties associated with both the need to repay loans and the increased costs of the modernization and expansion of production. It was decided to change the organizational form of business by creating a joint-stock company (RGIA. F. 23. Op. 24. D. 280. L. 1–5). In October, 1896, the activities of the joint-stock company “Mercury Business of A. Auerbach and Co.” were opened with a fixed capital of 2.250 thousand rubles. (Index, 1905: 17).

The processes of social development, including the economic and scientific-technical spheres, are a complex combination of different trends – linear and exponential growth, deceleration (“speed plateau”) and even temporary stops in development (Shestakova, 2018: 391-401). The decrease in growth rates clearly manifested itself in Russia during the global economic crisis of 1900–1903, which created significant difficulties both in the production and sale of mercury, and prompted shareholders to look for solid investors to lease or sell part of the mercury and coal mines (Chekushina, Peretokin, 2009: 90).

During these years A.A. Auerbach, who had received well-deserved recognition in society and the informal title of “mercury king”, gradually moved away from direct participation in the affairs of the joint-stock company, yielding the reins of government to his sons.

Perhaps one of the most famous representatives of the next generation of mining engineers of this dynasty was Vladimir Auerbach (1876–1957). He was born on October 25, 1876 (Zablotsky, 1999: 89) and, like his older brother Sergei, was trained at the Mining Institute in St. Petersburg. By the end of the 19th century, the Mining Institute had become a recognized, leading educational and scientific center for the training of qualified personnel in the field of geology (“ore specialists”), metallurgists, mine surveyors and representatives of other professions (Afnas'ev, Voloshinova, 2017: 142-150). In 1899 V.A. Auerbach, with the rank of collegiate secretary, completed his studies at the Mining Institute.

Like many other graduates, Vladimir received good professional training as an engineer. The overwhelming majority of the 25 subjects reflected in the supplement to his diploma are rated “excellent” and “good”. The curiosity in the diploma of the future outstanding mining engineer looks like two satisfactory grades – in the discipline “Geognosy and ore deposits” and in higher mathematics (RGIA. F. 37. Op. 48. D. 2615. L. 230–233).

After graduating from the institute, V.A. Auerbach was assigned “to serve in the mining department” and began working as a mining engineer in the family firm “Mercury Business of A. Auerbach and Co.” (RGIA. F. 37. Op. 48. D. 2615. L. 12). He worked in his father’s company for five years. As a specialist, Vladimir was probably in good standing, since in April 1900 he was sent to the Paris World Exhibition for a period of three months to arrange exhibits (RGIA. F. 37. Op. 48. D. 2615. L. 2). Another important assignment for him was his participation in the reconstruction of the Aleksandrovsky coal mine (Zablotsky, 1999: 89).

And yet Vladimir Aleksandrovich was “cramped” in his father’s firm; he wanted an independent business. In November 1904, having received the best characteristics and recommendations from the Mining Department, he got a job as the head of the cabinet of mining art at the Warsaw Polytechnic Institute of Nicholas II (RGIA. F. 37. Op. 48. D. 2615. L. 54-55). The publication of a detailed scientific work by V.A. Auerbach on coal pressing with a detailed technical and economic analysis of this production process is related to the same period of time (Auerbach, 1905).

However, apparently, the work of a practical engineer appealed to V. A. Auerbach more. After leaving the Polytechnic Institute, in the summer of 1906 he started serving as the head of the Chzhalaynor mines of the CER (RGIA. F. 37. Op. 48. D. 2615. L. 109-111, 125). His activity was carried out at a difficult time after the defeat of the Russian Empire in the Russo-Japanese War of 1904–1905. V.A. Auerbach had to participate in the transfer of equipment and other material assets associated with the railway from Dalny port to Kuanchentzi station – this section of about 700 km with all the infrastructure was transferred, according to the terms of the Portsmouth Peace Treaty, to the Japanese side (Zhigalov, 2008: 24).

In 1907–1909, Auerbach managed the Mining Department of the Board of the CER. During this period, he developed and implemented new engineering solutions for the development of the largest Dzhalai-Norsk brown coal deposit, and also conducted an examination of the Suchansk coal deposit in Primorye (RGIA. F. 37. Op. 48. D. 2615. L. 108, 127). As a result of the last of these events, a detailed report appeared, in which V.A. Auerbach analyzed the state of the technical equipment of the Suchansky enterprise, the living conditions for the workers and technical specialists, the reserves and quality of local coal – which, in the author's opinion, was not inferior to the Donetsk deposits – the state and prospects for the development of transport infrastructure and a number of other issues (Auerbach, 1908: 7-38). The thoughtful, truly scientific approach of V.A. Auerbach to the studying of the prospects for the exploitation of the Suchansky mines manifested itself in the desire to rely not only on the data of the enterprise administration, but also on his own calculations, as well as in the conclusion about the need for further, more in-depth “exploration and research” (Auerbach, 1908: 39).

In 1910, V.A. Auerbach transferred to Donbass – probably, his past experience in this region affected his decision – and Vladimir Alexandrovich found himself in the higher education system again, this time as a teacher of the Don Polytechnic Institute in Novocherkassk (RGIA. F. 37. Op. 48. D. 2615. L. 151). Here he worked until the outbreak of the First World War, and in September 1914 he returned to the sphere of private entrepreneurship again, having become a member of the board of the joint-stock company of Livengof glass and cork production (RGIA. F. 37. Op. 48. D. 2615. L. 173).

In the conditions of the revolution that began in February 1917, V.A. Auerbach returned to Petrograd and served on one of the committees at the Ministry of Labor. The revolutionary events made their tragic contribution to the fate of many people, including the Auerbach family. In 1918, Vladimir Alexandrovich left Soviet Russia. He died in Brussels in April 1957.

5. Conclusion

Representatives of the Auerbach dynasty, first of all, Alexander Andreevich and then his son, Vladimir, having been educated at the Mining Institute, became outstanding mining engineers who combined a high level of scientific and theoretical training and practical skills in their chosen profession. Each of them served mining throughout his life, perceiving it both as a field of scientific knowledge and as an area of practical, industrial and entrepreneurial activity.

The Auerbachs made a significant scientific contribution to the study of various properties of minerals, the process of coal pressing and other significant problems of mining. Their scientific interest was of a pronounced applied nature and contributed to the further development of mining techniques and technology. Discoveries and developments made by representatives of the Auerbach dynasty were actively implemented at the enterprises of the coal and mercury industries, owners (shareholders) of which they themselves were. However, neither Auerbach the father nor Auerbach the son were technocrats in the narrow sense of the word. They paid close attention to ensuring the profitability of enterprises and the raising of the standards of living and education of workers, and, as far as the level of knowledge and technology that existed in that era allowed, they cared about the minimization of the risks of environmental pollution. Moreover, A.A. Auerbach and his son, Vladimir Aleksandrovich, took into account the experience of organizing mining abroad, critically interpreted it and tried to use it for the development of domestic production.

A unique combination of rational, scientific thinking, practicality and organizational skills in the presence of broad, professional knowledge and skills in each of the considered individuals, determined the prominent place of representatives of the Auerbach dynasty in the history of mining in the Russian Empire in the second half of the 19th – early 20th centuries.

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