

REMARKS ON THE ROLE OF IRON IN THE ARCHITECTURE OF THE GRAND DUCHY OF BADEN

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The small and relatively poor Grand Duchy of Baden was a focal point for architectural development in Germany throughout the whole of the nineteenth century down until 1914, being particularly important on account of the Polytechnic in Karlsruhe, which enjoyed a very high reputation, so that there is surely good cause for taking a closer look at this area from the point of view of our topic, even if, in the field of iron construction, there are here by no means such rich solutions to be found as those in Britain, France or Belgium. The developments to be described here fall within the reigns of Grand Dukes Frederick I (1852-1907) and Frederick II (1907-1918).

1. The Engineers

Robert Gerwig (1) may be regarded as the great engineer of the Baden State Railways. After completion of his studies in Karlsruhe, road construction projects in the Upper Black Forest region were the first assignments he was entrusted with; we owe the construction of several tricky stretches of highway, such as Titisee-Schluchsee of St. Blasien-Albdruck, to him.

In 1857 he built the railway bridge across the Rhine at Koblenz-Waldshut, the oldest railway bridge across the Rhine in the Grand Duchy of Baden, and at the same time the oldest railway bridge link with Switzerland. In 1872 he was appointed chief engineer for the construction works on the Gotthard Railway, a post he held for three years; from 1875 on he was a member of the Directorate General of the Baden State Railways.

If one imagines that Robert Gerwig, as a superb engineer, was a particularly faithful supporter of the use of iron as a construction material, then that would be a mistake. His motto "more tunnels, fewer bridges" does not only show his determination, as a result of his experience with road construction in the Upper Black Forest, to protect the railway from the danger of avalanches and rockfalls, as far as possible, by constructing a route with many tunnels, but also documents the almost traditional aversion in Baden towards iron as a construction material.

The Koblenz-Waldshut Rhine railway bridge represents Robert Gerwig's first independent work: a lattice-box construction which is still in existence today, is still in use and was only recently restored. Mention should also be made of two other iron bridges, the road bridge to the Tiergarten and the Hirschbrücke bridge, both in Karlsruhe.

Also worthy of mention here is the so-called "Strategic Railway", which was proposed in a treaty made in 1887 between the German Empire and the Grand Duchy of Baden, namely to avoid the territory of neutral Switzerland. Extremely difficult topographical conditions and a maximum permitted gradient of 1:100, to allow the transport of heavy loads, required a very costly routing.

The Strategic Railway consisted of a whole system of bypass lines, namely around the Swiss cantons of Schaffhausen and Basle. The railway began in Donaueschingen at Hintschingen, whence it proceeded by a very complex route, with spiral tunnels, semi-circular tunnels, viaducts spanning whole valleys and towns to reach the Upper Rhine line at Oberlauchringen near Waldshut. It followed the latter line to Brennet near Bad Säckingen, then ran along the lower course of the

River Wehra, past Wehr, reaching the Wiesenthal valley at Schopfheim across a lattice-box bridge and through a long tunnel, then taking the Wiesenthal line to Stetten near Lörrach (just before the frontier with Basle), thence through Tüllingen tunnel to Weil am Rhein and from there across the Rhine over the Palmrain railway bridge, demolished in 1937, to Hüningen and the then German city of Mülhausen (Mulhouse) in Alsace. Of particular importance in the case of this railway are the great iron viaducts, such as the Biesenbach viaduct, constructed in 1890, or the viaduct in Epfenhofen, crossing above a whole village, also constructed in 1890. Between 1882 and 1887, the Höllental railway linking Freiburg with the higher parts of the Black Forest was constructed. The project was drawn up in 1869/70 by Robert Gerwig, the line was opened in 1887, and the extension to Donaueschingen was completed in 1901. In view of the in part very considerable gradients, the section between Hirschsprung and Hinterzarten was initially and for a long period after worked with rack operation. A major feature on this railway is the great Ravenna viaduct across the Ravenna gorge, originally erected in 1882/1887 as an iron structure, but replaced in 1926/27 by a stone structure, which also reflects the distrust still felt towards iron construction. - The well-known traverser bridge in Maxau should also be mentioned in this connection.

