Production of the Platinum Metals in Soviet Russia

"Entering again the world platinum market after the Revolution of 1917, our country not only had to re-establish the former output of platinum but also to re-organise its extraction on the basis of modern technology."

O. E. Zvyagintsev, 1927

For many years before the outbreak of the first world war the platinum industry in Russia was dominated by the European refiners. The two large producers, Count Demidov and Count Schuvalov, were supplying them with large quantities of native metal from the Urals, while a small refinery and workshop had been set up in 1875 in St. Petersburg jointly by Johnson Matthey and Desmoutis Quennessen to meet the very limited Russian needs for platinum laboratory apparatus. This control of the industry by foreigners was much resented by both the intelligentsia and the politicians, and in 1910 a conference was arranged by the Ministry of Trade and Industry, presided over by Professor Kurnakov, to consider the question of the refining of platinum in Russia. Recommendations were made, but no action was taken, and then in 1913 the Ministry imposed a duty of 30 per cent on exported platinum and a year later, on the outbreak of war, prohibited its export altogether. In the same year the setting up of a refinery was authorised and this was built at Ekaterinburg (now Sverdlosk), the centre of the Ural mining industry. The Quennessen company was to take on the financing, Heraeus to provide a suitable engineer, and Johnson Matthey to design the buildings and plant, to provide the methods of refining and to prepare and ship the equipment. The first local collaborator was the largely uncommitted mining concern, the Nikolai-Pavdinsky Mining Company, which was to find the site and to build the refinery. Many delays occurred, however, and it was not until after the outbreak of war in August 1914 that building began. Operations began on a small scale in 1915 with N. N. Baraboshkin, a former student of Kurnakov’s at the Mining Institute of St. Petersburg, as manager, and by the end of 1917, when all Russian mineral
resources were nationalised, output had increased to some 30,000 ounces a year. The refinery was then taken over by the new government under the terms of a state monopoly for the production, refining and marketing of platinum. The general disorder during the first years of the revolution greatly reduced production, however, which fell to only around 6,000 ounces in 1922 (1).

A Research Institute for the Platinum Metals

During the war the shortage of platinum for the contact process for the manufacture of sulphuric acid had caused great concern – the large Tenteleev organisation in St. Petersburg had been producing acid by this process since 1900 – and in 1915 a commission was set up for the study of all Russian natural resources, with a section devoted to platinum under Kurnakov. An appeal was made to Lev Aleksandrovich Chugaev, Professor of Chemistry at the University of St. Petersburg, and as well as urging the creation of a state monopoly he proposed the establishment of a research institute for investigations on all the platinum metals, their methods of refining and analysis, their alloys and their co-ordination compounds. After the revolution this scheme came to fruition and in 1918 Chugaev was appointed director of the newly formed Institute for the Study of Platinum and other Noble Metals (2). This organisation at once set out to provide the refinery with improved methods, as well as conducting many
Lev Aleksandrovich Chugaev
1873–1922
Born in Moscow where he studied at the University, in 1908 Chugaev became Professor of Inorganic Chemistry in the University of St. Petersburg, succeeding Mendeleev, and remained there until his early death at only forty-nine. Apart from his researches on platinum complexes he proposed the establishment of an institute for comprehensive research on the platinum metals. A project that came to fruition in 1918 when he was appointed the first Director of the Platinum Institute of the Academy of Sciences in Petrograd, now Leningrad.

researches on the chemistry of the platinum metals, particularly on their coordination compounds. Their results were published in a journal established in 1920, the Izvestia of the Platinum Institute, the first and for three decades the only journal devoted exclusively to the platinum metals (3). Unfortunately Chugaev died in 1922 at the early age of 49 and he was then succeeded by Kurnakov who continued to stimulate the refinery management at Sverdlovsk and to contribute to the study of the co-ordination compounds of the platinum metals. In 1934 the Platinum Institute, the Institute of Physicochemical Analysis and the General Chemistry Laboratory of the Academy of Sciences were combined into the Institute of General Chemistry in Moscow, with Kurnakov as Director. On his death in 1941 this was re-named the N.S. Kurnakov Institute in his honour. An appreciation of his life and work has been compiled by Professor Kauffman and will be published shortly (4).

Chugaev’s proposal for a nationalised industry had, however, already been adopted with the formation late in 1921 of a commercial trust, The State Association of Platinum Miners of the Urals, abbreviated to “Uralplatin”. The new organisation found that nearly all the old dredges used to excavate the

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alluvial platinum from the river beds had ceased to operate for lack of spare parts, and new American dredges were purchased, beginning in 1925 and continuing for several years. They could operate only from May to December as they were forced to stop working when the accumulations of ice became too great (5).

