EARLY INDUSTRIAL CONSTRUCTIONAL FORMS IN BERLIN, CAST IRON, CAST ZINC, TERRACOTTA

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Cast iron, cast zinc and terracotta as building materials are the technical pre-requisites for modern building - that is, for that phase of architecture when technology began to replace craftsmanship and the place of production was transferred from the building site to the factory, thus giving the opportunity for industrial mass production through standardisation, "Masterpieces of constant quality ...in the most suitable materials, in the best form possible and with the highest standard of performance in the most economic fashion possible" can be made "useful for the justified claims of all men".

"Building became assembly, a process differing in important features from all previous methods of building and conditioned only by industrialisation". Konrad Wachsmann's work "Turning Point in Building" from 1959, from which comes the definition quoted here, has also presented the pre-forms for the technical and static conditions of this construction in Gothic architecture, and presents "modular co-ordination" as the definition of basic principle for modern industrial construction.

Between 1775 and 1779 a cast-iron bridge was built across the Severn near Coalbrookdale (Shropshire) by A. Darby III, J. Wilkinson and F.F. Pritchard, the lightness and elegance of which was due entirely to the new iron casting technique.
The delicate construction with three concentric semi-circles and the hump bridge arch against the cantilever with an optical effect of springiness at the same time makes the situation with regard to statics so graphically clear in the most impressive form. In 1791, a good decade later, a small, but seemly exact copy was constructed in the Wörlitzer Park near Dresden as a reminiscence of the fourth trip made to England by Prince Leopold Friedrich Franz of Anhalt-Dessau.
The contemporary author of the "Journey to Görlitz 1797", Carl August Boettiger, calls it "... a bridge of cast iron, in accordance with the well-known English method, copied here earlier than in Silesia...". Admittedly, Boettiger made one mistake because this copy was in wrought iron, but precisely his mistake shows that he was well aware of the character of the English model.
Thus the first Prussian Artistic Iron Foundry, Gleiwitz, retains the honour of having erected the first cast-iron bridge on the continent over the Striegauer Water near Lassen in Lower Silesia, also copying an English model, the bridge erected immediately beforehand in 1793-96 over the Wear in Sunderland (by T. Paine and R. Burdon).
The eccentric arches, touching lightly at the centre, bring a new, long-continuing motif to bridge construction. What was also to serve as a model, the ever smaller circles in the spandrels, follow the English model.
At the end of the 18th century, the bridges were built over the Kupfergraben in Berlin (here an alternative drawing for the "functional ornament" and a view by Morino) and a drawing dated 1800 of a bridge in the Charlottenburg Palace Park, together with a view by Rösel, also from 1800. Two further Charlottenburg bridges provide only a slight variation on the scheme. Between the towers of the ruined castle constructed in 1794 in the sentimental landscape garden on the Peacocks' Island there was also a wooden bridge built of rough trunks covered with bark which soon became rotten. An alternative design in Gothicising forms from 1804-1806 formed the basis of the first works of the Royal Iron Foundry Manufacture which had been newly founded in Berlin in 1804. It is no coincidence that the cast-iron constructions employed Gothic form language. The static structure in responds and ribs, the thinness of its elements and the tracery,which is either not panelled or panelled in glass, fascinated the architect generation tending towards systematisation in building.
When Schinkel presented the Cathedral of Reims in the scenery he designed for Schiller's "Maid of Orleans", then the Gothic system is exaggerated in its rationality and schematism, the building is being prepared at the same time for technical reproducibility.
In the same way, the Gothic pinnacles also became the model for the cast-iron Kreuzberg memorial and by comparison with the immediate inspiration, the Spinner at the Cross near Vienna, the system of the superstructure is even more heavily emphasised by the completely identical pre-fabricated elements. But it is not just cast iron which created the basis for industrial building. From the 1830's on, cast zinc joined this, it being also personally connected with iron.

In 1794, the goldsmith and jeweller, Johann Conrad Geiss, from Offenbach am Main, settled in Berlin and from 1814 on he was active as owner of an iron foundry there, producing that popular filigree-like, pierced cast-iron decoration which soon gained world-wide fame as "fer de Berlin", produced as contract casting in the Royal Manufactury. His son, Philipp Conrad Moritz Geiss, one of the first pupils of the Royal Trade Institute and initially trained as an iron caster, presented Schinkel with the results of his zinc-casting trials in 1831, obtained his enthusiastic agreement and converted his production to zinc casting. As a judge in the 16th Prize Competition of the Society for the Support of Diligence in Trade, Schinkel commented about Geiss that he had invented "an application for zinc which had previously been unknown". It was particularly completely plastic hollow castings, "Large architectural parts, main ledges, capitals of large pillars, vases of all sizes and especially all large Baroque architectural ornaments".

Schinkel recommends the latter for employment in the preservation of monuments to save expense and so as not to ruin stonemasons' taste by having them copy Baroque forms. Schinkel found "the quite original rebating of the roof tile" particularly worth mentioning.