2. Factory construction and related matters

The installations of the inland harbour on the Rhine in Karlsruhe, erected to plans by the architect Hosell, should certainly also be included among the larger building works undertaken in the Grand Duchy of Baden in which iron played an important role. The shipyard installations and the silo stores also formed part of the municipally owned Rhine harbour. These buildings were erected between 1900 and 1903 to plans by the architects W. Strieder and A. Stürzenacker; we shall encounter the latter again as the builder of the new central station in Karlsruhe. (2)

Among the larger factory buildings erected at the time which are also of interest from the construction technique aspect, the fabrication sheds of the bell foundry and fire brigade equipment manufacturers Metz and Bachert in Karlsruhe should also be mentioned; a building with extensive and visible use of iron to emphasise the technical aspect. (3)

Among the most modern factory buildings of the time, with extensive use of iron, one can also include the factory building, erected in 1913, belonging to Messrs. Wolff & Sohn ("Kaloderma"), as also the factory building belonging to the sewing machine factory Held & Neu, founded in 1862, also erected at that time in Karlsruhe. (4) The contrasts which are possible are then demonstrated in a completely different kind of structure, the brewery building of the Hoepfner Brewery, "Burghof", from 1895 in Karlsruhe, which is a structure which appeals to the emotions, stylised in a Romantic castle-like form. This knight's-castle-like structure is, of course, also inconceivable without the use of iron. However, the significant fact is that in this one case iron as a material, as a construction element, is shown; in the other case, however, just as in the case of the brewery building mentioned here, it is expressly hidden, concealed by the castle-like character. (5)

3. Paratechnical structures

About the middle of the nineteenth century, the architecture critic Wolf wrote that iron "lacks the necessary plastic fullness required to complete the architectural whole in an adequate form", and further "on account of the prevailing trend in building taste towards the employment of more picturesque 'iron construction' principles derived from the plasticity of the façades it had become an expression of horror, especially for the plastic artist as an architect". (6)

Apart from Heinrich Hübsch, Joseph Berckmüller was one of the leading architects in the Grand Duchy of Baden around the middle of the century. Among the buildings which he erected, apart from the Bonndorf parish church, erected 1840-52, one could mention in particular the building housing the Grand Ducal Collection at Friedrichsplatz in Karlsruhe (1865-70). This building would also be inconceivable without the use of iron, while iron as a decorative element is just as little apparent here, or just as little a style component as in the case of Hübsch. (7)

The Vierordt Baths in Karlsruhe are a gift made to the city of Karlsruhe in 1873 by the banker Vierordt; they were built in 1873 by Joseph Durm in the forms of the Italian high Renaissance.

Just like Weinbrenner and Hübsch before him, Joseph Durm also held the highest post in the Baden State Building Administration as senior architectural director.

Apart from this, Joseph Durm was a gifted draughtsman. The great majority of the drawings in the first inventory of Baden artistic monuments, published by Franz Xaver Kraus from 1892 on, were his work. Joseph Durm also gained fame as one of the most important editors of the "Handbook of Architecture" which ran to several editions. The "Handbook of Architecture" provides an extensive, and probably exhaustive, answer to all questions posed about architecture at that time, also with regard to constructive aspects; Joseph Durm himself deals mainly with constructional history questions. With his numerous, for the most part superb drawings, the work is one of the most important source works for the architecture of the nineteenth century and its problems. The employment of iron, iron constructions, etc. is also dealt with very thoroughly in the work. (8)

The monastery church of St. Blasien, erected between 1768 and 1783 by the French architects Michel d'Ixnard and Nicolas de Pigage at the commission of the Prince Abbot Martin II Gerbert, following the secularisation of the monastery and the accommodation of factories in the monastery buildings, unfortunately fell victim to a serious fire in February 1874. The massive roof framework between an inner decorative cupola and the outer metal dome, a masterpiece of eighteenth century carpentry, burnt out completely, while the remains of the roof collapsed into the interior of the rotunda. Whereas the interior of the rotunda remained a ruin for nearly forty years, the state of Baden, worried in particular about the great masses of snow in winter, reconstructed the outer dome soon after 1874 on a roof framework of iron meridian arches: the most comprehensive and complicated iron roof construction in the Grand Duchy of Baden at that period. The meridian arches, of astonishing lightness, are stiffened by means of transversal struts to form a sort of lattice support. (9)

Among those structures which were also of a paratechnical nature one can also include the great festival hall, erected in Karlsruhe between 1875 and 1877 by Joseph Durm. When the hall was opened in 1877, it was the largest festival hall in Germany, erected on the occasion

of Grand Duke Frederick I's silver jubilee. The building soon became famed for its superb acoustics. This structure too is inconceivable without the massive and thorough employment of iron, which, significantly enough, was not, however, shown anywhere as a constructional element, but was carefully disguised. (10)

The same can also be said about the theatre auditorium constructed in 1891 in the "Kolloosseum" in Karlsruhe by Hermann Walder. That hall too is completely inconceivable without the decisive use of iron; this is only shown in part as a design element, and even then more in a decorative than from a constructive aspect.

