RESEARCH PAPER

State secrets and compromises with capitalism: Lev Theremin and regimes of intellectual property

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Submission date: 2 July 2024; Acceptance date: 21 March 2025; Publication date: 2 July 2025

ABSTRACT

Known as a pioneer of electronic music, Lev Theremin (1896–1993) had a career as an inventor which stretched the entire span of the Soviet Union's existence. He witnessed the upheavals of war, terror and revolution firsthand but also tried his luck as an inventor in the United States. With an emphasis on the Soviet Union, this paper uses the case of Theremin – including the years he spent in the United States – as a lens through which intellectual property can be analysed. Soviet attempts to control and reward inventors, inventions and inventiveness to a large extent took place outside the formal legal framework. Theremin's inventive career embodied the contradictions and tensions of intellectual property politics and its attempts to encourage, reward and control both inventions and inventors. As the case of Theremin will show, many of the dealings between inventor and state were classified and unrecognized, shaped by both voluntary cooperation and force. Using the methodological approach of the meta-archive, this paper traces the overarching structural context for owning and controlling knowledge and ideas through the personal trajectory of Theremin.

KEYWORDS

Lev Theremin, inventor, termenvox, intellectual property, Soviet Union, Gulag, Stalin, espionage, *sharashka*, Great Seal Bug, KGB

DOI: 10.13169/Prometheus.40.3.0002

Lev Sergeyevich Theremin (Termen)[1] (1896–1993) is known as a pioneer of electronic music. In 1920, he invented an early electronic music instrument played without physical contact, thus giving the impression of conjuring music out of thin air. Closely associated with his person, it is still known across the world as the theremin or termenvox. Theremin was also, among other things, an early television pioneer, the inventor of alarm systems and an eavesdropping device, nicknamed

[1] A literal transliteration of his last name is Termen (pronounced Tair-MEN), but as the family had French ancestry, the spelling Theremin is considered to be the correct non-Cyrillic version of his surname, and the one generally used in English. He is also sometimes known by Westernized versions of his first name (Leo, Leon).

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'the thing', that is seen as a predecessor of the now very widespread RFID-tags. However, his long career as an inventor stretched the full span of the Soviet Union's existence and saw the upheavals of war, terror and revolution firsthand. While he became a celebrated inventor, for a while, both in the Soviet Union and in the US, he also spent eight years as a prisoner in the Gulag system. He was awarded the Stalin Prize, but never obtained a secure or established position as inventor or scientist. After his release from prison, he spent 15 years working for the KGB, but he was probably involved in intelligence work already before his prison term. His biography is so rich in drama it could be turned into a blockbuster spy movie, but it also embodies the contradictions and tensions of Soviet intellectual property politics and its attempts to encourage, reward and control inventions, inventiveness and inventors.

This paper traces the overarching structural context for owning and controlling knowledge and ideas in the Soviet Union through the personal trajectory of Theremin. He had his work recognized by both patents and Soviet inventor's certificates, introduced as a socialist alternative to patents at about the same time Theremin began his inventive career, but in many of his dealings with the state his work was also classified, sometimes secretly rewarded but in other instances unrecognized. His inventions were created both voluntarily and as a result of forced labour.

The purpose of this paper is to use the case of Lev Theremin as a lens through which intellectual property in the Soviet Union can be analysed, and to do so we need to look beyond the law as invention law was a relatively small part of the regulation of inventive activity in the Soviet Union. This paper traces the overarching structural context for owning and controlling knowledge and ideas through the personal trajectory of Theremin. Lev Theremin is by no means a typical case. His biography is by all accounts extraordinary; however, it is also an ideal case to explore how the inventor and his inventions encountered and became entangled with both the socialist and the capitalist project. The obstacles he ran into highlight important features, and his career as an inventor illustrates the fuzzy boundaries of intellectual property regulation. Here the word 'regime' will be used to mean an assemblage of (among other things) intellectual property law, documents, rewards, threats, physical constraints, secrecy measures, ideological deliberation, international relations and embodied knowledge. Theremin had his work recognized by both Western patents and socialist inventor's certificates, and signed deals with both American corporations and the Soviet state. The emphasis in this paper is on the Soviet Union, but the years Theremin spent in the United States illuminate some similarities and differences between Eastern and Western approaches to intellectual property.

Method and materials

The purpose here has not been to uncover all the details about Lev Theremin's life, although his biography is interesting in its own right and it is easy to get carried away by all the fascinating turns his life took. His life is relatively well chronicled, although there are only glimpses of the years he spent in prison and working for the KGB. There is a comprehensive scholarly biography in English by Albert Glinsky (2005), and two Russian-language biographies by Svetlana Kovalyova (2008) (in parts remarkably similar to Glinsky's book) and Bulat Galeyev (1995), with the latter being a personal account which draws on the author's long-term personal acquaintance with Theremin. These three book-length biographies are united by an interest in Lev Theremin as a pioneer of electronic music and inventor of the theremin/termenvox, and this is also true for most of the scholarly interest in Theremin. There are numerous shorter texts giving details of his life and work, usually focused on the theremin instrument or the notorious Great Seal Bug he developed as a prisoner (more about this later). Especially in late Soviet times, his long and eventful life, from meeting with Lenin to *perestroika*, in itself attracted interest and was the subject of several interviews, and through the project *Ustnaya istoriya* (oral history) two recorded interviews with him can be accessed. There are also some of his own writings. Patent documents and inventor's certificates can be accessed through Espacenet and WIPO databases, although there might be additional undigitized documents.

In working with the example of Lev Theremin, the lead of Maria Tamboukou and others (Moore *et al*., 2016; Tamboukou, 2020) in navigating the traces of the meta-archive has been followed.[2] In her work on the mathematician Sofia Kovalevskaya, Tamboukou says: 'What has emerged instead from the significant body of secondary literature that has evolved around her life and work is a meta-archive of scattered auto/biographical documents with different and often competing translations, extracts from her letters, diary entries, as well as novels and plays that create palimpsests of traces of the self'(Tamboukou, 2020). In a similar way, the paper is a meta-archive of Theremin's own writings, newspaper materials, interviews, biographies, digitized documents, documentary film, novels. Not least, this meta-archive collects secondary literature, not only on Theremin, but on his inventions, forced intellectual labour and the Soviet IP regime more generally. Piecing together this scattered material in a narrative of Theremin and the Soviet IP system, in a way similar to that used by Tamboukou with Kovalevskaya, also creates one or more 'palimpsests of traces of the self'.

Intellectual property in and beyond the Soviet Union

Mario Biagioli has famously compared applying for a patent to casting a vote, arguing that both these 'practices play out in different ways what it means to operate in a regime of political representation' (Biagioli, 2006, p.1129). The conceptualization of patents as intellectual property and as a right parallels the demise of absolutism and the emergence of citizens rather than subjects, Biagioli argues. The earlier privileges that were used in many countries, including pre-revolutionary Russia, allowed merchants or inventors to make money and enjoy monopolies on inventions. These were not property rights, but rather dispensations or gifts given by the crown that could easily be revoked (Graham, 2013, p.119).

With the transition from privileges to patents, emphasis also shifted to the knowledge that made the invention possible and to the disclosure of that knowledge – in exchange for a limited monopoly. This transaction is usually termed 'the patent bargain'. However, the very notion of such a bargain, a contract between the public and the inventor, was based on the recognition that the inventor had rights to the invention, and 'would have been unthinkable outside of a political regime based on representation' (Biagioli, 2006, p.1131). Biagioli argues that it was the transformation of the invention to knowledge, the separation of that knowledge from both the inventor and the material manifestation of that invention, and the practice of disclosure of that knowledge and making it part of a public domain, that turned inventors into citizens 'that is, individuals with rights' (Biagioli, 2006, p.1161). In both pre-revolutionary Russia and the Soviet Union, the state was reluctant to view inventors in this way. As Loren Graham observes, the tsar feared successful entrepreneurs and industrialists, and was reluctant to give them rights, instead handing out privileges. In tsarist Russia, there were no citizens, only subjects (Graham, 2013, p.119). And this relationship between the state and inventors, specialists and entrepreneurs prevailed in Soviet times. While the Soviet Union adopted the language of citizenship, in practice its citizens were in many ways subjects.

