

«SIMPLIFIEDLY STOP REMARKABLY STOP SENSITIVE STOP»

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ABSTRACT

Petr Nikolaevich Rybkin is «the first radio operator», «the grandfather of the Soviet radio operators», the closest colleague of Alexander Popov. It was Petr Rybkin who, in March 1896, with the help of the Morse code, transmitted the first

radiogram in the world – «Henry Hertz». In May 1899, together with another assistant of Popov, D. S. Troitsky, he opened the possibility of perceiving radio signals with human ear. Based on this discovery, a radio receiver with a handset for receiving radio signals was developed.

Keywords: audition of radio signals, wireless telegraph, electromagnetic waves, radio receiver, coherer, detection.



Objective. The objective of the author is to consider life and work of Petr Rybkin, the closest assistant of Alexander Popov.

Methods. The author uses general scientific methods and historical-retrospective analysis.

A Russian radio technician who discovered the possibility of perceiving radio signals with human ear, Petr Nikolaevich Rybkin was born in a family of teachers on May 14 (May 2 old style) 1864 in St. Petersburg. His parents kept a private elementary school in their home, where the boy received his primary education. Later, while studying at the Vvedensky Gymnasium of the Petrograd Side, he independently passed the first course of a higher educational institution and in 1888 after receiving a certificate of secondary education he was immediately enrolled in the second course of the mathematical department of the Physics and Mathematics Faculty of St. Petersburg University (SPU). In 1892, a student Rybkin, who showed outstanding abilities during training, remained with SPU to prepare for independent scientific work. He simultaneously underwent a scientific internship as an adjunct (assistant professor) at the Main Physical Observatory (since 1924 the Voeikov Main Geophysical Observatory).

In the spring of 1894, in the Mine Officers' Class in Kronstadt (MOC), in connection with the moving of N. N. Georgievsky to Moscow, the post of laboratory assistant of the physical cabinet was vacated. The Maritime Department applied to SPU and there they recommended a young talented physicist Rybkin, who was interested in studying electromagnetic waves. Since May 1, 1894, he was admitted to MOC as a laboratory assistant and an assistant lecturer in galvanism and practical physics. In addition, Petr Nikolaevich was entrusted with management of a physical cabinet, compilation of catalogs of instruments and materials, as well as execution of various scientific assignments. In this, one of the oldest educational institutions of the Russian fleet, Petr Rybkin trained maritime radio specialists for more than half a century. Together with A. S. Popov in the physical cabinet and in the garden of MOC he tested the work of a radio receiver with the world's first antenna. He was present on May 7 (April 25 old style) 1895 at a meeting of the Russian Physico-Chemical Society (RPCS), where Popov reported to the audience about the invention of radio and demonstrated the first radio receiver. In March 1896, at a meeting of RPCS Rybkin, with the help of the Morse code, transmitted the first radiogram «Henry Hertz» to the telegraph tape with electromagnetic signals. The distance, however, was only 250 m. The telegram was transmitted from the chemical laboratory to a physical audience located in another SPU building.

Petr Nikolaevich conducted his first experiments transmitting signals at a distance in the summer of 1897 on the Kronstadt roadstead between the shore and a small «Rybka» ship, and then they continued in the training and mine detachment on the Tranzund roadstead near Vyborg. Alexander Popov at this time was in Nizhny Novgorod, where he was in charge of an electric station, and supervised Rybkin's experiments therefrom, actively communicating with his assistant. The experiments were successful. In order to be able to test wireless transmission over long distances, it was decided to use the cruiser of the 2nd rank «Africa» and the transport ship «Europe». On the masts of these ships it was possible to raise the antenna to a height of 20 m and the transmission range was increased to 5 versts (5-plus km). Successful results of the experiments were reported to the Marine Technical Committee, which decided to finance and continue further research in 1898.

In May 1899, Petr Rybkin, along with another assistant of Popov, D. S. Troitsky, at the forts «Milyutin» and «Konstantin» of the fortress of Kronstadt conducted experiments to test radio telegraphs. The receiver had a simple arrangement: an antenna, a battery, an electrical bell connected in parallel, and a Morse telegraph device, which allowed recording signals on a paper tape, an electromagnetic relay and



Mine room of Mine Officers' Class in Kronstadt.

