

# Prof. František Rieger and his air raid siren system [1]

*Mgr. Martin Dominik Hrtus*

Historical Laboratory of (Electro)Technology, Dep. of Economics, Management and Humanities, Faculty of Electrical Engineering, Czech Technical University in Prague (FEE CTU in Prague), Technická 2, CZ-166 27 Prague 6

[hrtusmar@fel.cvut.cz](mailto:hrtusmar@fel.cvut.cz)

**Abstract.** *The aim of the paper is to present a unique system of Prague air raid siren control system, which was designed and constructed by František Rieger (1904-1986) in the second half of the 1930s. It will briefly describe not only the personality of the author of this system but also focus mainly on the political and security circumstances of its creation in the broader context of the increased need to protect the civilian population in Czechoslovakia during this period. Based on available materials, it will attempt to reconstruct the technical aspect of the warning system, its trials and its application in the run-up to the outbreak of the Second World War.*

## Keywords

History of Technology, History of Electrotechnology, Air-raid sirens, Prague, Czechoslovakia, Electrical engineering, František Rieger

## 1. Introduction

In the face of a deteriorating security and political situation, virtually all European countries have stepped up their systematic efforts to protect civilians from air attacks. This has been done through awareness raising, the distribution of individual chemical protection equipment, the construction of shelters and, last but not least, the building of a warning system. Czechoslovakia was no exception in this respect. It was able to rely on a well-developed domestic industry, including the electrical industry. In 1936, under the leadership of František Rieger, a technically unique system for controlling warning sirens was built in Prague. When researching this equipment, we can ask ourselves several questions. At what phase of efforts to protect the civilian population was it created, what were its technical advantages and disadvantages, and how did the system prove itself during peacekeeping exercises? We can also take this opportunity to

briefly introduce the figure of the designer himself, František Rieger, who after 1945 was a prominent lecturer in the field of low-current electrical engineering at the Faculty of Electrical Engineering of the Czech Technical University in Prague.

The paper draws primarily on documents stored in the personal collection of Prof. František Rieger, located in the Archives of the Czech Technical University in Prague. [2]

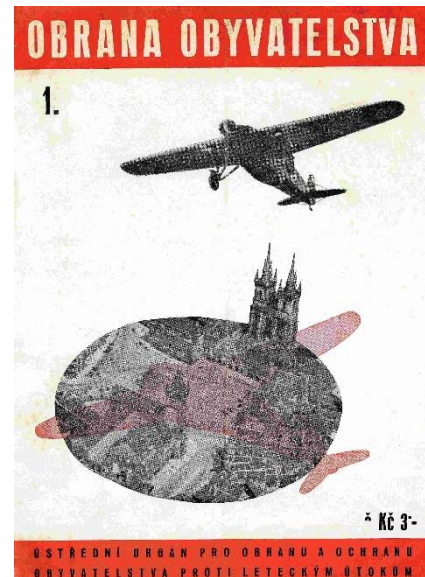
## 2. Passive protection of the population against air attacks in Czechoslovakia up to 1938

In 1929, the Population Defence Centre/ Ústředí obrany obyvatelstva was established. It was a voluntary defence organization that, with the support of the state authorities, set itself the goal of studying and preparing the organization of air raid protection for the population. [3] From the point of view of practical results, more important was the adoption of Act No. 82 of 11 April 1935 Coll. on protection and defence against air attacks. [4] The most important element in the protection of the population under this law was the local government, i.e. the municipality or town. Its authorities not only carried out practical steps to ensure protection but also created conditions for cooperation between private organizations and individuals. Within the Ministry of the Interior, which was responsible for civil air defence/ Civilní protiletectká ochrana (hereinafter referred to as CPO) in peacetime, an advisory board was created. Its counterpart at a lower level was local advisory committees assisting individual mayors. Cities that had more than 50 thousand inhabitants were divided into wards and then into districts. Towns with 10 - 50 thousand inhabitants were divided into wards. Smaller towns formed a single unit in terms of air

defence. The law ordered the municipalities to build a system of warning announcements as well as the construction of shelters for the population. Since it was obvious that the organizational and especially financial possibilities would not allow the municipalities to build these facilities in full, the law envisaged the involvement of private sources. Together with Government Decree No. 103 Coll. of 29 April 1935 [5], conditions were therefore created for tax relief for the construction of shelters. In addition to municipalities, individual state institutions and larger industrial enterprises also organized air defense on their own account. Steps were also taken to speed up and make cheaper the production of so-called people's civilian gas masks and their distribution among the general population. The first competition for the production of this type of mask was announced as early as 1933, but due to technical and administrative complications, mass production did not take place until 1937. Therefore, the army masks the model No 23 had to be used in the first CPO air raid exercises. Production and distribution, tied to a concession, were subject to strict state supervision according to Government Decree No. 83 of 17 April 1935. [6]

As the threat to the state has gradually increased, so has the pace of CPO development. Popularizing publications were issued, and drills and various agitational events were organized, often in collaboration with the Ministry of National Defence. The construction and modification of shelters and warning systems were also intensified, especially in major cities. In order to cover the rising costs associated with this activity, Act No 75 Coll. of 8 April 1938 concerning the collection of a special levy for protection against air attacks. [7] This levy was collected by individual municipalities.