For the Bolsheviks, the patent system was inherently capitalist and thereby inherently flawed. For them, it failed to serve the masses, it suppressed their talents, and their efforts were used against them to enrich the capitalists. Soviet writers emphasized that it was not the inventors who became rich, but those who exploited the patents. The ideological critique also claimed that patents

[2] There is no official Theremin archive, but enthusiasts and relatives hold personal collections. The meta-archive could no doubt be extended by going through material in archives and museums in Russia. Some material is, however, likely to be classified. The Covid-19 pandemic, followed by war in the Ukraine, have precluded travel to access primary materials. At the time of writing, the prospects of archival work or other fieldwork in this area are abysmal.

choked the flow of technical information as patent holders strove to limit as much as possible the disclosure part of the bargain (Martens, 2010, pp.32–3).[3]

In 1919, Lenin issued a Decree on Inventing which stipulated that all inventions that had been pronounced useful by the Committee for Inventing could be declared state property. This could be done by means of an agreement with the inventor or, if necessary, against the inventor's will. All inventions made on Russian soil should be made public in Russia before abroad. The decree recognized the inventor's *avtorskoe pravo* (author's right) which was expressed by the granting of a certificate (Ulyanov and Bonch-Bruyevich, 1919). As legal scholar Boris Mamlyuk (2011) has pointed out, the very notion of owning an idea or a work of art can be seen as contradictory to socialist principles of mass production and commonality of title. At the heart of the issue is the relation between an individual and society, where not only the individual but also 'the social medium in which he or she worked' would be considered creators of a work (Mamlyuk, 2011, p.560).[4] The certificate sprang out of the view that the state is the extension of the people, and thus, what is state owned belongs to the people.

The new inventor's certificate[5] that replaced patents testified to the inventor's right as an author of the invention but declared the invention itself to be a state property. Strictly speaking, it did not grant any property rights to the inventor. The inventor, or author, lost his or her ownership of the invention, but was entitled to compensation for its exploitation.[6] The new Soviet system was thus an attempt to avoid reliance on private property rights, and the certificate arrangement that emerged was intended to promote the free flow of information and to allow for broad and fast diffusion of new inventions and improvements throughout the Soviet Union. In relation to this, it should be noted that the Soviet Union had no institution of trade secrets (Lebedenko, 2022, 2024).

Legal scholar Svitlana Lebedenko also points out that innovation in the Soviet Union in many ways functioned as an economy of esteem, where monopoly rights in a patent system were replaced by other rewards and incentives (Lebedenko, 2024, p.14). In the Soviet Union, other rewards than monetary were considered important means to incentivize invention (see Hughes, 1945, for an overview). These would include both symbolic awards and access to privileges, goods and services. To some extent, prizes and the idea of socialist competition were also part of the system to incentivize invention – and in relation to Theremin's biography, the most important prize was the Stalin Prize.

However, despite ideological resistance, the early Soviet state took several measures to protect intellectual property.[7] Not least, this was seen as important in the sphere of foreign relations.

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[3] It is worth noting that this general criticism of the patent system was not unique to the Soviet Union, but has been rehearsed in many other contexts as well. Many of the same arguments, in quite different contexts, are discussed in Machlup and Penrose (1950).

[4] There were also proposals to discard the distinction between author's rights and patents over physical inventions, and instead introduce a broad protection of what was not to be termed intellectual property, but, more true to Marxist ideology, 'products of labour' (Mamlyuk, 2011, p.560).

[5] *Avtorskoe svidetelstvo*, literally 'author's certificate', but usually rendered 'inventor's' to avoid confusion with copyright law. The United International Bureaux for the Protection of Intellectual Property initially used the term 'certificates of authorship', but the terminology was changed in the preparation for the 1967 Stockholm conference and inventor's certificate has since been the standard English translation.

[6] The monetary rewards varied according to the potential savings the invention could produce. The exact form varied throughout the Soviet period, and the formulas for calculating this became quite complicated (Martens, 2010). Another difference was that, while the cost of keeping a patent can be quite high, the holder of an inventor's certificate did not pay any fees. Further, while patents were limited in time, the certificates had indefinite life (Blair, 1973).

[7] According to Mamlyuk, the notion of the socialist transition stage to communism, elaborated by Lenin, is key to understanding the apparently contradictory Bolshevik position on intellectual property. The inevitability of the transition period meant that compromises with capitalism could be justified as means of strengthening the state and building socialism, although they would not ultimately be a part of communism, when achieved (Mamlyuk, 2011, p.562).

After introducing the inventor's certificate in 1919, patents were reintroduced in 1924 and from 1931 existed in parallel with inventor's certificates until 1990. This dual document regime was kept through several revisions of the law on inventions and changes to the organizational form of the administration and processing of applications. In the 1960s, inventor's certificates also became an established part of the international intellectual property regime, and the Soviet Union joined the Paris Convention and later the Patent Cooperation Treaty (Bosse and Dahlin 2023).

While Lebedenko has called the Soviet period 'a peak moment of Russian innovation' (Lebedenko, 2022, p.175), historian of science Loreen Graham in *Lonely Ideas* (2013) takes a rather bleak view of the innovation system. Graham claims that Russia over several centuries has consistently failed in realizing sustained progress out of the many original ideas and scientific achievements made in the country. According to Graham, ideas are lonely because they are not supported by a social milieu in which they can thrive. Theremin in many ways fitted this pattern of loneliness, but his case also complicates the argument by showing the active role of the repressive features of the Soviet state when it comes to shaping invention and innovation. Graham claims that the most obvious reason for Russia's repeated failure at innovation is the absence of a proper patent system, but that this legal shortcoming is linked to other factors: attitudinal, economic, political, social and organizational.

Another factor that other scholars single out as an obstacle is the heavy reliance on secrecy and the militarization of Soviet society. While Lebedenko highlights openness and flows of knowledge, and how secrecy was seen as an obstacle in the civilian economy (Lebedenko, 2024, pp.3, 5), she does so with the important caveat that her study concerns only civilian inventions. However, the military sector was no small exception. The Soviet state was forged in war and the Bolsheviks saw enemies everywhere, and perhaps rightly so (Harrison, 2008; Barber *et al.,* 2000). For anything considered of military importance, other rules applied, and secrecy regulations were strict. There was no free flow of information in this sector.

In this parallel, or rather overlapping, world, secrecy reigned supreme. Some commentators even suggest there was 'a sole reliance on an invention secrecy system' in the military sector (Farley and Isaacs, 2020, p.73). This most likely affected knowledge circulation and innovation within the Soviet Union. In the military sector, individual actors struggled to get access to inventions and technological development, which is likely to have hampered innovation (Farley and Isaacs, 2020, p.73). Lebedenko points out that the certificate system among other things was designed to avoid duplication of effort, but in the military sector, with its heavy reliance on secrecy, this problem prevailed (Harrison, 2008, p.238). Secrecy is often considered to have been endemic in the Soviet Union (cf. Siddiqi, 2015; Getty, 2017; Hutchings, 1987), and as Harrison points out, secrecy is costly. It both costs to enforce and it also damages the efficiency of the economy (Harrison, 2008, p.230). If the certificate system was designed to allow for a free flow of information, secrecy in other sectors severely impeded the information flows (Harrison, 2008, p.235). The defence sector was also characterized by the type of competition and attempts at monopolization that the certificate system was meant to prevent (Harrison, 2008, p.256).

