CARL TUCHSCHERER: 1911-1934 AN INNOVATIVE GERMAN TIMBER CONSTRUCTION COMPANY

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Keywords

Modern timber engineering, construction company, truss and arch, split ring connector

Abstract

In Germany during the 1910s and the 1920s craft based timber construction developed into scientifically based timber engineering. One protagonist of this development was the Carl Tuchscherer Company of Breslau and later Berlin. Founded in 1911 the company built numerous halls for industry, the state railway, the military and for local government. Their leading position in timber engineering was achieved with the "Freitragenden Dachkonstruktionen System Tuchscherer" (Tuchscherer Wide Span Roof Construction) based on the patent for cord and joint configurations. The frequently reproduced truss of parabolic shape was the first truss used in building construction made completely of timber. From 1919 onwards the "Geschlitzte Ringdübel Patent Tuchscherer" (Tuchscherer Split Ring Connector) enabled the company to transfer tension force into rod connections efficiently and with reduced joint slip. This made any timber truss shape possible where formally only iron could be used. Well known architects such as Heinrich Straumer, Max Berg amongst others designed large public halls that shaped the picture of modern timber engineering. The Great Depression at the end of the 1920s and the resulting unstable economic and political situation however led to the end of the Carl Tuchscherer Company in 1934.

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INTRODUCTION

Technological changes in timber construction began in Germany in 1910 and were essentially completed in the years after the First World War and the first half of the 1920s. Previously based on craftsmanship and practical experience, timber engineering was now based on scientific findings in statics and material strength. These developments were driven by a number of timber construction companies with innovative buildings. At the time such buildings were well known through publications in various technical journals, the story however of these companies and their entrepreneur remains largely untold (Seraphin 2003).

One such company was Carl Tuchscherer in Breslau and later Berlin. Apart from building numerous bridges and timber residential homes they completed a very large number of halls demonstrating different shapes of trusses and arches based on practical chord and structural connection solutions. Some of the halls had wide span structures leading to impressive interior spaces.

The story of the Carl Tuchscherer company, its' owner and some of their halls is illustrated here. The company archives were lost following bankruptcy and liquidation of the company in 1934. All that remains are remnants preserved by the family. The Second World War and post-war reconstruction led to the loss of almost all the halls. The author knows of only two halls still in existence. Sources are therefore scarce. This article is based on company reports, company brochures, publications in technical literature and the correspondence between Carl Tuchscherer and his wife Ida.

CARL TUCHSCHERER (1878 – 1934)

Carl Tuchscherer was born in Eisenach/Thüringen. He was the eldest of four children of the shoemaker Karl August Tuchscherer and his wife Auguste Lisette. He trained as a carpenter and an architect at the Baugewerkeschulen (Colleges) of Gotha und Weimar. From 1898 he worked at the office of the Düsseldorf architect Heinrich Salzmann where he became construction supervisor of the Benrather Maschinenfabrik. In 1901 he married Ida Bünger, the daughter of the Bünger restaurant and distillery proprietor in Benrath. Together they had 4 children. Their correspondence lasting until the 1930s reveals him as a "very lively person. It must have been this strikingly emotional and communicative gift together with his technical, constructive and organisational talent that made him such a successful entrepreneur. At the same time he possessed incorrigible optimism. For Carl Tuchscherer a construction contract was often more important than a thorough calculation of the possible financial risks involved. If a personality like this meets

Figure 1: Carl Tuchscherer 1919
(Estate Tuchscherer)

Figure 2: Carl Tuchscherer 1934
(Estate Tuchscherer)

extreme conditions such as recession, war, inflation and economic crisis, as he indeed did, it is not surprising that the company history becomes a story of continual ups and down, success, insolvency and refounding and resulting in personal crisis for Tuchscherer himself.“ (Heydenreich 2012)

CARL TUCHSCHERER & COMPANIE
BUREAU FÜR ARCHITEKTUR UND BAUUNTERNEHMUNG, BENRATH

In 1900 at the age of 22 Carl Tuchscherer, opened an office for architecture and a construction companie in Benrath near Düsseldorf. He designed and built multi storey city homes for the expansion of the town close to Schloss Benrath and a hotel with restaurant, the “Rhein-Flora”. Together with the Düsseldorf architect Walter Furthmann he constructed the new Benrath Town Hall. These brick and stone buildings still exist and have become listed buildings. In 1908 the Benrath town expansion came to a standstill. Owing to a lack of new orders and the start of a recession Carl Tuchscherer abandoned the company.

