

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 Bohtz: 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

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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

kronor. Not surprisingly it caused rather a stir from the very outset and the entire population of the city made its way to the park to see what was initially known as "The New Winter Garden". The building also attracted international attention, and English newspapers gave detailed coverage to what they called the "wonderful Wintergarden in Gothenburg".

A south entrance was added in 1880, but otherwise the building has simply been maintained over the years and has remained essentially unaltered. In 1976 it was scheduled under the 1960 Historic Building Act.

Aptly enough, the year of our symposium also marks the inauguration of a renovation project which is expected to cost about 9 million Swedish kronor. Corrosion is the biggest problem, coupled with that of finding economically viable substitutes for the curved blown glass in the dome of the Palm House. The cost of the renovation will be shared between the proprietor, the Municipality of Gothenburg and the Swedish Government.

The Victoria House at the Bergianska Gardens in Stockholm is one of the many "Victoria Houses" built in the nineteenth century to provide a home for the spectacular Victoria Regia species of water lily, and it is one of the few to have survived two world wars. Some of the exterior decorations have peeled off, but the main features of the building are the same as when the building, designed by I. Östendahl, subsequently Master of the University Gardens in Uppsala, was opened in 1900. The hexagonal glass and forged iron dome, 7,5 metres high, surmounts a circular pool in which the giant water lilies spread their leaves.

A third and rather unknown wintergarden is the one at the garden of Adelnäs Manor House, the central part with the glass and iron construction is from the 1870's and the wings from the 1920's.

The established Church of Sweden has about 3.000 parish churches. In three of these, iron has been used as a creative element in connection with major renovations. The best known of these three is Riddarholm Church in Stockholm, the burial church of the kings of Sweden, which started as a monastic church in the second half of the thirteenth century. The tower was struck by lightning on 28th July 1835, with the result that the spire and large expanses of the roofs of the church and burial chapels were burned away. The subsequent renovation, between 1835 and 1846, was directed by the architect Axel Nyström, who designed several new churches in Sweden during the middle and second half of the nineteenth century. He capped the tower with a tall latrince-work spire of cast iron designed by the sculptor E.G. Göthe.

The second of the three churches is at Taxinge-Näsby in the Province of Södermanland, to the south of Stockholm. Originally built in the 1690's this church had fallen into such decay by the 1850's that a thoroughgoing renovation was called for. The vaulted roof, for example, was liable to cave in at any moment. Rebuilding operations began in 1863, and the project was entrusted to one of the most widely engaged architects of the time, Adolf Edelsvärd, whose work also includes a lot of railway stations. The roofs were demolished and replaced with a new ceiling with visible joists in the style of Gothic pointed arches, while the west end was capped with a cast iron ridge turret manufactured at the nearby Akers Styckebruk foundry.

The third church still displaying the influence of iron architecture is that at Norrby to the north of Stockholm, where the interior has slender iron supports and cast iron roof joists. These cast iron features are not specifically connected with ecclesiastical architecture. Similar forms are also to be seen in factories, railway stations and, as we see here, the Royal Stables in Stockholm, built between 1893 and 1895 and designed by architect Eckert. During the nineteenth century, however, iron building components of various kinds both structural and decorative, came to be mass produced. From the 1830's onwards there were hundreds of different articles to choose from in the sales catalogues. Iron pillars were used, for example, in rebuilding churches, as we have already seen, but above all for constructing open shop fronts on the ground floors of old solid-walled buildings.

Västerlånggatan in the Old Town of Stockholm retained its medieval character for a long time, and its principal transformation into a modern shopping street took place in the 1870's, with the aid of iron pillars cast by the Swedish firm of J.& C.G. Bolinder.

The bay window of the Petersenska House in Stockholm, dating from 1873, provides a further example of the creative use of iron as an architectural element in a building originally erected 1645-1649.

The large ironworks were naturally keen to employ iron for the construction of new upper class country residences and for major renovations. There are any number of examples to be seen in Sweden, but I will confine myself to an early one which is not without interest, Huseby Manufactory is in the Province of Småland, in southern Sweden. The existing manufactory residence was built in 1843 for the Hamilton family, who owned the manufactory at that time. The terrace-like cast iron stairway of the entrance was constructed the same year. The hall of the residence is decorated with painted cast iron pillars, and the white staircase leading to the first floor is also of cast iron, although it is now panelled. The hall of the residence is still decorated with the wooden frames for the case-hardening furnaces manufactured at Huseby throughout the nineteenth century, although many of the frames are actually seventeenth and eighteenth century. Other small articles manufactured here included stoves; this one is still to be seen at the residence, and this bridge (inspired by the many years that the owner Mr. Stephens had spent in India), made at the manufactory for the landscape garden at Huseby in the 1970's, has also survived.

