

The first PRIM wristwatch – a triumph of advanced Czechoslovak engineering or a reverse engineering succes? Probably both

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Abstract. *The text deals with the birth of the Czechoslovak PRIM/Spartak wristwatch, which originated in the early 1950s as a result of the intensive several-year efforts of the national company Chronotechna 02 in Nové Město nad Metují, which was established for this purpose. Czechoslovakia became only the eighth country in the world to be able to produce high-quality Swiss-type wristwatches after World War II. Czechoslovak industry undoubtedly achieved this prestigious goal thanks to good readiness of production technology infrastructure, ability to follow the relics of military precision engineering and fine mechanical production of the Third Reich in the Protectorate of Bohemia and Moravia and former Sudetenland, with later indirect contribution from both Eastern and Western technicians and their design models for their own design of a watch movement (caliber). How important role this lastmentioned fact has played in the development and building of the modern Czechoslovak watchmaking industry is the key topic of this article. In a broader context, its content concerns more general issues of transfer of production and technical knowledge, protection and violation of industrial property rights in the economic, political and economic conditions of socialist Czechoslovakia in the 1950s.*

Keywords

History of technology, history of fine mechanics, history of watch production, technology transfer; CMEA; metal industry, electrical engineering and armament industry; know-how, history of innovations, centrally controlled economy, 1945-1960

1. Introduction

Czechoslovakia achieved a major technological breakthrough in the second half of the 1950s, becoming the eighth country in the world to produce high-quality mechanical wristwatches and deliver a fully competitive, modern, high-quality domestic watch to the domestic market. At that time modern, technically advanced watches named Spartak, equipped with the commonly named Swiss lever escapement, were manufactured by the 02 Chronotechna¹ plant in Nové Město nad Metují. This manufacturing plant mastered the technology of industrial wristwatch production almost entirely under its own direction and watch production under the PRIM² brand and continued successfully in the next three decades as the only Czechoslovak producer of wristwatches. The start-up of industrial production of wristwatches with a modern movement (caliber) consisting of components made in Czechoslovakia, including the commonly named Swiss lever escapement, without adequate specialized technological background and previous industry experience and significant direct foreign technological assistance is an extremely technically, technologically and logistically demanding task. Thus, the phenomenon of the birth of the first Czechoslovak wristwatches is rightly perceived both in professional circles and by the general public as a triumph of Czechoslovak precision engineering and a proof of the extraordinary general technological sophistication of this industry.³

Much less and more reserved attention has been paid to the fact that the design of the first Czechoslovak watch movement of Spartak wrist watches (caliber 50)⁴ fully and in the smallest detail matches the French movement (caliber LIP R 25-3⁵ and that the Czechoslovak watch industry has

¹ MARTÍNEK, Z. Dějiny československého hodinářského průmyslu I. a II. Brno, Nové Město nad Metují: ELTON hodinářská, Technické muzeum, 2009, p.108.

² HOVORKA, L. Primky. 2nd edition. Brno: Host, 2018, p.32.

³ MARTÍNEK, Z. Dějiny československého hodinářského průmyslu..., op. cit., p.131.

⁴ HOVORKA, L. Primky..., op. cit., p.32.

⁵ COUSTANS, M., GALLAZO, D. Lip, des heures à conter (Beaux livres Patrimoine), (French Edition). Grenoble: GLENAT, 2017, p.74.

demonstrably not reached this "compliance" by direct means. Of course, the sources of the communist era do not provide any information on this takeover of the design of the movement of the first Czechoslovak watches from the West. What is striking, however, is that even in the current professional literature dealing with the history of the first Czechoslovak watch caliber, one can find somewhat euphemistic proclamations⁶, which at least downplay this reverse engineering chapter⁷ of the Czechoslovak watch industry or present it as a "mere" inspiration or simple "use" of a foreign model.



Fig. 1. The First Czechoslovak wristwatches Spartak. In MARTINEK, Z. Dějiny československého hodinářského průmyslu..., op. cit., p.113.

2. Watchmaking technology as an example of technology transfer

2.1 The issue of violation industrial rights in the context of cold war period

So what significance do these somewhat restrained reflections on the reverse engineering chapter of the birth of the first PRIM watches have for the present? In the context of the contemporary economic and political situation in Czechoslovakia, how can the perspective of insight into the issue of violation of industrial property rights⁸ be interpreted or changed? An equally important question is, what was the technological value of this reverse engineering "shortcut" in the whole sequence of interrelated steps preceding the serial production of modern mechanical wristwatches? Taking over the design alone in terms of fulfilling the whole is far from the final step. When characterizing the story of PRIM/

Spartak watches, we analyze the construction of the entire fine-mechanical industry, which practically did not exist in Czechoslovakia before World War II. For this analysis, it is not enough to focus on the possibility of using - copying only a foreign template. How to view and evaluate these processes in the context of the contemporary situation in Czechoslovakia is the main research question of this text.