Under these circumstances, a system of warning sirens was built in Prague in 1936, the author of which was František Rieger.



**Fig. 1.** The magazine Population protection/Obrana obyvatelstva, published between 1935 and 1938 in an effort to raise awareness of CPO, [8]

### 3. Prof. František Rieger

František Rieger (1904-1986) was born into a family of civil servants on 4 May 1904 in Pardubice. After his father's death in 1907, he moved to Prague with his mother and sister. He completed his secondary education in 1922 with a matriculation diploma at the Czech State Real School in Prague, Malá Strana. After that, he attended the College of Mechanical and Electrical Engineering of the Czech Technical University in Prague. In 1931, he obtained the degree of Doctor of Technical Sciences.

In 1929 he became an employee of the Post and Telegraph Administration. Here he changed several work institutions, in 1929-1931 and 1934-1945 he worked at the Postal Technical Research Institute in Prague. During his time at the Postal Administration, he participated in the construction of the Prague telegraph central station, the relocation of cable lines in Prague - Klárov, the laying of new cables for the replacement telephone and telegraph exchange at Wenceslas Square in Prague, and extensive reconstruction and study work on the Brno long-distance cable, for the construction of synchronization equipment for Hradec Králové and for the construction of a radio station in Liblice and Mělnice, a complete time service network and a time exchange in Prague, equipment for the transmission of signals on the radio and for the construction of a

warning siren system. His research work for the Ministry of Posts and Telegraphs resulted in patent No. 54210 "Synchronisation of independently running clocks by correction impulses transmitted simultaneously from a time exchange over telephone lines". It was awarded to him together with Ing. Volf and Ing. Rod. In 1945, at the request of the dean's office of the College of Mechanical and Electrical Engineering, Rieger was transferred by the Ministry of Posts to the Institute of Electrical Engineering of Weak Currents. Since then his life was connected with his work at the CTU in Prague. In 1946 he was habilitated there as an associate professor for the field of weak current electrical engineering and a year later he was appointed state associate professor for communication electrical engineering. In 1956 he was appointed professor of circuits and theory of signalling technology, becoming a full professor in 1966. During his tenure at the Faculty of Electrical Engineering of the CTU in Prague, he held several important academic positions, and from 1953 to 1955 he was vice-dean of the faculty. In addition to lecturing, he contributed to the education of new professionals by writing a number of textbooks and three national scientific textbooks - Theory of transmission by communication lines/Teorie přenosu sdělovacím vedením, Linear circuits/Lineární obvody, and Theory of communication electronics/Teorie sdělovací elektrotechniky. He retired in 1970 but continued to lecture at the college, first part-time and then as a part-time faculty member until 1978. [9]



Fig. 2. František Rieger in the 1930s. [10]

#### 4. Technical aspects of the Rieger siren system

The basis of Rieger's alarm siren system was the Postal Time Service network. This was designed to power several dozen electric clocks. These were not only street clocks, but also devices installed in larger private and state establishments (Radiojournal, Žižkov Freight Station, the General Staff Building, the headquarters of the Skoda Works, and others). [11] The network itself, about 50 km long, and located about 80 cm below the surface, was divided into 12 circuits and controlled from a central clock located in the main building of the post office on Jindřišská Street. This central clock, supplied by Siemens, transmitted a three-second signal every minute with a current intensity of 0.4 Amp. Dr. Rieger's system consisted of installing electric sirens directly to the time clock, equipped with a mercury or mechanical switch that would not respond to the 0,4 Amp current. In the event of an air raid alarm, an additional 0,6 Amp pulse would be applied to the time service circuit, which would switch on the siren control relays, thus putting them into operation at the same time. The voltage in both pulses was the same, 60 V. [12] The alarm current was interrupted during its connection by a two-position switch used to change the rhythm of the siren signal. This change marked the beginning and end of the alarm. According to the original drawings, the individual devices were also to include a light panel with the word "POPLACH" on it, which was to be illuminated with the sounding of the siren. This feature was not ultimately installed, presumably because it would have violated the principles of blackout in the event of warnings at night.