PHASE OF NEW ORIENTATION

At the start of 1909 Tuchscherer joined the Düsseldorf company “Deutscher Scheunen- und Hallenbau Carl vom Hövel.“ He was responsible for various small halls and the construction of the hangar for the airship pioneer Oskar Erbslöh in Leichlingen. Trestle supports and a purlin roof illustrate the conventional carpentry craftwork of this maintenance hall with a length of 80 m and a height of 27m.

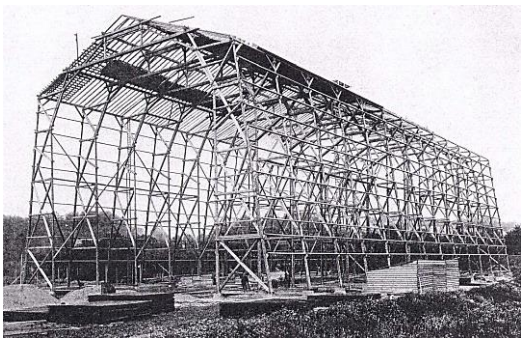

Figure 3: Airship hangar under construction (Estate Tuchscherer)

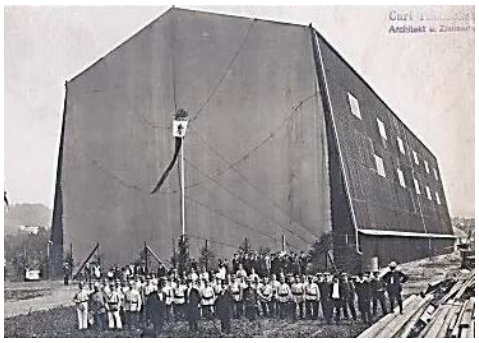

Figure 4: Opening ceremony July 1909 (Estate Tuchscherer)

Owing to a slump in orders at the start of 1910 Carl Tuchscherer moved to the Düsseldorf timber construction company “Stephansdach.” He represented the branch in Breslau, at that time the political and economic centre of Silesia and a prosperous town of around half a million inhabitants.

CARL TUCHSCHERER SPEZIAL-BAUGESCHÄFT, BRESLAU

In Breslau in 1911 he reformed up again with the Carl Tuchscherer Spezial-Baugeschäft. Offering medium sized halls for agriculture, industry, state railways and the military, he wooed customers with material efficiency in wall and roof construction. This was based primarily on a patent for reinforced masonry allowing 7cm thin walls and in 1913 on a further patent for curved cords and easily made joints for timber trusses and arches. Based on this patent Tuchscherer was the first to introduce an all timber truss in building construction. The form finding for this was

influenced by static principles and was no longer dependent on intuition and experience of traditional carpentry techniques. The patented parabolic truss led to more favourable inner stress resulting in optimal material costs for cords and diagonals and their connections. These connections could be constructed with a few bolts and newly developed 36 mm thick plywood. To simplify manufacturing the curved cord, there was a polygonal approximation by two sets of straight planks in staggered position.

For wide spans the parabolic truss is reduced to a two-hinge arch with tie by dispensing with the diagonals. Uneconomical strut dimensions are thus avoided. These would be caused by increasing length and the risk of buckling.