Further, it is not so easy to demarcate the boundaries of the huge Soviet military sector. As Barber *et al*. (2000) point out, the defence industry consisted of a core of enterprises that 'shaded into a far wider peripheral circle of dual-purpose and general-purpose products' (Barber *et al*., 2000, p.8). Many civilian products had a military potential in themselves or were composed of parts or materials that could be recomposed in another way for military use, and in some cases the same factories could produce both civilian and military products (Barber *et al*., 2000, p.9). Changes in military production also militarized formerly civilian technologies, and the continued expansion of the Soviet military sector drew resources from the civilian economy. This further blurred the distinction, so that these were not really two separate spheres (Harrison, 2008, p.256). The sphere of defence and national security interests was defined more broadly than in many other countries (Barber *et al.,* 2000, p.23). This had consequences for how information was viewed, and the conflation of civilian and military production and information meant, especially during the Stalin years, that "virtually anything was liable to be made secret" (Barber *et al*., 2000, p.23).

The case of Theremin shows the murky boundaries between military and civilian life. While, for instance, the musical instrument may have been seen as purely civilian, he made other inventions based on the same basic principle that had a security use. He also illustrates the dual document regime as he holds both patents (Soviet and foreign) and certificates, although many of his inventions are not acknowledged by any documents. His career as an inventor also spans the entire duration of the Soviet era. He began his inventive career in the 1920s at the time of intense debate and changes to the legal framework, and the permissive New Economic Policy era, and his patents from these early inventions were also a means of gaining access to foreign industry.

Patenting: compromises with capitalism

Despite a bourgeois background, Lev Theremin was a firm supporter of the revolution. In the devastating civil war which followed the revolution and ultimately consolidated Bolshevik power, he was a military engineer in the Red Army and broadcast supervisor at the radio station in Tsarskoe Selo, outside Petrograd (Glinsky, 2005, p.17). Even before the end of the war, he was recruited to the newly created Physico-Technical Institute under the leadership of prominent Soviet physicist Abram Fyodorovich Ioffe (1880–1960). Here, in 1920, he made his most celebrated invention, the electromusical instrument that came to bear his name. This was a difficult time, the civil war raged and there were shortages of both food and equipment. Ioffe saw his institute as part of a new Soviet science which would build a brighter future. While the Institute was to contribute to the Soviet project, it was also a sanctuary for suspicious, bourgeois elements (Glinsky, 2005, pp.19–20). The Soviet authorities had a very fraught relationship with the intelligentsia which, especially in the early period, often belonged to the old guard. The Bolshevik leaders saw the scientific and technical intelligentsia as representatives of 'all that the revolution promised to destroy'. But they were also seen as indispensable for development, modernization and creating the socialist utopia (Siddiqi, 2015).

At the institute, Theremin was investigating the capacity of the human body to act as an electrical conductor, or more precisely its capacitance, its ability to store charges. He discovered that a person's body could interfere with an electrical circuit, and by causing a change in its parameters, could set off a signalling device, thus creating an invisible alarm. Experimenting with this feature, he built an apparatus that he called the 'radio watchman' (Glinsky, 2005, p.23).[8]

His next task was to build a device that could measure the density and dielectric constant of gases. He used a system with an audion oscillator in a tuned circuit, which he also used in the radio watchman. When experimenting with the device, he made the discoveries that would lead to the development of the instrument that bears his name. He realized there was 'some sort of music in this capacitometer, a new way of producing notes. … This was electricity singing to him, pure and simple' (Glinsky, 2005, p.24). Word spread in the institute that 'Theremin plays Gluck on a voltmeter', and Ioffe encouraged him to develop the invention further (Anfilov, 1966, pp.143–4). The resulting instrument had a range of three to four octaves, and it was monophonic; that is, capable of producing just one note at a time. He dubbed the new instrument the 'etherphone', a reference to ether waves, a popular notion in the early era of broadcasting, hotly contested by scientists at the time, but lingering in the public imagination (Glinsky, 2005, p.26). In late 1920, Theremin did his first public performance at the Institute. In Glinsky's version, the invention of the instrument seems to have been almost accidental, but in his own account of the birth of the termenvox, Theremin describes a much more deliberate search, beginning as a childhood dream to unite his two interests music and electricity (Termen, 1972). According to Glinsky, Theremin was encouraged by Ioffe to patent both the etherphone and the radio watchman, not only in the Soviet Union but also abroad. Theremin filed for a Soviet patent on the etherphone in June 1921, now dubbed 'musical instrument with cathode relays'.[9] Processing patent applications takes time, and during this time much changed in the Soviet Union.

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[8] The 'radio watchman' was later patented abroad and there might be a undigitized Soviet patent as well.

[9] As the 1919 decree was in force, Theremin probably filed for a certificate of authorship. There is a reference to another application number for a certificate (SU75152) in the granted patent.

The civil war ended in 1922; recovery from the war made the 1920s into a time of pragmatism and ideological compromises. The Soviet regime launched the New Economic Policy (NEP) which allowed some private enterprises to recover from wartime devastation. Sometimes dubbed a compromise with capitalism, NEP incorporated some market principles, and there was also a desire to attract foreign investment. In this context, the new inventor's certificate was considered insufficient, and a reinstatement of patents was being drafted in 1921. Realized in 1924, the Soviet Union now granted patents and the socialist inventor's certificates (temporarily) disappeared. On 15 September 1924, Lev Theremin was awarded a patent (SU890) on the etherphone, together with several other patents (SU612, SU613, SU797).[10] The 1924 patent law was controversial in the party as it reintroduced property rights for inventors. If the 1919 decree was firmly rooted in Marxist-Leninist principles, these were absent from the new law, which 'closely resembled the German patent law of 1891' (Martens, 2010, pp.36–7). The reasons for this were purely pragmatic, it was believed, even among many leading communists, that patent protection was necessary to attract foreign technology-intensive investments (Martens, 2010).

During the 1920s, the USSR entered a number of bilateral agreements with European states in order to normalize trade relations, and in each of these agreements the USSR promised to preserve the property rights of foreign investors. The treaties also gave the Soviet Union something else it desired – international legitimacy. The treaties were conditional on the recognition under international law of the Soviet state (Mamlyuk, 2012, pp.544–545). The 1924 patent law, under which Theremin received his first patents, soon came under ideological attack. As the Soviet Union in the late 1920s prepared to launch its first five-year plan, the intensity of the attacks increased. There was a greater ideological vigilance and return to revolutionary fervour in economic management. The ideological atmosphere that allowed for a Western-style patent law was gone and in late 1927 new draft laws for inventing appeared. This culminated in a new invention law in 1931 in which the inventor's certificates returned. The new law favoured state ownership, but it was not a complete return to the early post-revolutionary decrees. For instance, it provided for the option of seeking patent protection (Martens, 2010).

Despite the changed atmosphere, pragmatism prevailed in the compromise of keeping patents alongside certificates. Martens points to several reasons for retaining patent protection. It facilitated bilateral contract negotiations and 'guaranteed that Soviet inventors could patent abroad via reciprocity' and foreign patents were also a way to secure access to foreign industry for intelligence purposes. In addition, patents were a source of hard currency, always in deficit in the Soviet Union, as foreigners paid in hard currency when they filed for patents and for fees to keep them valid (Martens, 2010, p.44).

The significance of the patents Theremin received in 1924 extended beyond the Soviet Union. Despite this being during the permissive NEP era, there was probably no possibility – nor desire from neither Theremin nor Ioffe – to commercialize his inventions. As we will see in the next section, the Soviet state would find Theremin's inventions useful domestically, but the real importance of the patents lay in the way they could be used internationally. Patents were reintroduced to attract foreign trade, and it is perhaps not surprising that securing foreign patents was also a Soviet priority. In 1925, Theremin was sent for a first business trip to Berlin. Ioffe had already paved the way, arranging patent applications for Theremin's inventions, made through the firm of M. J. Goldberg & Sons. The Goldberg family had Russian origins and retained connections with the motherland. Goldberg acquired the rights to Theremin's inventions, and also applied for European and US patents. Patent applications not only paved the way for Theremin but also opened the door

[10] In several books, including Glinsky's and Kovalyova's, SU780 is listed as the first Theremin patent. No such patent can be found, but SU890 is for the musical instrument. A discussion at http://blog.trmvox.ru/first-patent-thereminvox/ has arrived at the same conclusion. Patent SU797 is for a cathode generator relay. Both SU612 and SU613 are for a 'device for changing the magnitude of a cathode relay in cathodic musical instruments'. The original documents for SU612 and 613 could not be found, though drawings are reproduced at the site patenton.ru.

to Europe for Soviet intelligence (Glinsky, 2005, p.43). Any business or other dealings with foreigners generally had an intelligence side as well (Kovalyova, 2008, p.47). Thus began the association between Theremin and his inventions with surveillance, intelligence work and espionage, an association that would last throughout much of his life.