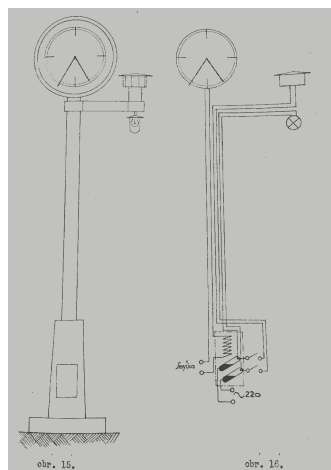


Fig. 3. Diagram of interconnection of clock and siren. [13]

## 5. Practical tests of the system

The entire system was designed and built relatively quickly in 1936. The Prague City Committee of the CPO originally wanted to install a smaller number of more powerful sirens. However, it abandoned its plan in March 1936 after a practical demonstration of a 60 hp siren. This was located on the roof of the AXA Palace and its acoustic range proved insufficient. Dr. Rieger had been working on his system since January of that year and was thus able to present a finished design at a meeting on other possibilities for powering alarm sirens, held in early June under the auspices of the Ministry of Posts and Telegraphs. [14] On the basis of this proposal, the first siren, located on the clock cabinet in the Square of the Republic, was already approved on 16 September. It had a power of 2 hp. After testing it, the ČKD factory in Prague was awarded a contract for the production of 16 alarm switches. [15] After delivery, they were installed together with sirens in the following locations: After delivery, they were installed together with sirens in the following locations: 1. In the main building of the post office, 2. at the Republic Square, 3. at Můstek, 4. in the middle of Wenceslas Square, 5. at the National Museum, 6. At the Old Town Hall, 7. at Újezd, 8. at Arbes Square, 9. at Anděl, 10. at Vokovice, 11. in Břevnov, 12. at the Bruska Waterworks, 13. at Sokolská Street, 14. at the Smíchov Power Station, 15. at the Klárov Transformation Station. 16. at the Holešovice power station [16]



**Fig.4.** The clock and siren at the National Museum. [17]

The first major exercise of the Prague CPO involving the new siren system took place on the 20th of November 1936. [18] As part of it, in cooperation with the Ministry of Defence, a mock

raid on Prague with simulated bomb explosions was carried out. The CPO headquarters was located in the Old Town Hall. After receiving a report of approaching aircraft from military patrols in the vicinity of Prague, an order to sound the sirens was signalled to the main post office building at 14:55 by a telegraph key. A patrol was stationed at each of them to record any malfunctions. The end of the alarm was announced at 15:07. During its duration, all sirens operated without malfunction. Subsequently, the electrical time clock was also checked and it was found that the operation of the sirens did not affect the accuracy of their operation. [19]

The second exercise that we have archival support for was a practice raid by nine bombers on the 26th of May 1937. It again involved all elements of the CPO as well as gendarmerie, fire brigade, army, and medical personnel. The planes, taking off from the Hradec Králové airport, fired white rockets simulating bombs while flying over Prague and the surrounding villages. The overflights continued into the night to assess, among other things, the effectiveness of the blackout. [20] The sirens were again indirectly controlled from the Old Town Hall. Their sounding was also the signal for the activation of the other sound warnings. These included the ringing of police or fire trucks and the sirens in businesses that were not connected to the central system.

## 6. Conclusion and prospects for further research

The Prague siren system designed by František Rieger was created at a time of increasing threat to the first Czechoslovak republic. At a time when local governments were trying to find quick and economical solutions to improve the protection of the civilian population from air attacks. It can be concluded that the system under study fulfilled both of these requirements. It made use of existing infrastructure, which was, moreover, largely protected from damage by its underground location. On the basis of tables drawn up by the ESC, Dr. Rieger estimated that the cost of building a new overhead line connecting a similar number of sirens would amount to CZK 200 000. [21] However, this line would also be much more susceptible to damage by sabotage or bombing. At the same time, the whole mechanism was designed so that it did not interfere

with the operation of the postal time service. However, the use of pre-existing wiring was also its greatest weakness, as it limited the choice of locations for the siting of the sirens. This was demonstrated during the exercise in May 1937, when the sound of the alarm did not reach some parts of the city further away from the center (Zličov, Radlice, Košíře) [22].

From the point of view of Czech historiography, the question of CPO and air defence in the period before the Second World War remains relatively unexplored. Existing studies look at it either from the point of view of legal history or from the point of view of military history. The technical aspect of the protection of the civilian population, not only in the field of alarm systems but also in the construction of shelters or collective and individual chemical countermeasures, has yet to receive a systematic examination.

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## About Author

**Mgr. Martin Dominik HRTUS** is a graduate in *Economic History at the Institute of Economic and Social History, Faculty of Arts, Charles University in Prague*. In 2018, he completed a four-month internship at the *Armenian National Museum in Yerevan*. He is employed as an assistant at the

*Historical Laboratory of (Electro) Technology, Faculty of Electrical Engineering, Czech Technical University in Prague, where he also began his doctoral studies in February 2022. The topic of his planned dissertation is the social aspects of electrification in Slovakia.*