Figure 5: Parabolic truss
(Tuchscherer 1918)

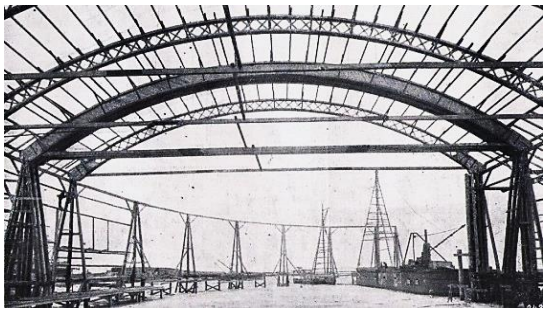

Figure 6: Two-hinge arch with tie
(Tuchscherer 1918)

Halls with the “Freitragenden Dachkonstruktionen System Tuchscherer” became very popular. By the end of 1918 approximately 90 projects had been completed, including 20 hangars. Carl Tuchscherer and his company were an economic success. During the First World War a 150 m long hall for flying boats was built in Warnemünde. The two-hinge arch with a span of 55 m attracted great interest amongst experts (Hammer 1920, Lewe 1922, Kersten 1926, Gesteschi 1926).

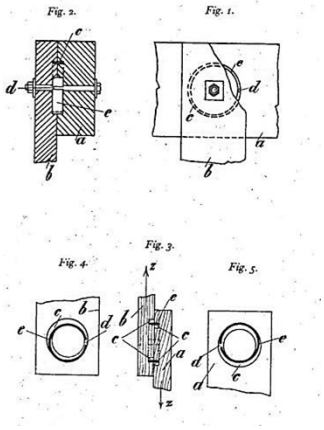

Figure 7: Patent Nr.315516
split ring connector

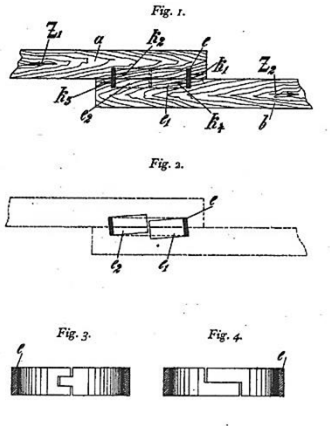

Figure 8: Complementary
patent Nr.330767

In 1918, Samuel Voss the company Chief Engineer registered a patent for a flat iron split ring connector under his wife’s name. The Tuchscherer company took over the patent in 1919. Ring grooves at that time were not always exactly milled but this split ring connector could ovalise under stress and catch the inner and outer edges of the groove. A higher load transmission of 1.5 to 1.75 was possible than with an unsplit non ovalising ring connector. It reacted well to

wood shrinkage too (Lewe 1920, Nenning 1927). Carl Tuchscherer registered a complementary patent in 1919. This prevented the split ring connector tilting when subjected to tension force through a pin-like spread of the slit.

The split ring connector was positioned precisely according to static calculations and with little drilling or milling. The result was far greater traction efficiency than traditional carpentry methods. The "Geschlitzte Ringdübel Patent Tuchscherer" provided the company with an extremely powerful and at the same time economical joining technique. Now they were able to build any timber truss shape, instead of parabolic shape, where previously only iron had been possible due to the high forces in the joints. The company produced not only rectangular and triangular shapes but also the mansard truss shape. Compared to the parabolic one this shape was more economical to produce as the upper cord was completed with few straight timber elements and the web members could be arranged so that few material-intensive struts were necessary. Furthermore this form allowed skylights in the middle or windows on the sides and therefore more beneficial light and ventilation.

DEUTSCHE HOLZBAU-WERKE CARL TUCHSCHERER AG, OHLAU

Industry and state railways needs were high in the years after the war. Construction with timber was booming owing to the lack of iron and cement and also the scarcity of expensive coal necessary for their production. Carl Tuchscherer sourced his wood relatively cheaply from the Silesian hinterland. The company was now averaging about 60 construction projects a year. On account of the healthy order books they could expand. Numerous branches were opened in Germany as well as in Vienna, Prague and in Sweden.

Figure 9: Headquarter in Ohlau
(Estate Tuchscherer)

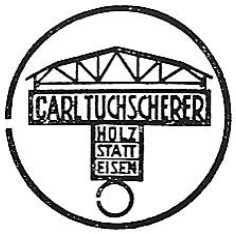

Figure 10: Company logo
(Tuchscherer 1922)

In 1920 the company headquarter was moved from Breslau to the more southern Ohlau on the Oder. They had rail and harbour access here and they operated under the name „Deutsche Holzbau-Werke Carl Tuchscherer". The new company logo displayed the split ring connector in abstract form and the mansard truss together with the company motto "Wood for Iron." It became a public limited company with the same name in 1921.