'Snatching': in the interest of the state

While Theremin's first patent applications were being processed, there were changes to the legal framework and Theremin's work began to attract the attention of the Soviet authorities. He was invited to the Kremlin to demonstrate his inventions for Lenin; this meeting with Lenin is usually framed as an important event in the construction of Theremin's biography. It was not music that primarily interested the leaders, but the potential to use the radio watchman technology as an alarm system. However, apart from the potential usefulness to the regime of the technology as an alarm system, Lenin also saw great propaganda value in Theremin's work. A famous Lenin quote defines communism as 'Soviet power plus electrification'. Theremin was sent on an agitprop tour with his new instrument to promote not electronic music *per se*, but the wonders that electricity and the Bolsheviks combined could produce. As the fame of the instrument rose, it became increasingly associated with its inventor. The etherphone became the termenvox – Theremin's voice (Glinsky, 2005, pp.28–33).

Along with lecture performances and concerts, Theremin was increasingly engaged to set up his radio watchman as an alarm system; for instance in the Gokhran (state storehouse for expropriated church valuables), the Gosbank (state bank) and the Hermitage in Leningrad. Theremin also became involved in a new monumental task – the development of distance vision or, as we now know it, television. He took this on as his dissertation work. In 1924, he enrolled at the newly organized School of Physics and Engineering at Leningrad Polytechnical Institute. At the time, no working television had been developed anywhere in the world, although intense research was being done in many places. Working conditions were far from ideal. Parts were hard to come by and Ioffe's business trips to Germany provided a chance to get hold of necessities. Theremin would also search flea markets in both Leningrad and Moscow for parts. The work Theremin would eventually present in his thesis defence (*The Mechanism of Electric Distance Vision*) in June 1926 was pioneering. He accomplished near instantaneous transmission of a far larger image – 64 lines – than anyone else had achieved. The defence included a demonstration in an assembly hall, where Theremin projected images transmitted from an adjoining room. 'A face could easily be recognised if the person made no sharp movements, and movements of a waving hand were plainly visible on the receiving screen at virtually the same moment they happened' (Glinsky, 2005, p.44). The demonstration caused a sensation at the Polytech, and Ioffe lauded Theremin's discovery in *Pravda*. In December 1926, Theremin presented a new version before the Fifth All-Union Congress of Physicists in Moscow. The reception was enthusiastic. Theremin had been able to project a far larger image with a shorter time lag than anything achieved on the other side of the Atlantic (Rokhlin, 1984).

As a dissertation work, Theremin's television came under the scientific regime of publishing and making public. Dissertations were to be publicly defended. Already public, the result was thus not patentable, the reward for Theremin was the academic degree. But the invention itself was also impressive. He had effectively built the first functioning TV in Russia, and it is perhaps not surprising that the state took an interest. In 1927, Theremin received a commission from the Kremlin to design a distance vision for the border patrol. The specifications were ambitious by the standards of television research at the time. In June 1927, Theremin had a secret, fourth version, of his distance vision ready for demonstration in the Kremlin (Rokhlin, 1984). It could operate in natural daylight, not only in lab conditions, and had a resolution of one hundred lines, which was a record at the time. This was enough to make a person's face clearly visible, even if the person was moving. Voroshilov oversaw the project, and Stalin was present at the first demonstration. They, and other

high-ranking Bolsheviks present, were duly impressed. Theremin received further orders, and was eventually rewarded 'for his efforts with a coupon for "a big food parcel," courtesy of the government' (Glinsky, 2005, p.46). But there was a catch. His television was now a matter of state security and made top secret. No detailed technical data were ever disclosed and Theremin himself was unable to develop his work further: 'His distance vision scheme had been snatched and sealed in a vault' (Glinsky, 2005, p.47). While it was intended for the border patrol, Voroshilov reportedly kept it, at least for a while, in his office, making a game of guessing the identity of approaching visitors (Rokhlin, 1984).

The television that began life as a public and published scientific work[11] was thus later classified and sealed, the author prevented from taking his invention further. A 'big food parcel' seems like pretty poor reward, even if it was from the restricted store normally open only to the leadership. Similar to their tsarist predecessors, the Bolsheviks' impulse was to control rather than to stimulate inventions. The secrecy that surrounded the fourth version can be seen as the very opposite of the free flow of technical information that the certificate system was supposed to create, and it also shows the overlap between military and civilian technology. With the prospects of continuing television work being low, Theremin was sent abroad. Framed as a sort of cultural exchange, he was to go on an extended business trip. We can see the tour as cultural diplomacy, taking the propaganda abroad and showcasing the wonders the Soviet Union produced. Through both business and culture, Theremin became part of the Soviet Union's foreign relations. First stop was Berlin, where Theremin needed to conclude some previously initiated business with M. J. Goldberg & Sons. While the 1927 trip was framed as a cultural exchange, it had a business side as well and Theremin received 'a little extra assignment' from military intelligence, the GRU (Glinsky, 2005). Theremin set out for Germany in July 1927 with a company of musicians, including a quartet from the Moscow Philharmonic.

The inventor in exile

Following an extended tour, where Theremin was demonstrating his 'ether instrument' in Europe, the inventor continued on to the United States. Upon arrival, Theremin attracted great interest and became something of a celebrity: an exotic Russian with a futuristic instrument. Theremin arrived on a three-month visa, but he was to stay a decade in the US, on a string of extended temporary visitor visas. At the time, there were no diplomatic relations between the US and the Soviet Union, but there was a shared interest in pursuing business opportunities. While for the Americans, the Soviet Union seemed a promising market, for the Soviets business relations were closely tied with intelligence work. Theremin was no exception, he still had his 'little extra assignment'. When he arrived in the US, Theremin had already made patent applications through Goldberg in the US for the radio watchman and the termenvox. These were granted in early 1928, and later in the year he made another six patent applications.[12] As the instrument was gaining fame, Theremin was also challenged by two American inventors who independently had earlier patents in a similar area. However, neither took any legal action at the time. Theremin was also shown interest by big corporations, and began to draw up a commercial strategy and plans for a company. He would ultimately sign a deal with RCA, one of the biggest, for mass production of theremins in March 1929 (Glinsky, 2005, p.93). Things were looking good. He created two companies to which the patent rights to his inventions were assigned.

While the ether instrument was a novelty and curiosity, the big thing at the time was television. And RCA was in the TV race. This was a field of intense activity, but Theremin's work was

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[11] It was also popularized, for instance, through a large article in *Radioliubitel* (*Radio Amateur*) in 1926, following the demonstration in Moscow, which explained the workings of the system. Theremin and his co-worker, Kovalenkov, applied for a related patent in 1924. The awarded patent is reproduced in Soldatova (2004).

[12] These were, according to Glinsky (2005, p.90), 'refinements of his basic system components'.

still impressive by the standards of the time, even though he had been out of the race for a few years. In September 1929, Theremin signed a contract with RCA, giving it an option on a television prototype (Glinsky, 2005, p.98). However, Theremin's television system was not RCA's first choice; RCA had decided to go with Zworykin's electronic system.[13] Theremin's system was mechanical, and the offer to Theremin was likely intended as way of keeping options open – or to prevent him from doing anything with it that might compete with RCA. The attempts by RCA to create a dominant position in television, similar to its position when the company got into radio, has received a lot of attention – not least to the ways RCA treated Philo Farnsworth, one of the early pioneers of electronic television, where RCA copied parts of Farnsworth's inventions without paying him for any licences. Farnsworth eventually won in court, but by abusing its dominant position RCA had already in effect crushed his company. RCA also engaged in patent suppression; that is, acquiring rights to inventions they did not intend to use in order to prevent others from developing that technology (cf. Schwartz, 2002; Stern, 1964).