For many years now, the (now former) university library in Freiburg has attracted particular interest as a structure which can be regarded both as belonging to the Historicism period as also being a technical-functional structure of the most modern kind for its age. (11) The building's architect was Carl Schäfer. Right from an early period on he had connections with Viollet-le-Duc who influenced his work (certainly also with regard to the use of iron).

The most interesting part of the building, from our point of view, are almost certainly the stack room wings. "What was decisive for the construction was their function as book stacks and the desire to make as economic a use as possible of the space available, with good illumination of the interior rooms." The result is a pillared structure in which the window pillars take the width of the axes of the book shelves into account. "Schäfer used the Lippmann system for the book shelves which had been invented by the Strasbourg wrought-iron craftsman Lippmann, and had first been used in the university library in Strasbourg. Its advantage lay in its minimum requirement of space for the supports and the ease with which the shelves could be adjusted. In contrast to the usual arrangement, the iron frame supports are not placed against the individual storey ceiling, but extend through two or three storeys." (12) The roof framework of the building is an iron construction using French trusses. This construction, as also the for that period extensive use of concrete and asphalt in this building, was also in keeping with the requirement for keeping a structure as fireproof as possible.

Although Carl Schäfer certainly did make use of iron as a means of construction, it certainly did not play the role of a decisive stylistic element in his work, because he was, for instance, equally concerned with the polychromy of historical architecture or with the practices of medieval treatment of stone, with the history and construction of wooden architecture, etc. Iron certainly does occur in Schäfer's work to a considerable degree, however, with a few exceptions, it is for the most part concealed and is only visible where this was absolutely necessary for constructional reasons.

A competition was held for the construction of the new central station in Karlsruhe, in which a whole series of then well-known architects participated. The first prize in this competition was won by the architects H. Billing and W. Vittali. However, their project did not come to fruition because the Baden State Railways had technical objections. What was constructed was the project by the architect August Stürzenacker. Although Stürzenacker won fourth prize in the competition, he was commissioned with the execution of his technically mature project. This was for a through railway station, with tracks on a viaduct and the platforms roofed over with a six arched trainshed in steel. At the front of the whole structure, facing the city, is the station building, constructed in somewhat strict art nouveau forms. (13)

A second large station belonging to the Grand Duchy of Baden was the newly built Baden Station on Swiss territory in Basle, erected in 1913 by the Swiss art nouveau architect Karl Moser who also ran a well-known architect's bureau in Karlsruhe under the name of Curjel & Moser, which was often entrusted with large contracts. Behind the station building, also in art nouveau, there were five huge train sheds over the tracks on their slightly raised embankment, which are, unfortunately, being demolished at the moment, despite all the efforts of the Basle curator of monuments. (14)

4. Iron as expression of the ornamental, exotic or non-serious aspect

The architecture theoretician Wolf told the general assembly of architects in Gotha in 1846 that iron should only be used where it was more necessary to cope with temporary requirements, whereas monumental architecture intended for permanency should be left to stone block construction.

Despite the almost permanently prevailing reservations about the use of iron as a constructional material in the Grand Duchy of Baden, there were fields in which iron was employed almost exclusively, especially for lamp-posts, decorative railings, lanterns, kiosks, etc. The Ferdinand Seneca Company in Karlsruhe played a decisive role in this connection, not only with the design, but also with the manufacture of such objects in cast iron. It was a very efficient iron foundry in the nineteenth and twentieth centuries, founded and managed by Ferdinand Seneca.

A series of designs for lamp-posts and wall-mounted lanterns is preserved from 1886. One especially valued feature of the lamp-posts from the Seneca Company, which had been flourishing since 1860, was that they were sufficiently robust to take bolts, so that it was possible to exchange them at any time. The Seneca Company's products are also regarded as an example of how the nineteenth century was able to link cast-iron components to one another. The forms were interchangeable and were already the object of a certain degree of standardisation. (15)

The funicular railway was also part of the range of public holiday pleasures. The Turmberg funicular in Karlsruhe from 1888 is regarded as being Germany's earliest funicular railway. It operated by counterweight; 4,000 litres of water was carried as additional ballast on the downward journey and discharged at the lower station.