The increasing size of the company required commitment in higher federations and commissions. From 1920 Carl Tuchscherer was on the Board of the newly founded "Deutschen Holzbau-Vereins" (Federation of Timber Construction) and Chief Engineer Samuel Voss worked on the timber building standards committee.

A five-bay hall still standing in Glückstadt north of Hamburg has to be representative for the numerous hall constructions during this phase. This locomotive hall with a roof structure from the end of the 19th century consists of iron trusses with a span of 5 m for both side sections and

17 m for the central section. For the 1921 extension Carl Tuchscherer company used timber trusses in the same form and with the same layout demonstrating the company motto in a convincing fashion.

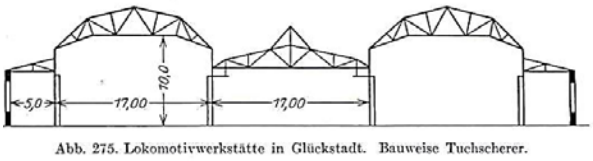

Abb. 275. Lokomotivwerkstätte in Glückstadt. Bauweise Tuchscherer.

Figure 11: Cross section locomotive hall
(Kersten 1926)

Figure 12: "Wood for Iron"
(Photo Buchmann)

CARL TUCHSCHERER AG, OHLAU/BRESLAU

The end of inflation and the reorganisation of reparation payments according to the Dawes Plan of August 1924 led to increased investment at a municipal level in Germany. This was triggered by foreign bonds, in particular from the USA. Tuchscherer managed to gain orders for large public halls. In quick succession and within only one and a half years the Carl Tuchscherer AG, renamed in 1925, carried out four very large projects with well known architects. These shaped the picture of engineering timber construction for the general public and expert circles (Platz 1930, Hilberseimer 1931):

In 1924 the Haus der Deutschen Funkindustrie (House of the German Radio Industry) (three-hinge arch, span 22.30 m) was built together with architect Heinrich Straumer on the future exhibition site in Berlin. Exhibition halls followed in Breslau (two-hinge arch combined with truss, span 37 m) with architect Max Berg and in Gelsenkirchen (two-hinge portal frame, span 43.50 m) with municipal architect Hermann Grage. In the autumn of 1925 the Westfalenhalle in Dortmund was completed within only seven months. The hall was planned with architect Ludwig Moshamer, a former colleague of Max Berg, and the city planner Dr. Delfs.

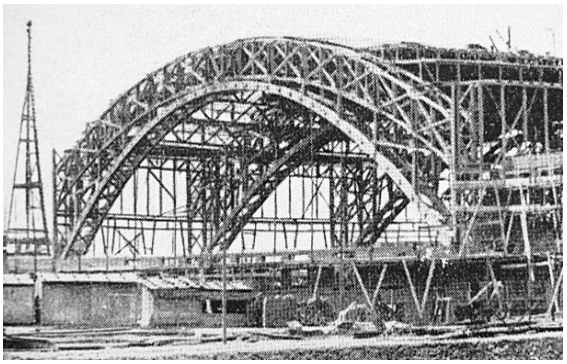

Figure 13: Westfalenhalle under construction
(Tuchscherer 1933)

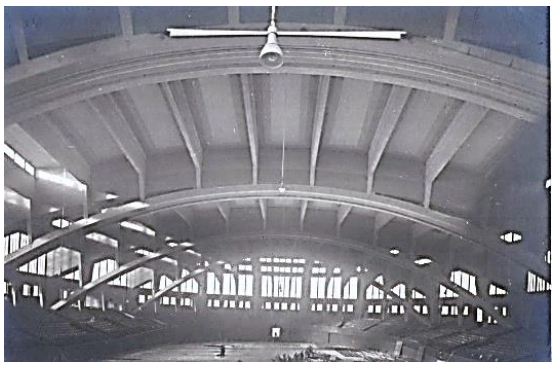

Figure 14: Interior view
(Tuchscherer 1933)

At a length of 110 m and a width of 86 m it was the largest timber designed hall in Europe at that time. It provided room for 12.000 visitors and although largely planned for sports events

held fairs and exhibitions too. A 200 m long dismountable cycling track for the 6 Day Racing event, so popular in the Ruhr defined the oval layout of the hall.