2.2 Industrial and economic espionage in the field of watchmaking

Classical mechanical watchmaking has always been a prestigious field, going to the very limit of contemporary technical and technological possibilities. It can be described, with some exaggeration, as the Hi-tech era of mechanics. In the fields of strategic importance, such as the production of marine chronometers key to accurate navigation, the precise timekeeping technology become the subject of industrial espionage, often not for the benefit of individuals but of entire states.

This competitive trend continues into the 19th century, when clocks and watches became industrial goods, but still retained the hallmark of exclusivity and prestige, and remained the industrial domain of only a few countries. Many countries, especially those with superpower ambitions, have aspired to gain the technology of producing precision timepieces (wristwatches, pocket watches and precision on-board chronometers) either by legal means or through industrial espionage.⁹

An illustrative example is Japan, which gradually adopted the technology of precision watchmaking over the course of three decades from the late 19th century to the 1920s with the help of Japanese-American joint ventures and later with the strong support of industrial espionage. Accurate timepieces have been and are key to military combat control systems as well as the equipment element of the modern soldier. In the civil sphere, they represented a certain feature of the modern lifestyle.¹⁰ However, technology transfer in the field is extremely difficult and expensive, so most countries, including pre-war Czechoslovakia, therefore rely on imports mainly for economic reasons. However, this does not mean that many do not seek to master this technology for strategic reasons.

The Soviet Union acquired the first industrial wristwatch technology from the United States in the mid-1930s through the acquisition of the Deuber-Hampden

⁶ There are claims about taking over a foreign model or that a simple model was used. (Hovorka, Martinek) However, a simple visual comparison reveals an almost complete correspondence of the Czechoslovak caliber with the model in the LIP caliber.

⁷ GLITZ, A, MEYERSSON, E. Industrial Espionage and Productivity. American Economic Review, 2022, 110, No 4, p. 1055-1103.

⁸ UHRICH, L. Economic Espionage Act--Reverse Engineering and the Intellectual Property Public Policy, The, 7 Mich. Telecomm. & Tech. L. Rev. 147, 2001,p.169.

⁹ LAFUENTE, A., SELLÉS, M. A. The problem of longitude at sea in the 18th century in Spain. Vistas in Astronomy, 1985, 28, p.3.

¹⁰ HOVORKA, L. Primky ..., op.cit.,p.670.

¹¹factory. At that time, the Soviet Union legally transferred the industrial technology, albeit outdated, needed to produce the first wristwatches and pocket watches. At the same time, despite many sanctions and embargoes that the Soviet Union was subjected to in the 1930s, it is clear that it was US economic aid which was behind its relatively massive industrialization in the 1920s and 1930s - watchmaking is no exception. It shows that although the Soviet state power loathed capitalism, its technology was not the case. Later, in 1936, the Soviets bought the technology and manufacturing documentation from the French company LIP in Besançon¹², which after the war became the basis of the legendary Russian watch Pobeda¹³, the first relatively modern post-war wristwatch on the local market. The basis of Pobeda consisted of the LIP R 26¹⁴ movement, which, however, was already obsolete at the time of the purchase, and probably that is why the Czechoslovaks were considering the possible design use of Pobeda for their watch project. In the end, in Czechoslovakia, a model from a newer line of French watchmaking machines was used. The Soviets later bought other technologies in the 1960s and 1970s, mainly from Switzerland.¹⁵

However, this did not mean that they did not infringe industrial rights in the watch industry. For example, the caliber Vostok 2809 VP (Very Precise), which was equipped with chronometrically Soviet precise wristwatches VOLNA, was an almost identical copy of the first-class Swiss chronometer caliber Zenith 135¹⁶, whose project documentation apparently fell into the hands of the Soviets thanks to industrial espionage. The onboard chronograph, which the post-war Soviet jet fighters were equipped with, came from the model of the Swiss on-board clock brand Jaeger-LeCoultre¹⁷ purchased by the USSR for mounting cockpits of war piston engined fighters Polikarpov. However, the development of 20th century watchmaking also registers violations of industrial rights in a "higher strategic interest" by American companies. The marine chronometer Hamilton 21¹⁸ of US Navy, mass-produced by the American watch company of the same name, was significantly inspired in construction by the Swiss marine chronometer produced by Ulysse Nardin¹⁹, thanks to the reverse engineering analysis provided by the Hamilton designers.