This monument at Finspång Manufactory in central Sweden, built in 1870's is maybe the only of its kind in Sweden, another illustration of the way in which an architect could play with iron.

This monument in a neogothic style also manufactured at Finspång in the 1870's is from Österbybruk Manufactory in the Province of Uppland.

#### IRON USED IN THE EXPANSION OF SWEDEN'S TRANSPORT APPARATUS

The expansion of Sweden's transport apparatus in the second half of the nineteenth century would have been impossible without iron. Railways were laid down at lightning speed, canals were cut, bridges were thrown, new lighthouses replaced the old ones along the coasts, and a telecommunications network began to emerge. Here are some examples of the use made of iron in this process.

Malmö station in the Province of Skåne was built in 1890. The appearance of this station has remained essentially unaltered, and the building is shortly to be scheduled for protection under the Historic Buildings Act.

Trelleborg station in Skåne built in 1896 has also been kept unaltered.

Another type of decoration and structural elements of iron can be seen at Arboga station in central Sweden, with elegant cast iron supports forming a colonnade facing the railway platform.

Finally we have a third type of station in which iron serves a more functional than aesthetic purpose, namely Alvesta station in Småland, built shortly after the turn of the century.

Just as columns and girders for alterations and new buildings were mass produced, factories during the second half of the nineteenth century began turning out prefabricated units for other purposes, especially bridges, which when thrown across canals could be of uniform length and therefore based on the same drawing.

One such example is the series of cast iron bridges designed by Capt. J.A. Richerts for the Eastern Harbour Canal in Gothenburg in the 1960's and 1970's. When the stone abutments were ready, ironworkers from the firm of Motala Verkstad arrived to assemble the bridges, which were manufactured in sections of cast iron, rolled iron and tube.

Djurgårdsbron in Stockholm really deserves a better fate than of being quoted as an example from transport history, because it is sheer architecture. It was built in the 1890's to link the former royal park of Djurgården with the Östermalm area of Stockholm, and when completed it looked like the drawbridge of a fairy-tale castle, in the guise of the 1897 Stockholm Exhibition of Art and Industry. In character it is Oscarian and national-romantic.

The first bridge on this site was built in 1690 and was succeeded by various others of wood and stone. The first iron bridge was built in 1846-1849, but it only lasted for forty years.

The drawings for the present bridge were approved in 1895, the final versions being prepared by the architects G. Wickman and Erik Josephson.

Since, however, the original drawings are lost, we do not know for sure who designed the various parts of the bridge.

The sections were assembled by Bergsunds Mekaniska Verkstad, having been cast at the Brevens Bruk manufactory. The four national-romantic sculptures, representing characters from the old Norse sagas, are by the sculptor Rolf Adlersparre. They are cast in zinc and galvanized with copper. But the bridge, which was officially opened in the presence of the King, was completely overshadowed by the Exhibition of Art and Industry.

The parapet is made up of cast iron sections set in a forged iron framework. Its constituent elements are the same: stylized water-lilies and papyrus. The lanterns, originally gas-lit, have now of course been electrified. By the time it was worn out, the bridge had completed eighty years' service. The structural part was entirely replaced in 1977, but the original forgings and sculptural decorations were retained.

Mention should also be made of the lighthouses constructed at this time. We have Rökallen lighthouse near Luleå built by the architect Heidenstam in 1872, followed by several others in the same style around the Swedish coast.

To finish off with, I would like to show two examples of mass-produced articles which remained in production for several decades during the late nineteenth century. This telephone kiosk in the Old Town of Stockholm made shortly after the turn of the century and produced until the 1920's is still in use, and there are quite a few others like it elsewhere in the city.

Another example is a sentry box from the Old Town of Stockholm made at the end of the 1890's; this one is now a public convenience, providing welcome relief for Old Town strollers.

Cast iron design really blossomed and became more widespread in graveyard design. Cemetery railings, gates, rails and fences round graves and crosses of all kinds are fairly widespread mementoes of this period.

What about statutory safeguards for monuments of iron architecture in Sweden? There is, of course, no special legislation for the protection of these monuments. Instead they come under more general provisions. Where buildings are concerned, we have special legislation dating from 1920 for the protection of all church buildings belonging to the Church of Sweden, whatever their age. There is special legislation for the protection of buildings of cultural and historic interest belonging to the State, a category which includes railway stations and lighthouses, for example. Finally we have the 1960 Historic Buildings Act, which applies to all buildings and structures in Sweden of cultural and historic interest.