A view of the roof of the Friedrich-Werdersche Church in a painting by Eduard Gärtner from 1834 shows that all state-owned buildings of the time had zinc roofs. The Nikolaikirche in Potsdam was also constructed with abundant use of zinc casting. Apart from numerous architectural details, such as capitals and gallery pillars, it is again the roof covering, about which Schinkel wrote in 1854: "When covering the roof of this church, initially the zinc tiles cast by Mr. Geiss's factory in Berlin were used, which seem to have proved to be a superb roofing material, they require no shuttering, just lathing, each individual tile, which by reason of its rebate lies firmly fixed in the whole mass and is held additionally by means of a gusset cast onto it with a nail going through to the lath below.The zinc casting has also found advantageous employment in the very large and richly decorated drip moulding of the main ledge, just like the sculptures on the railings of the galleries and on the pillar capitals in the interior of the church are produced in this material".
The material terracotta has a special tradition in Berlin. In the March of Brandenburg there was always a lack of natural building stone so that construction in brick became the predominant method.

In the reign of Albrecht the Bear in the middle of the 12th century, this method of building was imported by the colonists from the Netherlands. Until the dawning of the Renaissance,brick construction remained predominant, then with the employment of a coating of lime

plastering, freestone forms began to be copied. The Rüdersdorf Limeston Quarries now also supplied the ashlar elements in the more noble structures. Schinkel, whose wish for style pressed for the greatest perfection in building technology, also became the founder of modern brick construction.

One of the finest examples is the Werdersche Church, erected 1825-28. Its still not very attractive, but weather-resistant facing bricks and the simpler moulded bricks came from the Royal Joachimsthal Brickworks, the richer ornaments and the sculptures from Feilner's Stove Factory. In succession to Feilner, Marck's factory also became renowned ,it having been at work in Charlottenburg since 1836. In 1828, Schinkel designed the façade for Feilner's house (but not the ground plan). The house was completely destroyed in the last war. It is planned that the façade will be reconstructed on another site by the Department of Monuments in 1981 for the bi-centenary of Schinkel's birth utilising terracotta bricks which have been recovered.

In 1869, Friedrich Adler wrote of this façade: "His (Schinkel's) increased requirements gave all the ceramics a greater impulse and the successful production of surrounds, facings and coping stones, of friezes and reliefs - all in pottery tiles and pieces of pottery - removed with one fell swoop the effect of medieval brick construction based on recurring profiles and thus often monotonous".
But the foundation building proper for the modern period is the Academy of Building.
Here Schinkel was, so to speak, his own master and did not have to take any notice of the self-willed crown prince (Frederick William IV), a brilliant dilletante.
In 1826 Schinkel had undertaken a journey to England together with Beuth, the co-founder of the school of building, which was to have the most far-reaching effects on his building technique. In England there had been factory and warehouse buildings using industrial construction methods with cast-iron pillars since 1800,Schinkel drew such a completely rationalised functional structure into his sketch structure. In his school of building, he translated this method for the first time into the "official building method", admittedly still without iron pillars which were still too expensive in Prussia. The fire safety of this type of building would seem to have been particularly attractive for him. The exterior walls of the Academy of Building are a skeleton façade with pre-fabricated trussing.Relief blocks on which is recounted the history of architecture decorate the portals. In front of the main portal we see cast-iron candelabras which are also present in the Schinkel Pavilion in Charlottenburg,also in terracotta from the Merck factory, something characteristic for the interchangeability of the modern material.
Schinkel's journey had the greatest of consequences for Berlin building techniques. In the Academy of Building, Schinkel was not yet able to adopt the cast-iron system of supports which we see in a drawing of an English factory hall, but his pupil, Friedrich August Stüler, produced this light and elegant construction in his "New Museum" (designed after 1841) in zinc casting, whereby, of course, the softer material, zinc, only served as ornamental casing for the iron supports.
The finely arranged fragility,which zinc casting permits, gives this late period of classicism its own sound: Lovingly produced craftsman's fineness from an imaginary age of Mastersingers is made technically reproducable as a valid model for taste, with the greatest of perfection.
The structures in the Glienicker Park designed by Schinkel and his school from 1824 on for Prince Charles, in the middle of a landscape created by Pückler, Lenné and the owner who is also an enthusiastic

possessor of garden monuments and who ambitiously wanted to put himself on a par with the gardeners of Muskau, at the same time spreading out the whole samples catalogue from the production of architecture.
The lions' fountain, the pillars of which represent stone, the water spewing lions, gilt bronze, comes from the Geiss Zinc Casting Factory, just like the architectural reliefs screening the brick pillars of the castle. They are also in this material on Schinkel's regimental mess, picked out in colour,such as the iron oxide yellow walls and cornices and just as can be seen on original parts, they are "sanded", that is to say, during the painting calcinal quarz sand is mixed into the wet paint in order to give the surface the character of stonemason's work, without any loss of fineness.
The "Great Curiosity", an adaptation of the Lysistrates monument in Athens by Schinkel, shows zinc cast coping and terracotta capitals as apparently equally regarded materials. The new building materials employed as support systems, roof covering, cornices, capitals and facing should not, however, just be regarded as handy applications which the new techniques made available; they are immediately connected with a ground plan design which is still effective even today, of a highly rationalised schematism, which is what makes their use possible, whereby the question as to what is the cause and what is the consequence of the new technology is impossible to answer.
Both are only possible simultaneously and disappear if they are used not just by skilled technicians but also by great architects, the boring aspect of so many present-day buildings results from building technology and art not being able to combine.