In 1921 a representative of Johnson Matthey, Mr. A. B. Coussmaker, then the company’s mining engineer who had considerable experience in the platinum fields in the Urals, secured an interview with Maxim Litvinov with a view to obtaining supplies of native metal for refining. Litvinov, later the Soviet Ambassador in London and then Foreign Minister in Moscow, emphasised, however, that his government was well aware of the extent to which the world was dependent upon Russian supplies of platinum and that they firmly intended to do the refining themselves.

Refining and separation of the platinum metals progressed in the Ekaterinburg plant under the guidance of Baraboshkin and with the close co-operation of
To publish the results of research in the newly founded Institute for the Study of Platinum and other Noble Metals Chugaev founded a journal, the Izvestia, first published in 1920. This included a massive series of papers by Chugaev himself and by his colleagues on the chemistry and metallurgy of all the platinum metals. This shows the cover of the volume for 1936, with the title given in French, and then edited by N. S. Kurnakov and O. E. Zvyagintsev. The journal ceased publication in 1955.

Kurnakov and his staff in improving the processes; high purity platinum, palladium, iridium and rhodium were successfully produced, and a state factory in Moscow carried out the fabrication work.

By 1924 negotiations with the Russians yielded an agreement for Johnson Matthey to take the whole of their output of refined metal for the following year, estimated at 70,000 ounces. This was shared with the other European platinum companies, and further quantities were made available on the same basis in 1926 and 1927, but then a marketing company was set up in Berlin by the Russian government for the direct disposal of their metal.

The Discovery of Platinum in Siberia

Extraction of the alluvial platinum in the Urals continued, and a detailed survey of the mineral resources there was undertaken by a leading Swiss geologist, Professor Louis Duparc, with a Russian assistant, Marguerite Tikanovitch (6), but it was realised that a search must be made for the primary

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After the discovery of a large nickel-copper ore body in north-western Siberia the extraction of the platinum metals from this source began to increase. In the early period before World War II the mineral was shipped to Murmansk and then to a refinery at Monchegorsk where the nickel was refined electrolytically, the platinum metals accumulating in the anode residues and then being separated and refined individually.

rock from which these water-borne deposits emanated. In 1919 while prospecting for coal, Russian geologists discovered a large nickel and copper ore body in the far north-west of Siberia and in 1924, after some samples had been sent to Leningrad, this was found to contain the platinum metals. Some years passed before any further action was taken and then in 1935 the Noril’sk Mining and Metallurgical Combine was established to exploit this large body of mineral. First of all a railway had to be built to link the future mining operations with the port of Dudinka on the River Yenisei, open only for four months of the year. By 1938 the railway had been completed despite the most harsh Arctic conditions, and extraction operations could begin. Initially the ore was shipped from Dudinka to Murmansk and then to Monchegorsk where a nickel refinery had been opened in 1938, but in 1940 Noril’sk had its own smelter and refinery and became a vital source of nickel and copper during the second world war. The ore is first treated along similar lines to those in use at Sudbury, smelted to a matte and the final refining of copper and nickel carried out by electrolytic methods. From these two last operations the anode residues containing the platinum metals are flown to a refinery built at Krasnoyarsk, the capital city of the region nearly a thousand miles to the south on the Trans-Siberian Railway. Here the individual platinum metals are separated and refined. By far the major part of the Russian output of platinum metals now comes from this source.
In more recent years a large smelting complex has been built at Noril'sk to refine both nickel and copper. The final anode residues are then treated at a platinum refinery at Krasnoyarsk, nearly a thousand miles to the south.

The ore-body at Noril'sk is, unlike the rich platinum mineral from the Urals, much richer in palladium than in platinum, while the fact that these metals emerge only as by-products from the extraction of nickel and copper means that production is governed by the demand for these two base metals. Output figures for Russian platinum are most difficult to establish, but production has increased many times since the opening of the Noril'sk operations in 1940 and for a time constituted the greater proportion of world supplies until it was surpassed by the increasing output from the South African mines, to be reviewed in the next chapter.

References for Chapter 22

Arthur Blakeney Coussmaker  
1885–1974

After gaining valuable experience in the platinum mining area of the Urals prior to the 1914–1918 war Coussmaker was appointed a Director of Johnson Matthey and determined to seek a major new source of native platinum to expand their refining and fabricating activities. The discovery of the Merensky Reef in 1924 made it possible for him to achieve this objective.

From a portrait by David Jaeger in the possession of Johnson Matthey.