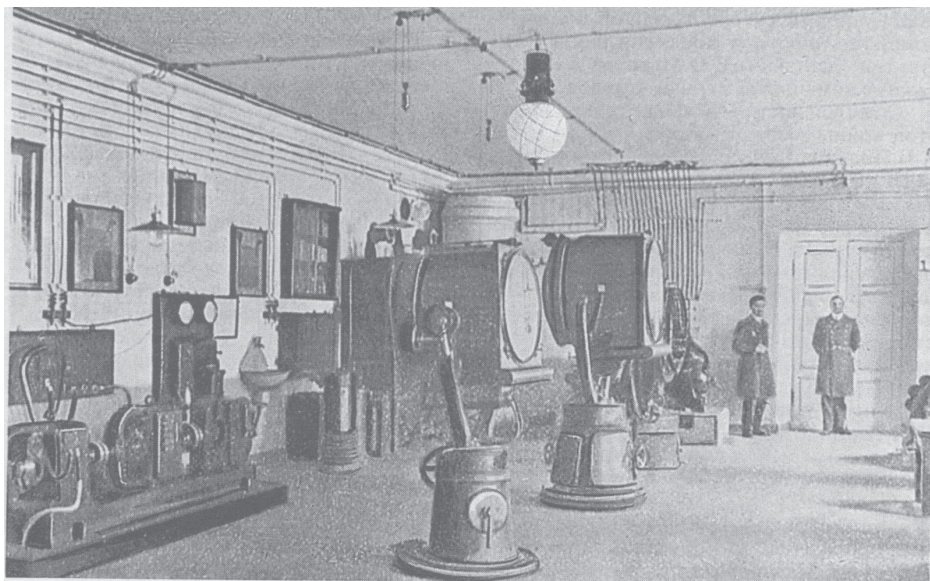
a coherer (a glass tube with two electrodes at the ends, filled with metal powders). Due to poor contacts between the sawdust, the resistance of the coherer was large, so the electric current in the circuit was small. The relay did not close the circuit of the telegraph unit and the bell. Under the influence of high-frequency electromagnetic waves received by the antenna, electrical discharges between individual metal filings occurred in the coherer, they were sintered, the resistance decreased by 100 ... 200 times, and it began to pass an electric current from the battery, sufficient to trigger an electromagnetic relay, which switched on telegraph and telephone. A dot or dash was drawn on the telegraph tape, and the hammer of the bell struck the coherer, shaking its metal filings. The adhesion between the sawdusts was weakened – the receiver was ready to register the next signal. Once, during the transfer of signals from the fort «Constantine» to the fort «Milutin» on a moving telegraph tape, points and dashes were no longer drawn. Having connected the telephone receiver to the coherer to check the serviceability of its electrical circuit, Rybkin heard short and long beeps in the headphones instead of the usual click, from which the word being transferred was composed. A study of this fact showed that during the operation of the transmitter the receiver battery discharged. Therefore, the amount of energy supplied to the coherer sawdust was not enough to connect them to the conductive bridge, thereby closing the relay circuit of the telegraph writing machine. The transmission was on a small spark with reduced energy, which was enough to hear the signals in the handset. About this discovery Popov was informed by an urgent telegram: «Rybkin Troitsky discovered a new property of the tube to receive simplistically remarkably sensitive».

On the basis of the discovery of the conversion of electromagnetic oscillations into a sound signal (detection) without shaking the coherer, a radio receiver with a telephone receiver was designed to receive radio signals by ear, which was more sensitive and did not require a telegraph apparatus to record transmitted messages on a moving paper tape. This made it possible to simplify the receiver circuitry (the

drummer and the interrupter of the electrical circuit became unnecessary) and to increase the radio communication range. In June 1899, Popov, together with Rybkin and Troitsky, applied for a patent «Receiver of dispatches sent by electromagnetic waves». The patent was issued with the number 6066. The world's first device for receiving radio signals by ear was patented in England and France. Currently, this invention is used in digital cellular radio communication systems. The incoming wave causes weak electromagnetic oscillations, the energy of which is not used for reception. Weak signals only control the use of semiconductor devices by power sources that feed subsequent circuits that amplify and reproduce the information received.