The release of the RCA theremins coincided with the stock market crash in autumn 1929 and was never a success. When Lee De Forest, who in his memoirs dubbed himself 'father of radio' and was one of the inventors that earlier challenged Theremin, sued for patent infringement, it was the death blow to an already failed enterprise. While the RCA Theremin failed commercially, the information on the technology did indeed enter the public sphere and enabled enthusiasts to build their own instruments – it went from '*the* theremin' to 'a theremin' (Glinsky, 2005, p.150).

Perhaps predictably, RCA never took up the option on Theremin's television. With several failed enterprises, Theremin was in debt. The promise of his early days in the US was gone. In the 1930s, he had some limited success with the company Teletouch, developing alarms based on his radio watchman (and later other things as well). The most spectacular commission of Teletouch – an alarm for the Alcatraz prison – also led to its downfall As there were malfunctions in the system, the contract was eventually terminated and Teletouch had to pay compensation (Glinsky, 2005).

During his years in the US, Lev Theremin resembled the Western archetype of the lone (heroic or eccentric) inventor; for a long time he worked out of his hotel room. The lone inventor was a figure that, during the time of Theremin's American sojourn, was seen as threatened by the research and development departments of big corporations (cf. Hintz, 2021). Tellingly, one biography of Farnsworth is called *The Last Lone Inventor* (Schwartz, 2002). While, as Hintz (2021) has shown, they never completely vanished, the obstacles faced by the lone inventor were formidable. In a review of Schwartz's book, Malcolm Gladwell observes that the case of Farnsworth is not only a David vs Goliath story, but actually shows how important big companies, or for that matter institutions more broadly, are: 'they are also the safest environment for failure – and, much of the time, failure is what lies in store for innovators and visionaries' (Gladwell, 2002). For Zworykin, developing television involved a bumpier road than he envisioned, but throughout the process he had his pay cheque and the support of RCA.

Going alone means that the inventor must attract investors and run a business, and probably both Theremin and Farnsworth were a lot better inventors than businessmen. The lone inventor must also shoulder the risk of failure alone. Much of Soviet criticism towards the Western patent system can be illustrated by the fate of Theremin in the US, and the history of television. The intellectual property system does not necessarily serve the inventor: corporations ultimately profit. Patents may be designed to stimulate and reward inventors, but patents can equally be used by large corporations to control both inventions and inventors. In the US, Theremin's ideas were 'lonely' in Graham's sense, albeit in a different way than they were in the Soviet Union. But there were also similarities, and the way Theremin's contract with RCA prevented him from developing his television ironically resembles his dealings with the Soviet state regarding the secret fourth version. In

[13] Vladimir Zworykin was a few years Theremin's senior and like him had trained in St Petersburg, but at another institute. In the early 1900s, he studied under Boris Rosing who did pioneering television work, calling it 'electrical telescopy'. Zworykin emigrated to the United States during the First World War.

the case of Theremin, it is clear that developing and commercializing his inventions required a lot of money that he did not have. During his years in the US, Theremin had accumulated large debts. Glinsky suggests it was the need to escape these, paired perhaps with homesickness, that made him return to the Soviet Union in 1938.

Forcing: inventing as a prisoner

Theremin's homecoming to Leningrad, after having lived and worked for more than a decade in the United States, was less than triumphant. The city was severely affected by the terror that had just reached its 1937–8 peak. The mood was suspicious. His former colleagues at Ioffe's Institute received him coolly and were reluctant to take him back. His former boss, Abram Ioffe, suggested he first settle his affair at 'the big house', the NKVD (secret police) headquarters. With no work, his savings were quickly running out and Theremin was desperate. He went to Moscow and tried to seek the support of party leader Kliment Voroshilov, who had been impressed by his fourth version of the TV. But the meeting was unsuccessful and shortly after, in March 1939, Theremin was arrested (Glinsky, 2005, p.211).

As Glinsky notes, it is not surprising that Theremin was arrested. There were so many circumstances in his life that could have marked him as an 'enemy of the people' on Stalin's gauge. This was a time when any ties with foreigners were suspect, and he had just returned from eleven years in the US. In August 1939, he was sentenced, under the notorious article 58 of the criminal code, to eight years in a corrective labour camp for participation in a counter-revolutionary organization. By the draconian purge standards, eight years meant he got off relatively lightly.

Following the sentence, Theremin was sent to Kolyma, in eastern Siberia. This was one of the most notorious camps, sometimes, together with its 'gateway' Magadan, used as a shorthand for the entire Gulag system. In Kolyma, Theremin was assigned hard manual labour. He used his inventiveness to create a kind of monorail system for wheelbarrows that significantly improved his unit's productivity. Whether it was for this display of ingenuity or for some other reason is hard to tell, but in December 1939 he was transferred from Kolyma to a *sharashka* in Moscow (Kaplunov and Cherenkov 1988a).[14] A *sharashka* was a special kind of prison workshop, where highly qualified inmates worked under guard on specific projects. Following the Great Terror of 1937–8, many celebrated (already or to-be) specialists were arrested and sentenced to long prison terms, usually on fully fabricated grounds. As a prisoner, Theremin worked with Sergei Korolev, who went on to be a key figure in the Soviet space programme. The Great Terror had smashed so many aspects of Soviet society to pieces; scientific and technical work was fundamentally disrupted. To put the imprisoned intelligentsia, suspicious elements, to a highly supervised use in a prison setting could be seen as an effective solution (Siddiqi, 2015).

The workshop where Theremin arrived was one of the most famous. TsKB-29, colloquially known as *Tupolevskaya sharashka*, was assembled around aircraft constructor Andrei Tupolev (1888–1972). Tupolev was arrested in 1937 and charged, falsely, with selling plans to the Germans.[15] However, as war drew closer, his services were badly needed and Tupolev was ordered to identify imprisoned aircraft specialists for the *sharashka* that was created in 1939. Hundreds of imprisoned Soviet aircraft designers worked on the projects of TsKB-29. In the *sharashka*, both prisoners and free workers were employed together on the projects, often with a peculiar status reversal. Generally, the prisoners were the experts and the senior members of the team, while the free workers had more junior positions (Siddiqi, 2015). The *sharashka* workshops were often project-driven, focused on

[14] Kovalyova (2008, p.174) suggests he was first sent to a *sharashka* in Omsk, and thereafter to Moscow.

[15] While Tupolev was a celebrated person in post-war Soviet Union, the years he spent in prison were absent from his official biography. But in the 1970s, a memoir with the title *Tupolevskaya Sharaga* began circulating as *samizdat* (i.e., unofficially). The author's identity was later revealed to be Leonid Kerber, himself a respected Soviet aircraft designer who also served in the TsKB-29.

completing specific projects and doing so fast. Once the project was finished, inmates might be transferred or even freed. While the credit for work done by inmates was often taken by others, it was also possible for the imprisoned specialists to be acknowledged as inventors and receive patents or certificates (Siddiqi, 2015). Compared with ordinary camps, life in the *sharashka* was a privileged existence with better food and the absence of hard physical labour. Aleksandr Solzhenitsyn, Nobel prize laureate and chronicler of the Soviet prison system, even called them 'paradise islands' within the Gulag archipelago. Conditions in the *sharashka* may have been 'paradise like' compared with hard labour camps, but this was still prison. Inmates remained under guard at all times, windows were barred, conversations monitored and prisoners lived in a state of isolation, not knowing what went on in the outside world, and with their relatives frequently not knowing anything of their fate (Siddiqi, 2015, p.576).

