

## The Dramatic Beginnings of Modernism in Poland or Kraków's Trouble with *Ferroconcrete*

Waldemar J. Affelt

*Among the earliest modernist buildings constructed in Poland prior to 1914 was the Museum of Industry and Technology in Kraków, which combined elements of applied arts by Józef Czajkowski and Wojciech Jastrzębski with an early-modernist structure designed by Tadeusz Stryjeński.*

*The latter, one of the most prominent figures in the first generation of Polish modernists, deserves a bit more credit than he has received so far.*

Andrzej K. Olszewski<sup>1</sup>

### Introduction

A few years ago we were reminded of the Stryjeński surname on the occasion of a monographic exhibition shown in the national museums of Kraków, Warsaw and Poznań and dedicated to the work of Zofia (1891-1976), wife of Karol (1887-1932) and Tadeusz's (1848-1943) daughter-in-law. Tadeusz was the son of Aleksander Stryjeński (1803-1875), a military engineer, graduate of the Corps of Cadets in Warsaw, the Corps of Cadets in Kalisz and the School of Artillery and Engineering in Warsaw, who, after the suppression of the November Uprising (1830-1), left the country and settled in Switzerland. Tadeusz, born in Carouge near Geneva, did not arrive in his native country or – to be more precise – in Kraków until he was 28 years of age<sup>2</sup>. It was in Kraków that his son Karol was born. Following in his father's footsteps, that is, through Zurich and Paris, Karol pursued a diploma in architecture, too. Among his many professional successes, one of the most spectacular certainly was the *Wielka Krokiew* ski jump in Zakopane, which opened on 22 March in 1925. The same year – from 25 April until October – people could visit and admire the Polish pavilion of *l'Exposition Internationale des Arts Décoratifs et Industriels Modernes* in Paris, with its Art Deco interior designed by Karol and walls decorated with Zofia's paintings. Thus, with their significant contribution to Polish culture and art, the Stryjeński family once played a very important role.

Tadeusz Stryjeński arrived in Kraków with impressive foreign academic credentials and international work experience; in the years 1874-77 he worked in Lima as an architect appointed by the Peruvian government, having arrived there with a group of educated Poles recruited by Polish engineer Edward Jan Habich (1835-1909), a graduate of *Ecole des Ponts et des Chaussées* and founder of *Escuela de Construcciones Civiles y Minas del Peru*, who, persuaded by engineer Ernest Malinowski (1818-1899), a brilliant

designer and builder of the Central Trans-Andean Railway, had also decided to leave the country and live and work overseas. A seasoned and versatile construction practitioner, Stryjeński soon established a design office and construction company with which he began his conquest of the investment market in Kraków. His main advantages over the competition were a knowledge of the latest developments in the field, his business acumen in property development and readiness to take risk. Therefore, it is no wonder that it was Stryjeński who has been given credit for the introduction of reinforced concrete – a material that brought a revolutionary change to the practice of architecture and construction in the early twentieth century. Even today one can admire the earliest examples of how reinforced concrete beams and floor slabs were used inside the former building of the *Stary* (Old) Theatre in Kraków (1904-6) when its first floor was converted into a large concert and dance hall and smaller rehearsal rooms, while the ground floor was turned into a restaurant and shops. A few years later the creators of the 1903 reinforced concrete "premiere" commented on the event in the following way:

"All the floor constructions as well as those of the balcony have been made of ferroconcrete (as reinforced concrete was called at that time) after the system introduced

1. Kraków, *Academy of Fine Arts Faculty of Industrial Design: plaque with the name of the original user of the building put up on the façade. Photo by W. Affelt*



1. Olszewski Andrzej K., *Nowa forma w architekturze polskiej 1900-1925*, Wrocław-Warszawa-Kraków: Ossolineum 1967, p. 70.

2. See: Orłowski Bolesław, *Dwusetna rocznica urodzin Aleksandra Stryjeńskiego (1804-1875), współtwórcy pierwszej nowoczesnej mapy Szwajcarii*, "Przegląd Geodezyjny", 2004, No. 9 pp. 22-23, and Orłowski Bolesław, *Współtwórca nowoczesnej Szwajcarii*, "Przegląd Techniczny", 2004, No. 23, pp. 28-29.