2.3 The Czechoslovak story – the way to the first wristwatch

The post-war Europe divided by the Iron Curtain created completely new conditions in the economic space of the countries of the emerging Eastern bloc. The countries in the Soviet sphere of influence suddenly found themselves, either cut off from the sources of quality watchmaking goods or consuming valuable currencies by purchasing them. The military importance of the production of timepieces and other fine-mechanical devices was also important, reinforced by the onset of the Cold War.

Developed precision engineering used mainly in the arms industry even in the pre-war period as well as a later relocation of some fine-mechanical equipment production in the Sudetenland, however, created a good industrial and knowledge base for the possible start of watchmaking.

The production of wristwatches was undoubtedly a production associated with military production in the socialist bloc countries. Saturating the Czechoslovak demand for personal mechanical timepieces was a secondary motivation for grasping the technology of precise watchmaking. The effort to implement watchmaking in the Nové Město nad Metují plant was, of course, accompanied by many initial setbacks. However, the conceptual technological thinking and the good organizational skills of the plant's senior technical staff had a positive impact on the long-term vision of introducing the production of wristwatches in Czechoslovakia.²⁰ It was wisely decided that the industrial production of fine-mechanical timepieces would be approached in gradual steps. This was matched by a long-term plan to acquire key production technology skills, starting first with the production of partial components, and later with pocket watches as a prelude to the serial production of wristwatches. This project of gradual acquisition of watchmaking know-how was unexpectedly "happily" accelerated by the indirect engagement of the Soviets in the early 1950s. In order to supply accurate flight deck clocks to the Soviet MIG-15 jet fighters manufactured here under license, they provided Czechoslovakia with technical documentation for the production of military flight deck clocks structurally and technologically close to high-quality pocket watches. Czechoslovakia thus took full advantage of the opportunity to gain invaluable industry experience in the large-scale production of precision timepieces. Therefore, the management of the company,

¹¹ GARRAT, A. F. The Birth of Soviet Watchmaking. E-book <https://cs.hampdenwatches.com/the-birth-of-soviet-watchmaking> (on-line 10. 3. 2022), p.27-67.

¹² Ibid.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ KOLLESNIKOV-JESSOP, S., Russian watches from the Soviet era: rugged iterations of Swiss-inspired design. *New York Times* 7. 11. 2007.

¹⁷ Ibid.

¹⁸ MORRIS, W. J. The Mariner's Chronometer: Structure, function, maintenance and history. CreateSpace Independent Publishing Platform, 2012, p.107-117.

¹⁹ Ibid.

²⁰ MARTÍNEK, Z. Dějiny československého hodinářského průmyslu ..., op. cit., p.110.

after mastering the licensed production of cockpit chronographs, decided to proceed directly to the preparation of its own production of mechanical wristwatches.

However, the design of the original watch caliber represents another time-consuming and technologically demanding development stage, with an uncertain forecast of successful completion. The further development of the first Czechoslovak caliber thus took the path of gaining a design model from abroad illegally. The models of the movement were secured in the early 1950s by the regular purchase of complete wristwatches from France. These were then handed over to Chronotechna's designers for detailed analysis. All parameters of the illegally taken over movement (LIP-R25) were recalculated not only due to the absence of technical documentation, but also due to verification of technological correctness of production procedures.²¹ The preparation of complete design and manufacturing documentation, including drawings of tools, jigs, production tolerances, gauges and material standards, is also fully the work of domestic designers and technologists.

From today's perspective, the use of foreign technical solutions can be clearly assessed as unauthorized use of foreign intellectual property. However, the question remains whether, in the specific situation of the Iron Curtain of a divided Europe, there was someone thinking about the structural use of foreign "Western" models in the parameters of the violation of industrial property rights.



Fig. 2. The original calibers LIP R25 and its subversion with central second
In COUSTANS, M., GALLAZO, D. Lip, des heures à conter, ..., op.cit., p.74.



Fig. 3. The Czechoslovak caliber PRIM 50 and template of its central second subversion
In HOVORKA, L. Primky..., op.cit., p 34.