Details of Theremin's life in the *sharashka* are scant and sometimes contradictory; one account even says he died in Omsk in 1942 (Sharagin, 1971).[16] Most of the conflicting versions seem to have originated with Theremin himself, who was inconsistent in telling his own story. Galeyev, who knew Theremin for 30 years, says he was told of the inventor's life between 1938 and 1962 'in snatches', and that he sometimes did not know what to make of it. Theremin often focused on the good or funny episodes, saying that it was 'interesting' in the camp, and recalling the good library in the Butyrka prison, that they went mushroom picking in early autumn when he was first sent to Kolyma, or when he was assigned the task of assembling an orchestra of inmates in the Kolyma camp, and staged a performance of Ravel's Bolero, filling the entire orchestra with members of the Leningrad and Moscow Philharmonics (Galeyev, 1991, 1995).

In TsKB-29, Theremin was assigned to work on project 102, a long-range high-altitude bomber, under aircraft designer Vladimir Mikhailovich Myasishchev (1902–78). Theremin was to work on its instrumentation (Glinsky, 2005, p.233). After the German attack on the Soviet Union in June 1941, TsKB-29 (along with many industries) was relocated east. It was rebuilt in Omsk, and here Theremin for a brief period also set up a rocket lab with Korolev. However, project 102 fell apart shortly after the Omsk relocation; Myasishschev was needed on another project and sent to Kazan. From here on, the details about Theremin's whereabouts become quite murky. According to some accounts, Theremin was reassigned to a radio *sharashka* in Sverdlovsk (Yekaterinburg).[17] After Sverdlovsk, he was reassigned to another *sharashka* in Kuchino, near Moscow. Or was he? There are documents suggesting he served a stint in Saratov.[18] And according to Galeyev, he was transferred to a *sharashka* near Leningrad, working on projects that seemed remarkably similar to what Solzhenitsyn describes in his famous novel, *In the First Circle* (Galeyev, 1995, p.59).[19] Eventually, all agree that Theremin at some point ended up in the Kuchino *sharashka*. This was an MGB (the name of the Soviet secret police in 1946–53) facility for radio electronics and measuring devices.[20]

During Theremin's years in the *sharashka* system, he was involved in many projects. In an interview he describes how he created a 'radio beacon' to find missing aircraft and submarines (Kaplunov and Cherenkov, 1988b). However, he is best known for the creation of two legendary

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[16] However, in the expanded English translation, this paragraph is rewritten (Kerber, 1996).

[17] Theremin is mentioned in the reminiscences of Rem Merkulov from the *sharashka* in Sverdlovsk (https://statehistory.ru/1038/Lev-Termen/). Kovalyova also draws on Merkulov in her depiction of Theremin's time in Sverdlovsk.

[18] RGANTD in Samara (http://rga-samara.ru/searchrti/id/884/).

[19] Theremin, however, denied that he ever crossed paths with Solzhenitsyn, and the years do not match as Solzhenitsyn arrived in the *sharashka* in Marfino after Theremin's release. If he was indeed near Leningrad, that might lend credibility to the claims in *Counterpunch* that Theremin's old mentor, Ioffe, was involved in the creation of 'the thing' (see Atamnenko, 2010).

[20] According to the Russian human rights organization, Memorial, dedicated to research on and commemoration of the Soviet terror, Kuchino was not established as a *sharashka* until 1946 (see https://topos.memo.ru/article/384+69).

eavesdropping devices. In 1945 or earlier, Theremin was assigned the task of creating a device that could be used to spy on the American ambassador's residence in Moscow. Soviet technicians had limited access to the ambassador's residence, which made installing surveillance devices difficult. Also, the house and garden were surrounded by brick walls and high fences. Theremin's solution was a device that on the face of it looked rather plain, but has become famous as the Great Seal Bug, 'the thing', endovibrator or *zlatoust* (golden mouth). Its simplicity was key to success: 'it was ingeniously simple, little more than an antenna attached to a cavity with a silver diaphragm over it, serving as a microphone' (Harford, 2019). It had no batteries or current but was powered by an incoming radio signal. The device consisted of a small, silver-plated copper cylinder. Attached to the cylinder was a 20 cm rod or antenna. It weighed no more than 31 grams and is often considered a predecessor of RFID technology. As it was remotely powered, its lifespan was indefinite. To this day, there is some doubt exactly how 'the thing' worked (Brooker and Gomez, 2013).

The bug entered the ambassador's residence as a Trojan horse – hidden in a large wooden wall plaque, a carved relief of the Great Seal of the United States. It was presented to the ambassador, Averell Harriman, at his annual Independence Day reception on 4 July 1945 by a group of pioneers (the Soviet scout-like children's organization). The Americans were of course suspicious of Soviet intelligence, and all objects entering the residence, the Great Seal included, underwent routine X-ray screening. But the hidden 'thing' was not detected. The device was activated when a beam was directed at its antenna from a neighbouring building or a van parked near the residence. Once activated, a metal plate inside the cylinder began to resonate, working as a miniature tuned circuit. The diaphragm moved in response to sound waves generated by human speech in the ambassador's office. The device then acted as a microphone (Glinsky, 2005, p.260).

Theremin had worked with tuned circuits when he created the termenvox many years earlier. He was, as Glinsky notes, 'the ideal specialist for the job' (Glinsky, 2005, p.260). The 'golden mouth' sat undetected in the Great Seal for seven years, listening to several ambassadors, until a British intelligence officer accidentally picked up a transmission. After further searchers, the device was detected in the Great Seal, though its existence was not disclosed until 1960 (Fischer, 1970).

Later in life, Theremin was sometimes nostalgic about working conditions in the *sharashka*. In an interview,[21] he says that he was 'officially' a prisoner, but gives the impression of himself being a respected worker charged with great responsibility. The *sharashka* in some of his reminiscences is portrayed as the ideal working environment, where all basic needs were taken care of and he could devote himself wholeheartedly to the work at hand, around the clock if need be.[22] Again, at this stage of his life, the Soviet regime's desire for secrecy and control manifested itself. But this time, control of the invention or the knowledge behind the invention was not enough, control of the mind and body of the inventor was required. While Theremin's inventiveness served him during his years as a prisoner, the 'reward' from the state was in this case to escape a more horrible fate.

Awarding: Stalin Prize and release

Apparently happy with 'the thing', Beria called on Theremin's services again and he was enlisted for further eavesdropping operations. In 1947 or earlier, when Theremin probably served in the Kuchino *sharashka* outside Moscow, he was called upon to create another device for wireless surveillance, but this time it should operate fully remotely without any device planted at the target site. The project received the code name *buran* (snowstorm). To solve this difficult task, Theremin paid attention to the resonators already present in a building, such as windows. A conversation in a room

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[21] Lev Sergeievich Termen, 'Ob otkrytii zvezdi, izobretnii Termenvoksa, vstreche s Leninym, komandirovke v SShA i areste ', interview with Uliana Evgenievna Napastnikova, available at: https://oralhistory.ru/talks/orh-920 (accessed July 2022).

[22] Statehistory Ru, 'Lev Termen - Izobretatel elektronnoy muzyki, sovetskiy razvedchik, politzakliuchennyy i laureat Stalinskoj Premii ', available at https://statehistory.ru/1038/Lev-Termen/ (accessed June 2022).

may cause window panes to vibrate slightly, and Theremin devised a method to detect these vibrations from a distance, using an infrared beam directed at the window pane, and then to interpret them and convert them to discernible speech (Glinsky, 2005, p.261).

The buran was able to detect speech from as far away as 500 metres, making detection very difficult. Interception would have to disrupt the infrared beam and jamming would require optical overpowering. Both were unlikely. However, it could be used only when weather permitted and was not effective in rain, fog or smog (Glinsky, 2005, p.261). Buran is often considered a predecessor of the laser microphone, although it employed an infrared beam rather than laser. Not as notorious as 'the thing', *buran* served the MGB well. With its aid, discussions at the American embassy's business office, and the British and French embassies were monitored (Glinsky, 2005, p.262). Reportedly, Beria used the system (or yet another system devised by Theremin) to spy on the inner circle of party leadership, including Stalin himself. Theremin claimed to have kept tapes with recorded Stalin conversations until they crumbled to dust with age.