2. Kraków, Academy of Fine Arts Faculty of Industrial Design: façade at 9 Smoleńsk St. Photo by W. Affelt

by Jäger of Zurich, which turned out to be an extraordinary means of solving the problem of larger floor spans. With its main and secondary beams, such a construction often offered ideas how to solve problems with ceiling divisions. (...) The greatest difficulty was load distribution on the walls which were meant to have door openings, air heating vents and openings for ventilation put through. Due to the number of floors and the large span of the building, the middle wall dividing the foyer from the small room in particular was to suffer the weight of five storeys, 9 metres in length on both sides of the wall. Here again the ferroconcrete floors proved to be an excellent means because they distributed the load evenly over the entire surface of the wall; a certain misalignment of the lower openings caused a serious difficulty, however.<sup>73</sup>

The Chamber of Commerce and Industry at the intersection of Długa and Basztowa streets, called *Dom pod Globusem* (House under the Globe) turned out to be another spectacular success. The construction work on the building designed by Tadeusz Stryjeński and Franciszek Mączyński (1874-1947) started in July 1904. The plan was to have the project completed by October 1905; the architect advised, however, "not to put the building into operation before 1 January 1906".<sup>4</sup> It seems that this additional time was needed for the concrete generously used in the construction of flat-slab floors on the ground floor and the reinforced concrete beam floor above the two-storey-high assembly room to dry out. Another person of note involved in the interior design of the building was Stanisław Wyspiański (1869-1907), a famous Polish playwright, painter and poet, as well as an interior and furniture designer, in whose artistic career Stryjeński took an active interest.

It was the new building to house the Museum of Industry and Technology in Kraków, however, that was to become the crowning achievement of building construction.

3. See: Nowacki Kazimierz, *Architektura krakowskich teatrów*, Kraków: Wydawnictwo Literackie 1982, p. 251.

4. More detailed information on this and other particulars can be found in the monograph study: Beiersdorf Zbigniew, Purchla Jacek, *Dom pod Globusem*, Kraków: Wydawnictwo Literackie 1988.

At that time Stryjeński already held the title of Imperial and Royal Building Adviser; he was also a city councillor. In 1906 he took part in a debate on the idea of the new museum, writing:

"Every average citizen of Galicia is surrounded by trash from Vienna, buys German appliances, American shoes, etc. Local craftsmen complain about the lack of appreciation of Polish products, while artists and persons of good taste have this annoying symptom of developing a general taste according to German models of inferior quality, professing the ideal of a second-class Viennese café. It is a disgrace to us that we cannot counteract this trend effectively enough. For several years now our newspapers have been printing such appeals as: "Support our domestic industry!" Unfortunately, however, they continue to sound like a voice crying in the wilderness. Therefore, it is the ultimate task of our institution of arts and crafts to support these ideal appeals by giving practical assistance and creating a *modus vivendi* for local creativity, a rational creativity applied to meet our needs, and one matching our modest resources."<sup>5</sup> This declaration resounds with echoes of such modern movements as English *Arts and Crafts*, German *Bund für Heimatschutz*, French *Art Nouveau* and Belgian *La Libre Esthétique*.

This media campaign brought the desired effect: Stryjeński was appointed Director of the Museum (under construction) and was able to simultaneously control the process of its functional and operational programme, design and execution. The question of the building's location was solved in March 1907, when the city bought a plot at 9 and 11 Smoleńsk St. Stryjeński then went on a study tour including visits to Lviv, Graz, Klagenfurt, Linz, Prague, Nuremberg,

5. Stryjeński Tadeusz, *Instytut Sztuki i Rzemiosł w Krakowie* (printed by the author), reprint of "Czas", Kraków 1906, Library of the Academy of Fine Arts in Kraków, catalogue No. 12272.

3. Kraków, Academy of Fine Arts Faculty of Industrial Design: the main staircase; ferroconcrete pillar supporting the landing and "softly" transformed into a diagonal beam supporting a flight of stairs. Photo by W. Affelt





4. Kraków, Academy of Fine Arts Faculty of Industrial Design, reading room; floor structure as viewed from below: secondary beams resting on main beams which rest on posts adjacent to pillars between windows. Photo by W. Affelt

Bern, Liberec, Trieste, Gorizia and Opava.<sup>6</sup> It is not surprising that he wanted to give Kraków a truly modern edifice, using the most advanced technologies in building construction and the most modern architectural form. And so it happened, however...