The task of implementing a production program for serial production of mechanical wristwatches has several dimensions, not only the design, which, as we already know, was the result of legally illegitimate, reverse engineering activities of our technicians, but also the production, technological, economic and organizational dimension. The serial production of mechanical wristwatches was extremely demanding and complex, numbering hundreds of production operations, which, of course, was reflected in the industrial engineering and economic dimensions of the whole event. The complex requirements of a demanding technological task realized in industrial parameters could not be met without other necessary conditions, namely to have a modern technical park, integrated professional staff, gradually acquired industry know-how, with a generally good level of industrial and production technology background of post-war Czechoslovakia.

year	annual production pcs.	total production pcs.
1954	12	12
1956	1 500	1 659
1957	3 000	4 659
1958	15 000	19 659
1967	367 134	2 271 342

Tab. 1. Increasing production of PRIM wristwatches
In HOVORKA, L. Primky..., op.cit., p.34.

3. Conclusion

The history of science and technology, of course, knows many examples of successful industrial espionage and reverse engineering, and in certain historical constellations it can be seen as a beneficial force for innovation in less technologically advanced industries and areas, although it seems to be a morally dubious element of scientific progress.

Reverse engineering, industrial rights violations, economic and industrial espionage, especially if they were in the strategic or state interest, have accompanied technology transfer processes almost naturally, and the question is whether there is a universal measure by which these processes can be assessed and evaluated.

In the context of the time and situation of the Czechoslovak state, standing in the bipolar order of post-war Europe on the Soviet-dominated side of the Iron Curtain, the decision of Czechoslovak designers to use a foreign design solution can be fully understood. It should be born in mind that the design was a key, but not the only, part of a very complex process of mastering industrial watch technology,

²¹MARTÍNEK, Z. Dějiny československého hodinářského průmyslu..., op. cit., p.112.

which requires a number of other specific and demanding requirements, together with the necessary general level of industrial and production technology. The acceptance of a foreign model thus accelerated the development and start of the production of wristwatches in Czechoslovakia, which later resulted in the independent development of modern and original Czechoslovak caliber PRIM series 66-68 with direct drive central second hand, followed in the 80s by caliber 90 and 96 with automatic winding.²² These calibers with slight modifications and after the resumption of primary production in 2009 are in the production program of the successor manufactory *Elton hodinářská, a.s.* to this day.

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References

- [1] COUSTANS, M., GALLAZO, D. *Lip, des heures à conter* (Beaux livres Patrimoine), (French Edition). Grenoble: GLENAT, 2017.
- [2] UHRICH, L. Economic Espionage Act--Reverse Engineering and the Intellectual Property Public Policy, *The*, 7 Mich. Telecomm. & Tech. L. Rev. 147, 2001.
- [3] GARRAT, A. F. *The Birth of Soviet Watchmaking*. E-book <https://cs.hampdenwatches.com/the-birth-of-soviet-watchmaking> (on-line 10. 3. 2022).
- [4] GLITZ, A., MEYERSSON, E. Industrial Espionage and Productivity. *American Economic Review*, 2022, 110, No 4, p. 1055-1103.
- [5] GOULD, R. T., BETTS, J. *The Marine Chronometer: Its History and Development*. Antique Collectors Club Dist, 2013.
- [6] HARRIS, J. R. *Industrial Espionage and Technology Transfer: Britain and France in the 18th Century* (1st ed.). Routledge, 2017.
- [7] HOVORKA, L. *Primky*. 2nd edition. Brno: Host, 2018.
- [8] KOLLESNIKOV-JESSOP, S., *Russian watches from the Soviet era: rugged iterations of Swiss-inspired design*. *New York Times* 7. 11. 2007.
- [9] KRÁLÍK, J. *Prima čas - Historie hodinek PRIM 1949-2019*. Praha: Grada, 2019.
- [10] LAFUENTE, A., SELLÉS, M. A. The problem of longitude at sea in the 18th century in Spain. *Vistas in Astronomy*, 1985, 28, p. 243–250.
- [11] MARTÍNEK, Z. Časoměrná technika. In SMOLKA, I., FOLTA, J. (eds.). *Studie o technice v českých zemích 1918–1945. Díl V., část 2.*, Praha: Národní technické muzeum v Praze, 1995, s. 637–667.
- [12] MARTÍNEK, Z. *Dějiny československého hodinářského průmyslu I. a II. Brno, Nové Město nad Metují: ELTON hodinářská, Technické muzeum*, 2009.
- [13] MICHAL, S. *Hodinářství a hodináři v českých zemích*. Praha: Libri, 2002.
- [14] MORRIS, W. J. *The Mariner's Chronometer: Structure, function, maintenance and history*. CreateSpace Independent Publishing Platform, 2012.
- [15] VAJSAR, J. *Technologie náramkových hodinek vyráběných v Novém Městě nad Metují v letech 1954-1986*. Manuscript, Nové Město nad Metují, 2005.



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²² HOVORKA, L., *Primky ...*, op. cit. p.67.