The main supporting structure in the transverse direction of the hall consisted of two-hinge arch with a cross section of 60/50 cm combined with a truss at a height of 3.41 m. Both supporting structures were arranged in pairs in four axes at a space of 20 m apart and had a span of 75 m, unattained at the time in timber design. The arch consisted of twelve horizontal screwed planks bearing the complete load with a favourable pitch of approximately 1/5 of the span. The slightly curved truss with a height/span ratio of approximately 1/23 stabilized the arch.

The secondary supporting structure lengthways was formed by trusses at a height of 2.20 m. They came to an end above the semicircular end spans of the hall in longitudinal half portal frames optically limiting the space. Apart from the arches all supporting elements were clad.

"The structure itself carries the idea of space. It does not serve the space, but rather defines it" wrote the architect Ludwig Hilberseimer in 1931. He was describing the visible timber structure above the council chamber of the Palazzo della Ragione in Padua from 1420. In the hall designs of his own time and with modern timber engineering he saw a continuity of this same architectural philosophy. The wide spans of the hall timber structures created by the Carl Tuchscherer company he describes as "large constructions of rare boldness and innovative effect." (Hilberseimer 1931)

CARL TUCHSCHERER BAUUNTERNEHMUNG GMBH, BERLIN

Contracts from the state railways which made up a large part of the turnover ceased from 1925. An abrupt fall in orders from municipal authorities for halls, fierce competition and depressed prices forced the Carl Tuchscherer AG into liquidation in 1926. With the proceeds from the sales of his foreign companies and still in possession of his patents Tuchscherer founded the Carl Tuchscherer GmbH, Berlin in 1926. He extended his business areas into brick and reinforced concrete constructions in answer to different market needs. The company then completed larger buildings still in existence today: in 1927 a residential building (architect Harry Rosenthal) in Berlin-Schmargendorf, in 1930 the Hospital St. Antonius (architect Felix Angelo Pollak) in Berlin-Karlshorst und in 1931 the Grundschule (Primary School) am Weißensee (architect Reinhold Mittmann) in Berlin-Pankow.

Further timber projects were carried. Together with the architects Fritz Schupp and Martin Kremmer Carl Tuchscherer GmbH built two churches, 1928 in Berlin-Niederschönweide und 1930 in Berlin-Lichterfelde. Most halls built at that time were of medium to small size. Continuing in the tradition of large halls the extension was built to the Haus der Deutschen Funkindustrie (House of the German Radio Industry) (architect Julian Ballenstedt). A two-hinge arch at every 12 m with a height of 1.12 m that spanned a width of 40.10 m.

The Great Depression at the end of the 1920s and the ensuing unstable economic and political situation led to further insolvency, refounding and finally to the end of the Carl Tuchscherer company. Owing to diverging interests between local government and political parties in September 1934 the town of Goslar cancelled an order for a municipal hall with a timber arch of 42 meters span. The company again became insolvent and went into liquidation.

Carl Tuchscherer committed suicide on 26.9.1934. Parts of the company were carried on under different names by former employees. The patent for the split ring connector was sold to an American company.

CONCLUSIONS

During Carl Tuchscherer's training as a carpenter and architect at the end of the 19th century, timber design was still dominated by traditional carpentry methods. Following a short period as an independent building contractor for brick and stone constructions Tuchscherer acquired knowledge about building large timber structures as an employee at two timber construction companies. In his own firm from 1911 he concentrated more and more on timber design. His patents for the "Tuchscherer Wide Span Roof Construction" and the "Tuchscherer Split Ring Connector ", based on scientific findings in statics and material strength enabled his company to build a large number of halls. The structures of these halls were a contribution to the technological development of timber construction, craftsmanship to engineering. Some of the halls with their wide span structures had impressive interiors. They shaped the beginnings of modern timber engineering. Almost all of these halls were destroyed. Only two halls could still be found in existence but they are threatened by collapse or demolition. Do any more halls still exist? Other unanswered questions relate to the management of such large projects by the company. How did they organise manufacture, transport and assembly?

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