#### **New building for the Museum of Industry and Technology in Kraków**

The local daily *Czas* in its evening release of Friday 9 December 1910 reported on the construction of the new building – meant to house the Museum of Industry and Technology – as well as the Institute for the Promotion of Handicrafts and Industry as follows: “The three-storey building has been completed. The front wall made of cut stone is still covered by a network of scaffolding from behind which lurks an already-made inscription specifying the purpose of this three-storey building. The roofs have been tiled and chimneys built; at the back window frames have been set and rooms on the first and second floor fitted out.

The ground floor was occupied by fitters responsible for interior installations, who stored their tools there. Because of the bank holiday yesterday, the building was completely empty. The workers had their day off; the fitters went out. Around 5 p.m. a watchman noticed some cracking in the wall; the process accelerated, foretelling an impending disaster which could not be prevented because of the imminent danger of the building’s collapse. In that situation any access to the building was impossible. The catastrophe occurred after 10 p.m., amid the roar of broken beams, falling roof framing and floors.(...) The entire back wall collapsed, from its ground-floor part, through the first, second and third floor over a length of 9-10 metres and a height of 16-18 metres. At the bottom a torn semicircular

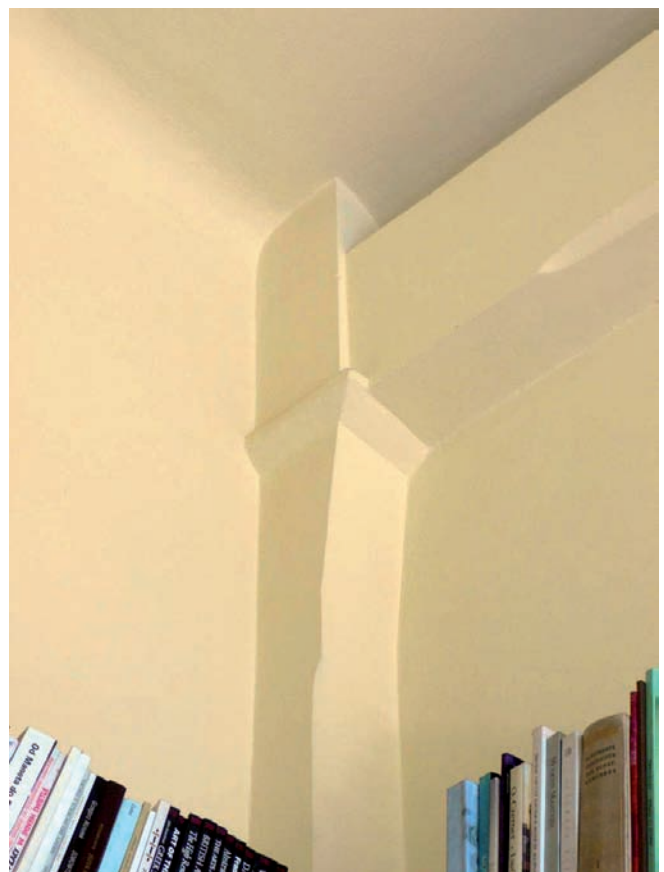
6. Lameński Lechosław, *Gmach Muzeum Techniczno-Przemysłowego w Krakowie i jego twórcy*, [in:] *Mit. Symbol. Mimesis. Studia z dziejów teorii i historii sztuki dedykowane Profesor Elżbiecie Wolickiej-Wolszleger*, Lublin 2009, pp. 269-290.

gap reaches deep into the ground floor. (...) This view is indeed amazing; next to the ruins parts of the building made of excellent material stand intact. Experts firmly rule out any further collapse of the building now or in the future, and argue that it is enough to correct the error during reconstruction to ensure the durability of the building. The Municipal Council – as we are informed – is going to launch an inquiry into the causes of the building’s collapse. The construction was led by the Building Adviser Tadeusz Stryjeński; the masonry work was performed by Messrs Wilczyński and Kramarski – construction entrepreneurs.”

Dark clouds gathered over Stryjeński’s career. Documents held by the State Archive in Kraków allow us to recreate the case, whose most severe consequence was an order to pay back to the municipal purse advances paid because the local authorities claimed that they had obviously not been presented with the work commissioned. The architect appealed from the decision, arguing that such a large sum would ruin him. Also other news releases informing the general public about the architect’s comedown, his removal from the post of the director of the museum and from the construction project itself must have been equally distressing to him. Nevertheless, what we can see inside the building today – at the Faculty of Industrial Design of the Academy of Fine Arts in Kraków – is undoubtedly Stryjeński’s work, whereas the decoration of the building’s façade was created by artist and designer Józef Czajkowski (1872-1947).