The kiosk also forms part of the exotic and non-monumental field. The tramway waiting room was erected in Karlsruhe at the Ettlenger Tor in 1910. - We should also include the weather house here, something which was also often to be found around 1900 in towns and spas, thus, for instance, the weather house at the Mühlburger Tor in Karlsruhe, this too designed and produced by the Karlsruhe iron foundry company of Seneca; a similar weather house, probably also from the same manufacturer, is still standing in the spa park in St. Blasien. (16) The fact that the use of iron as an artistic medium did not indeed expand unchecked is also to be seen very clearly in the case of monuments. Whereas the monument to the poet Johann Peter Hebel, erected as early as 1835 to plans by Joseph Berckmüller, is produced in cast iron (except for the bust of the poet itself which is in bronze), for the planned so-called Prussia Monument, presented by King Frederick William IV of Prussia in 1852, and reputedly designed by Friedrich Eisenlohr, in memory of those Prussian soldiers who fell suppressing the Baden Revolution in 1848/49, the "more serious" material stone was chosen again. Comparison of these two monuments

throws more than a characteristic light on the use of iron as an artistic means of design. Whereas the relatively small monument to the poet, erected in the castle park, is produced completely in iron (and bronze), for the monumental military memorial, recourse was once again had to traditional stone. (17)

A survey of architectural development in Baden between 1870 and 1914, which it is necessary to forego here for space reasons, would show how it is possible to observe an almost consistent movement away from iron from Heinrich Lang (former "Hotel Germania", Karlsruhe) through Joseph Durm (Hereditary Grand Ducal Villa in Karlsruhe, now the home of the Federal Court) and especially to those architects particularly devoted to Neo-Baroque and art nouveau style, such as, for example, Hermann Billing, Friedrich Ratzel, as also Curjel and Moser, away from a visible engineering achievement again to a corporeal, masonry structure, modelled indeed in soft masses.

This was clearly recognised and articulated already at that period: "In the meantime it had been recognised that the natural sources for the development of a style are to be found where the old development had stopped: in the architecture of the late Baroque and Empire. Since modern architecture again turned to this tradition, it also at the same time again found the foundation for the continuation of a standard local style". (18)

I should like to make the following observations to sum up:

The question is not so much whether and how much iron was in fact employed in a structure, but the extent it was proposed to show this fact as a visible means of artistic decoration and as an element forming the style; that means what architectural role was one prepared to concede to it.

From this aspect, it is possible to make the following rough division into periods for the Grand Duchy of Baden in the nineteenth century:

a) The period prior to iron

Weinbrenner who created important constructions in wood, facing them, if necessary, with stone; cf. the report in the first part of the Colloquium.

b) The reception of iron

Iron was adopted cautiously, but always with an extremely critical distrust and only for "utility buildings" (Hübsch, Eisenlohr). Reference has already been made to the ideological conflicts linked with the reception of iron in the first part of the Colloquium.

c) The use of iron

This took place wherever no other construction material of even remotely comparable quality was available, in railway construction, particularly for bridge construction (Gerwig); but even here, right at the very heart of the use of iron, it is still possible to observe a certain distrust of iron as a building material (cf. Ravenna bridge).

d) Iron as a not particularly popular auxiliary material for constructional purposes in "major" architecture (Berckmüller, Durm, Lang)

Iron is used as an indispensable auxiliary construction material, but carefully disguised.

e) Finally follows the almost final rejection of iron as a medium of architectural expression in Neo-Baroque and art nouveau style, even among the most modern architects of the period (around 1900).

The extent to which this development in the small and relatively easily observed state of Baden can be regarded as an analogy for more far-reaching developments and links could well now form the subject of a discussion.