Theremin was released on 27 June 1947, as his eight-year sentence was served. Given the standards of the time, it could have been much worse. In 1947, he was also awarded the Stalin Prize. This was established in 1939 and was to be awarded in 16 different categories, ten of which were scientific (from history to agriculture to mathematics)[23] and the remainder for the fine arts. It was the highest honour the state could bestow on a scientist or artist. The prize focused on singular achievements, one outstanding piece of work, and from 1941 these should have been made in the preceding twelve months. The Stalin Prize was disbanded as Stalin fell out of favour after his death. It was later replaced with similar prizes. Oliver Johnson suggests that it was not only the name of Stalin and the association with the Stalinist personality cult that was compromising as the Soviet Union changed its political course, but also how the prize and its committees were entangled in the networks and power structures associated with Stalinism (Johnson, 2011). The prize was awarded at a grand ceremony, and the announcement of the laureates was made with great fanfare in the Soviet media. The prize came with a sum of 100,000 roubles (for a First Class award; there were also Second Class prizes), a significant amount at the time, but since there were many things money could not buy in the Soviet Union, the symbolic capital of a prize was probably more important. This 'in many cases granted the new laureate a rapid improvement in living and working conditions' (Johnson, 2011, p.822).

Beria nominated Theremin for a 1947 Second Class prize when he was still in the *sharashka*, but Stalin himself changed it to a First Class award as he reviewed the nomination list.[24] However, it was to be awarded as a secret Stalin Prize, because of the sensitive nature of the achievement. In addition to the 100,000 roubles, the award came with a 'two-room furnished apartment in a Moscow MGB housing complex on Leninsky Prospect' (Glinsky, 2005, p.264). Galeyev also suggests the award came with freedom, the promise of which was a common way to incentivize prisoners to work and invent in the Gulag (cf. Siddiqi, 2015; Kerber, 1996). Whether it was the award that led to freedom, or if it would have come anyway as he had served his eight years, is hard to tell. Galeyev also mentions the award came with a legal place to live and *propiska* anywhere. The *propiska* system (with modifications still in force in Russia today) is a type of registration that determines legal place of residence. Many released prisoners were not allowed to return to their homes but had to stay in the regions where they served in 'internal exile'. However, Kovalyova (2008, p.226) suggests Theremin could not return to Leningrad, but had to stay in Moscow. That he was awarded a flat in MGB housing complex suggests he was already embarking on an intelligence career. There was probably not much choice involved in the allocation of a place to live, but the two-room flat on

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[23] 'Postanovlenie Soveta narodnykh komissarov Soiuza SSR: Ob uchrezhdenii pre- mii i stipendii imeni Stalina', *Pravda*, 21 December 1939, in Svinin and Oseev (2007).

[24] Kaplunov and Cherenkov (1988a) reference the prominent physicist and 1962 Nobel Prize laureate Lev Landau, as does Galeyev (1995).

Leninsky Prospect would have been considered both 'good' and 'big' by Moscow standards of the time. According to Kovalyova, it even came with a maid!

A secret award seems to be something of a contradiction in terms. While the material benefits of course were substantial (not least, if freedom is to be counted among them), the honour side of the honour (so to speak) disappears. It is still hard to find any official recognition of the reward, and Galeyev recounts how Theremin could not 'use' the reward later, not even by being introduced as a Stalin Prize winner. The honour and recognition could not be translated into future benefit by the inventor. Theremin's case was hardly unique and the Stalin Prize was not the only prize that could be awarded in secret. On the contrary, this was a relatively standard Soviet solution to the problem of rewarding scientists and inventors working in sensitive areas (Medvedev, 1978).

That Theremin received the award as a prisoner (or at least was nominated as a prisoner) was unlikely to have been the reason for secrecy; the nature of his inventions was much more likely. He was probably awarded for the *buran* system (this is also somewhat unclear), which was still in full secret use. There are other examples of prisoners being recipients. Andrei Tupolev, for instance, was awarded the Stalin Prize in 1943 for his work on the Tu-2 dive bomber, developed in the *sharashka* as project 103 (Glinsky, 2005, p.263). Tupolev was awarded further Stalin Prizes in 1948, 1949 and 1952, all of these before he was officially rehabilitated in 1955. While rewarded, Theremin was still not in control of his own life. He had to accept whatever he was given. He was not a citizen with rights. His body was not to be separated from his knowledge. The MGB had use for his skill and controlled his mind, body and movements.

Classifying: work in the 'mail-box'

After his release, Theremin went back to work for the MGB (later KGB) for another decade and a half. Probably he remained in Kuchino, continuing the work he did as a prisoner. It was not uncommon for released prisoners to keep working in the *sharashka* as free workers (cf. Kerber, 1996). Theremin returned voluntarily, but it is unlikely that he had very many options. The prison term was a stigma, and his academic qualifications were no longer recognized. The work he did was top secret, and secret research and development facilities and/or settlements were known as 'mail-boxes' as they were referenced only by impenetrable postal codes. The prison system and much that characterized the *sharashka* also applied to the mail-box, although it was staffed with free workers (Siddiqi, 2015). The mail-boxes were often in remote locations, though Kuchino was near Moscow. Kuchino 'became the KGB's main research centre for surveillance technologies', and after the fall of the Soviet Union remained with the FSB (Soldatov and Borogan, 2015).

Theremin had no right to correspond or to be in any contact with his relatives. However, by the time he was released from prison, he had very few contacts. He got married to one of his co-workers, the only option permitted by his superiors, and they had two twin daughters. The family would later rent a *dacha* (summer house/allotment plot) in the Kuchino area and spend the summers there (Kovalyova, 2008, p.200). Glinsky calls Theremin 'the invisible man' in his chapter on this stage in his life, and very little is known about this period. The mail-box appears as an impenetrable black box and, to the end, Theremin remained very elusive whenever the topic was raised (Galeyev, 1995). There are few other traces from this period in this life. Theremin's abilities were appropriated by state, the body of the invisible man now free but the inventor and his intellectual property somehow still imprisoned. There are no documents nor any recognition of the work he did during this period. Secrecy had shaped many of his dealings with the state before, but it was never as dominant as now.

Acknowledging: mature socialism and return to electronic music

In 1964 Theremin 'resurfaced'. While retired from the KGB, he was like 'a walking file cabinet of state secrets', as Glinsky terms it, and this cast a shadow over his life for many years. At 68, he

re-entered the workforce. He first got a job at the USSR Sound Recording Institute, a studio laboratory working with sound effects for radio. Here, he had the opportunity to familiarize himself with the development of Russian electronic music. He had nearly four decades to make up, having had nothing to do with the field since he left for America in 1927. However, the Communist Party of the USSR had a very conservative taste in culture and electronic music was considered suspect. It was neither flourishing in the 1960s nor had it taken any great leaps since the 1920s. The institute studio was closed in 1965 and Theremin found a job at the acoustics laboratory of the Moscow Conservatory, where he had some contacts. As a technician, he created various devices, three of which were later awarded inventor's certificates. He also used the opportunities provided by the laboratory to develop his own interest in electronic music and contributed to the lab's seminar series (Kovalyova, 2008). He started to reconnect with what there was of an electronic music community in the Soviet Union, wrote a few papers and attended a few conferences.