In 1899–1901 Rybkin took part in improvement and testing of a wireless telegraph at sea, floating on the ships of the Baltic and Black Sea fleets. Especially important for him was participation in the epic to rescue the battleship of the coastal defense «General-Admiral Apraksin», which was wrecked in the Gulf of Finland. At the end of November 1899, during a snow blizzard, the ship lost its course and sat on rocks in the ice near the southern shore of the island of Hogland (now Sur-Sari). In the winter time, Finnish postmen and couriers did not always provide communication between the mainland and the island because of the fragile ice. For the same reason, it was also impossible to lay the cable. Because of the lack of communication, work on rescue was disrupted, which threatened the battleship with death. The Marine Ministry instructed Popov to provide regular communication between the accident site and the mainland via a wireless telegraph. At the station Kotka (now in Finland) Popov led the work, and on the island of Hogland – Rybkin. To the island, people and materials necessary for the construction of a wireless telegraph station were transported by the icebreaker «Ermak», which was released in early January 1900 from Revel (since 1917, Tallinn). In the blizzard and frosts, the sailors, under the command of naval officers and Rybkin's direction, transported cargo from the icebreaker to the shore by unstable broken ice and deep snow, and then to the island and then





Electrotechnical room of Mine Officers' Class in Kronstadt.

mounted antennas. Communication on wireless telegraph during rescue operations within a radius of 50 km between the mainland, the island and the battleship was maintained regularly and uninterrupted. Until April 1900, when the battleship was still removed from the rocks, several hundred telegrams were transmitted. In connection with the successes during the rescue Petr Rybkin was announced from the Emperor of Russia Nikolai II «Monarch favor» and was granted with 1100 rubles.

In the summer campaign of 1901 Rybkin took direct part in equipping the first civil radio communication line in Russia for the needs of river navigation in Rostov-on-Don between the port and a special lighthouse in the delta of the Don River, eight kilometers from the port. Messages on the water level in the canal connecting the port with the Sea of Azov were transmitted via the radio, thus ensuring the safety of navigation.

After the transition of Popov to the St. Petersburg Electrotechnical Institute in 1901 Rybkin took his place as a teacher at MOC. He did not stop his work on improving the radio receiver circuit, achieved greater reliability in work, continued further tests of radio stations on ships. In 1906 he initiated the creation in MOC of a posthumous exhibition of instruments and radio communication equipment created by Popov. From 1920 until the end of his life he was in charge of the radio museum. For almost 50 years, he directed a radio department at MOC, and then School of Communications n.a. A. S. Popov in Kronstadt. The sailors of the Baltic called Rybkin «The Grandfather of the Radio Operators». On his initiative, in 1922, evening electrical courses were organized in Kronstadt, where he taught until 1934.

During the Great Patriotic War, Petr Rybkin carried out the tasks of the Baltic Fleet command in the defense of Leningrad, for which he was awarded the Order of the Red Star. In March 1942, he was

evacuated from Kronstadt and worked until the end of the war at the Inskaya station of the West Siberian Railway six kilometers east of Novosibirsk. In 1944, Petr Rybkin was awarded the highest award of the USSR – the Order of Lenin. And at this time his son, also a radio operator, Vladimir Petrovich Rybkin, fought at the front.

Conclusion. After a serious and prolonged illness, Petr Nikolayevich Rybkin died on January 10, 1948 at the age of 83 years. He was buried in his native Kronstadt. Petr Nikolaevich has more than 30 works in the field of radio communication practice and history, in which the priority of Russian science in the invention of a wireless telegraph has always and uncompromisingly been upheld. For pedagogical and scientific activities, he was awarded orders and medals of the USSR, watch with engraved name from the government of the USSR and the badge «Honorary radio operator of the USSR». Director Maria Kligman shot him in the documentary film «The Birth of Radio» (1941).

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