Notes

1. Cf. Albert Kuntzemüller: Die badischen Eisenbahnen 1840-1940. Freiburg 1940 (new edition Karlsruhe 1953).
2. Cf. among others Robert Goldschmidt: Die Stadt Karlsruhe, ihre Geschichte und ihre Verwaltung. Festschrift an das 200jährige Bestehen der Stadt. Karlsruhe 1915, pp. 483 ff.
3. Harald and Suse Schmuck, Wilhelm Kratt et al.: Karlsruhe um 1910. Karlsruhe 1979, Fig. 96.
4. Hubert Doerrschuck: Karlsruhe, so wie es war. Düsseldorf 1971, pp. 56 and 79.
5. Joachim Goericke: Bauten in Karlsruhe, Karlsruhe 1971, No. 566.
6. Cf. Klaus Doehmer: "In welchem Style sollen wir bauen?" Architekturtheorie zwischen Klassizismus und Jugendstil.
7. Schmuck, Fig. 107.
8. Schmuck, Fig. 104.
9. Cf. Ludwig Schmieder: Die Abtei St. Blasien, Augsburg 1929, p. 227 ff. - H.J. Wörner: Die ehemalige Klosterkirche St. Blasien. In: Badische Heimat. 55. 1975. 1. pp. 35-63.
10. Schmuck, 114; Doerrschuck, p. 83.
11. Cf. Jutta Schuchhardt: Carl Schäfer, Munich 1979.
12. Cf. Schuchhardt, p. 295.
13. Mihály Kubinszky: Bahnhöfe Europas. Stuttgart 1969, p. 138.
14. Kubinszky, p. 139.
15. Cf. Siegfried Wiechmann et al.: Der Ludwigsplatz Karlsruhe. Karlsruhe 1978, pp. 127 ff, 130.
16. Doerrschuck, pp. 11, 29.
17. Cf. Carl Helmut Bohatz: Karlsruhe. Munich-Berlin, no date, Figs. 30-33, p. 44 - Schmuck, Fig. 93.
18. Goldschmidt, p. 128.

IRON ARCHITECTURE IN THE LATE NINETEENTH CENTURY: SOME SWEDISH EXAMPLES

Birgitta Hoberg

Sweden has been an ironworking country from time immemorial. Iron ore was already being extracted in prehistoric times and subsequently played an important part in Sweden's output of rudimentary weapons etc. The importance of iron as a factor in Swedish industry, both for iron as a factor in Swedish industry, both for domestic supply and for export, culminated in the seventeenth and eighteenth centuries and in the first half of nineteenth. In Swedish history, the period with which this symposium is concerned, the second half of the nineteenth century, was a period of heavy mortality among the iron manufactories; innumerable enterprises were closed down for efficiency reasons, and many others had to reorganize their production in response to changing demands.

Sweden, with its long and eventful ironworking history, is an eldorado of industrial archaeologists, and some of the participants in this symposium have visited Sweden in this connection.

We often feel however in Sweden that, down to the present day, we have been living to one side of the mainstream of European culture, and with few exceptions it also applies to the examples of the formal language of iron architecture which I shall be showing you presently. Some of these examples show how iron has been used for creative purposes within classical architectural contexts. Others show iron as a symbolic manifestation of the Swedish iron industry during the expansion of Swedish communications which attained its peak during the second half of the nineteenth century.

TRADITIONAL ARCHITECTURAL PURPOSES

All over the world we have monuments to the aspirations of a vanished period, and also specimens of the engineering art of the nineteenth century, in the form of fantastic glasshouses, the precursors of railway stations and exhibition halls. There is the Palm House at Schönbrunn, outside Vienna, the New York Botanical Garden, the Jardin des Plantes in Paris and of course the Palm House in Kew Gardens. Sweden too has its palm houses, the most celebrated being at Trädgårdsföreningen in Gothenburg and the other, known as Victoria House, at the Bergianska Gardens in Stockholm.

The Gothenburg Palm House stands on traditional garden soil where throughout the nineteenth century there were orangeries, greenhouses and pineapple and peach conservatories.

The Palm House was built in 1876 by the firm of Alexander Shaks & Sons. The engagement of a British firm was no coincidence. Iron and glass architecture in Britain had a long tradition to draw on, and Gothenburg had longstanding ties of kinship with Britain through certain of its leading families, such as the Dicksons and the Carnegies, who had already left their mark on the city's architecture. The roof of the building is supported by cast iron pillars, and the glass roof is constructed of wood, iron sections and wooden bars, the actual panes, some of them curved, being 21 oz British Glass throughout. The British company shipped all materials and provided the work force to erect the building on site. By the time it was completed in 1878, this "Crystal Palace", with a floor space of more than 616 sq. metres and a maximum height of 14 metres, had cost 145 000 Swedish