Bulat Galeyev, who became his friend and later biographer, recounts their first meeting at a conference at the Moscow Conservatory in 1967. Galeyev was 50 years younger than Theremin, but shared his interest in physics and music and had known about the inventor since childhood. But he had also, like so many others, assumed Theremin had died in the Stalinist repressions. Approaching Theremin after his presentation, Galeyev could only ask in disbelief: 'Lev Sergeevich, are you really still alive?' The reply: 'You are not the first one with this question. I just gave an interview to an American journalist' (Galeyev, 1995, p.7). The American journalist was Harold Schonberg of the *New York Times,* who got wind of Theremin's continued existence through an image in Gleb Anfilov's *Physics and Music* (1966) and paid a visit to the Moscow Conservatory to interview the inventor. Theremin took Schonberg on a tour of the Conservatory and displayed his inventions. The resulting article (Schonberg, 1967) reconnected him with many of his lost American friends. But the attention also had side effects. Electronic music was neither officially sanctioned nor held in high esteem at the conservative Conservatory, and Theremin's ambiguous status as former prisoner, spy and carrier of state secrets did not help. As the laboratory was being renovated, much of his equipment was destroyed and he himself dismissed from the position. In an interview in the 1980s, he mentions this as the one time when his past haunted him (Kaplunov and Cherenkov, 1988b).[25]

Theremin moved his remaining equipment home and set up a lab in a closet in his two-room flat. In 1972 he was given a position as a grade six mechanic in radio electronics at the acoustics lab at Moscow State University's physics department. It appears the department was well aware of who they had hired and tried, unsuccessfully, to give him an academic position. Theremin did some lecturing and also supervised students.[26] On the side, he continued musical research at home and at the Scriabin Museum. He wrote a few papers, and began to teach students privately on the termenvox, at his or their homes. The times were promising, interest in the instrument seemed to be on the rise, and Theremin turned his attention to 'the old complaint that the theremin couldn't utter more than one note at a time' (Glinsky, 2005, p.312). His efforts resulted in inventor's certificate 601742, for an 'electromusical instrument' or, as it is termed later in the description, a 'polyphonic termenvox'. Late in life, Lev Sergeyevich again had his work acknowledged by the Soviet state. The instrument was actually first created for a demonstration at the university, where some students and employees had taken an interest in the termenvox. However, music was not part of the department's research and the rooms were to be used for other things. The 'polyphonic termenvox' was dismantled (Mattis, 2002) but, transformed to inventor's certificate 601742, it was now registered as a useful invention and certified by a document bearing the state emblem of the Soviet Union.

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[25] However, according to Kovalyova (2008), there is another version of the story in which Theremin, who as a pensioner had a temporary contract, left the Conservatory voluntarily when his contract expired.

[26] One suggestion was to have Theremin defending a new dissertation to have the formal qualification. His 1926 disseration was nullified when he was sentenced to prison. He tried, unsuccessfully, to have it recognized after he was rehabilitated. Late in life, he did not, Kovalyova suggests, have the ability to carry out dissertation work: his true talent was not academic, but practical (Kovalyova, 2008).

Lev Theremin – and others – continued developing the theremin, and there are two more inventor's certificates from the 1980s that mention his name, one with L. D. Korolyov (issued 1983) and one issued in 1987 (with V. I. Maksimov) for a 'kids' version' of the theremin called Tonica. As Soviet society opened up in the late 1980s Theremin once again appeared on the international stage, giving interviews and travelling to electronic music festivals and conferences abroad. He even visited the US in 1991 and was reconnected to long lost friends, depicted in the documentary *Theremin: An Electronic Odyssey* (Martin, 1993) which premiered the day before the inventor's death in 1993. When Theremin, reportedly peacefully, left this world on 3 November, at age 97, he had survived the Soviet Union by just short of two years.

During the last decades of his life, Theremin was once again the lone inventor. There was no supportive social atmosphere, although friends and contacts tried to help him. While the state acknowledged some of his inventions with inventor's certificates, these documents appear to have been of little use. His prison term continued to haunt him. Decades after his release, he was unable to have his pre-prison achievements recognized and his options continued to be limited.

Conclusion

In piecing together the traces of Lev Theremin from the meta-archive, there appears to be not one Lev Theremin but many. He was constantly reinventing himself, using the metaphor of the palimpsest, he was writing the page over and over and only traces of the former version remained. His life was entangled with how the Soviet state unfolded, and the violent changes and brutality of the Soviet system impacted firsthand on both his life and deeds. He aligned himself with the system and used his skills to strengthen the state's surveillance capacity. Galeyev called him a Soviet Faustus, invoking the image of a man who traded his soul with the devil. However, Theremin himself seems not to have been troubled by this. Instead, he expressed nostalgia for life in the *sharashka.* Neither does he seem to have harboured any resentment or bitterness for the way he was treated by the regime. Theremin came to be described as a dedicated communist, finally allowed to join the Communist Party in 1991, when neither his bourgeois family background nor his prison past remained an obstacle. He could hardly be accused of opportunism at that point.

The example of Theremin illustrates the patchwork of the Soviet intellectual property regime, an assembly of many parts in which the West's central concept of 'rights' is not at all prominent. Intellectual property regulations and documents were only a small part of the tool-box used to control inventions and inventors in the Soviet Union. Theremin's inventive activity was shaped by physical constraints and security measures, both as a free man and as a prisoner. Deliberations on what type of knowledge could circulate and how shaped many of the state's dealings with his inventions, in many cases keeping him officially unrecognized but unofficially rewarded. The early years of Theremin's career also illustrate how Soviet desires for international recognition and intelligence opportunities influenced possibilities to patent inventions.

Despite being awarded patents, certificates and prestigious awards, Theremin appears to have been unable to really capitalize on these. Patents, of course, are not a guarantee of commercial success, as his years in the US illustrate. Perhaps he was not a very skilled businessman, but for a lone inventor in the US, it was not the state but big corporations that posed the greater obstacle. Secrecy also made it hard for him to tap into the 'economy of esteem'; his Stalin Prize was awarded in secret, making the prestige it offered invisible although the material non-monetary benefits that came with the award, not least the flat, were probably important to him. Glinsky called him 'the invisible man', but he was not the only invisible man in the Soviet Union. For example, his old *sharashka* workmate, Sergei Korolev, was posthumously celebrated as the rocketry pioneer he was, but during his lifetime his name and identity were kept secret and he was officially referred to only as the 'chief designer'.

It is notable that the inventions Theremin made that most attracted the interest of the state were also the ones where development stopped. His pioneering TV was 'snatched' and classified

and not developed further, his *sharashka* inventions were pioneering, but even as they are considered predecessors of technology that is widely used today, development of these technologies did not rely on Theremin's foundations and took place elsewhere. In a career where so much of his work was aligned with intelligence, some of his inventiveness was directed to areas that would have been classified anywhere, but the case of Theremin also shows how far-reaching this category was in the Soviet Union. The inventor's certificate was designed to aid the circulation of knowledge, but large chunks of the Soviet economy were beyond its reaches. The case of Lev Theremin shows the prevalence of secrecy in how the Soviet Union dealt with inventions and how this often stopped technological development and knowledge flows.

Aligning himself and his inventive ability, voluntarily and by force, with the state, Theremin can be defined, and perhaps came to define himself, his inventions and his image, through what can be termed the 'Soviet intellectual property regime'. Theremin's behaviour seems to have increasingly followed the patterns of that regime. For instance, the way he contributed to the general murkiness and confusion about the details of his life is very like the lack of transparency in the way his inventions were treated by the Soviet government. The Soviet approach to patents and intellectual property shaped not just the inventions, but also the inventor, Theremin. From the point of view of the state, the body of the inventor, the actual Lev Theremin, was the intellectual property and his inventiveness and skills could not be divorced from the actual person. Controlling inventions meant controlling inventors – not as citizens with rights, but as subjects handed rewards or punishments by a superior power. The theremin instrument, however, lives on. With the knowledge of its construction travelling freely, it became divorced from its creator and his fate but continues to carry his name.

Postscript

There is one peculiar artefact that appeared in my searches for traces of Lev Termen. It is a 1993 letter to the Moscow Conservatory in which he complains about the establishment of a centre for electronic music bearing his name – without anyone from the Conservatory being in contact with him about the matter. In the letter, he expresses his right to his name and his legacy, and what should be associated with them. The letter goes on to attack some of the people who have been most active in preserving his legacy, for spreading lies and exaggerating their connection to him. Alongside family photos and photos of the destruction of Theremin laboratory in 1992, a photo of the letter is published on the Theremin family Facebook page, transliterated on the Theremin family webpage. What to make of this letter? Just another strange internet artefact of dubious origin, the ramblings of an old man who is perhaps losing touch with reality or justified grievances? But whichever of these, it once again highlights the issue of 'authorship' – beyond certificates, patents or rewards. It concerns the right to a legacy. Theremin: inventor, genius and pioneer. This is beyond what any intellectual property regime could resolve.

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