A municipal commission that was appointed immediately after the collapse conducted site inspections on 14 and 17 December. The post-inspection report included the following: “the large arched opening in the wall parallel to the front wall does not need to be so large and its pillars rest on the lower opening; (...) the part of the building next to the

5. Kraków, Academy of Fine Arts Faculty of Industrial Design: room interior (possibly after alterations have been made), detail of the main beam support on a pillar; the shape of the edge of the ferroconcrete elements mimicking traditional carpentry woodwork is worth noting here. Photo by W. Affelt





6. Kraków, Academy of Fine Arts Faculty of Industrial Design: detail of the massive ferroconcrete floor structure; what draws attention here is the shape of the edge of the ferroconcrete elements mimicking traditional carpentry woodwork. Photo by W. Affelt



7. Kraków, Academy of Fine Arts Faculty of Industrial Design: rear elevation, detail of the reinforced concrete beam of a window lintel with a visible loss of the concrete covering of a rebar; this might be interpreted as a result of poor workmanship or corrosion caused by the lapse of a hundred years. Photo by W. Affelt (as of June 2009)

stone staircase has unevenly distributed windows; therefore, the entire weight of the masonry pillar between the windows starting from the ground floor rests on the basement window lintel beam; (...) designs for the installation of the heating system involved chiseling grooves for piping-in low strength pillars; what is more, the concrete beam slip blocks are so damaged by drilling in many places that the beams have no support to bear the floor load. (...) The next step was to peruse the ferroconcrete floor plans only to see that they were poorly designed because the assumed floor load was calculated at 300 kg/1m<sup>2</sup>, which applies only to residential but not public buildings.<sup>77</sup>

On 21 January 1911 Franciszek Zuliani, a contractor responsible for the ferroconcrete works in the construction of the ill-fated building, addressed to "the Illustrious Municipal Council of the Royal-Capital City of Kraków" a request for payment of the amount due, supporting his claim with the following: "the report by the Honourable Experts did not show any instance of defective work performed by me."<sup>78</sup>

On 16 September 1910 he had submitted to Stryjeński an offer to construct a ferroconcrete upper floor in the library with an area of 6 x 25.45 m, with an assumed load of 600 kg/1m<sup>2</sup> and its structural elements comprising the following:

- 6 ferroconcrete main beams with a 20 cm / 27 cm cross section with inverse brackets – not overloaded at their ends to be laid across the building;
- 3 ferroconcrete secondary beams with a 15 cm / 15 cm cross section running along the building and supported by the main beams;
- one ferroconcrete slab 8 cm thick.

Very cursory calculations of the abovementioned construction elements, including 14 lines of text and some mathematical formulas, were attached to the offer. The cooperation between Stryjeński and the subcontractor was far from smooth. In a surviving letter of 13 August 1910 addressed to Zuliani, the site manager wrote:

"You are requested to dismantle and repair as soon as it is only possible the floor structure above the third level of the staircase that has cracked because of faulty workmanship and also because its slab formwork has been removed; if you fail to do so, I shall be forced to inform the Authorities."<sup>79</sup> Other archival documents are related to payment issues between Zuliani, Stryjeński and the Municipal Council.

### The end crowns the work

In his letter dated 23 June 1911, the Mayor of Kraków informed Stryjeński of his decision to release the architect from the obligation to manage the construction of the Museum, to which he received Stryjeński's answer, addressed "to the Most Honourable Mayor of the City of Kraków" on 30 July 1911: "I do acknowledge your releasing me from the obligation of further managing the Museum construction project: and I am prepared to give back all the files relating to this project on condition that an agreement terminating our cooperation is drafted and mutual payments are settled in a way that will release me from any future responsibility for the construction work executed under other management and supervision".

The construction site was taken over by engineer Zygmunt Nowicki, Senior Construction Inspector employed by the Municipal Council, but as is clear from the letter that the entrepreneurs J. Wilczyński and A. Kramarski – builders in Kraków wrote to the Municipal Council of the Royal Capital City of Kraków on 4 July 1911, no construction work was resumed at that time. A similar state of uncertainty continued until the following spring, which is confirmed by the "Minutes of the meeting of the Committee for the Construction of the Museum of Industry and Technology in Kraków" recorded on 20 May 1912. Soon the construction and fitting-out work resumed under the leadership of the newly-appointed Director of the museum, Imperial and Royal Construction Adviser Ernest Till (1846-1926).

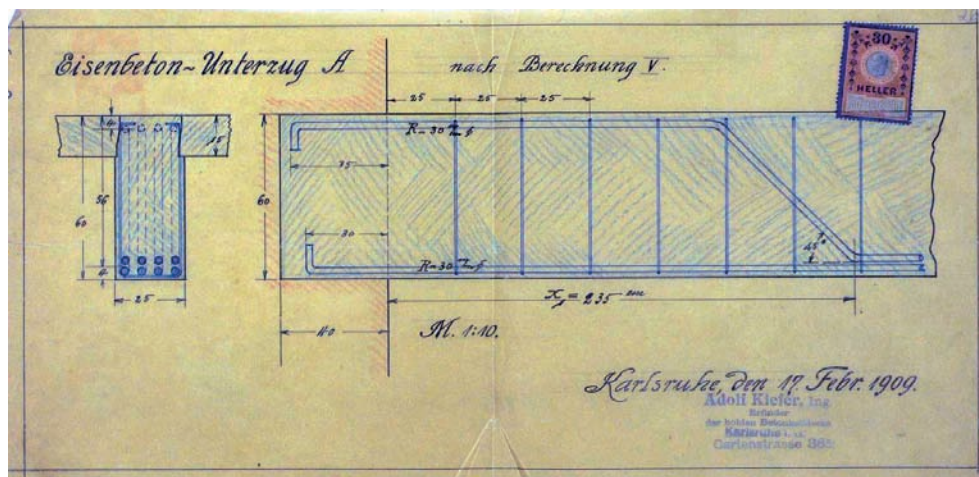
The process of adjudicating on the causes of the disaster and deciding on the necessary remedial steps to be taken in order to continue the project took a long time. The following experts were involved in the process: Dr. John Bogucki, a professor of the Technical University of Lviv, then bearing the name The Imperial-Royal Polytechnic, and Prof. Władysław Ekielski (1855-1927) as well as Prof. Maksymilian Thullie (1853-1939), also from the same *alma mater*, an undisputed international expert on ferroconcrete construction.<sup>10</sup> Because there were some discrepancies between Bogucki's and Ekielski's opinions, Thullie acted as a supreme authority who saw no irregularity as to the placement of the ferroconcrete lintel beams over the first-floor windows and the pillars between the windows on the second floor, whereas he claimed that, in the case of the

7. Archiwum Planów Budownictwa Miejskiego WAP Kraków/ Archives of Urban Construction Plans WAP Kraków, files of the property at 9 Smoleński St.

8. Ibid.

9. Ibid.

10. See: *Jubilaci Lwowskiej Szkoły Politechnicznej*, "Przegląd Techniczny", 1914, No. 8, p. 96; Thullie's pioneer works on ferroconcrete structures written in Polish in 1897-1905 were mentioned on the occasion of a laudatory celebration of Prof. Thullie's 35-year academic career.



8. Construction drawing in cross section and support of a ferroconcrete beam on the wall made by Adolf Kiefer of Karlsruhe in February 1909. Source: Archives of Urban Construction Plans WAP Kraków, portfolio of property at 9 Smoleńsk St. Photo by W. Affelt

lintel beams over the first-floor windows, “no calculations related to them were made during the construction process and that they were quite inadequately and inexpertly designed”. Concluding his report he stated: “...these figures themselves present irrefutable evidence as to the cause of the collapse, which was the cavalier attitude of the designers of this façade. The undersigned bases this grave accusation, which is absolutely objective and strictly factual, on: 1) the lack of static calculations over time as changes were introduced in the construction plans; 2) incorrect dimensioning of the beams (beams bearing more load had smaller dimensions and vice versa); 3) the circumstances that, while positioning the window axes, as can be easily seen, only their horizontal projections or, maybe, a desire for a variety in the positioning of windows of dubious artistic value, were taken into consideration; what was not taken into account, however, was the most elementary principles of statics and construction, which compel us to adapt the construction according to the weight of the anticipated load” (underlined as in the original).

The suit against Tadeusz Stryjeński brought to court by the Municipal Council of the Imperial and Royal City of Kraków had its finale as late as the autumn of 1912. How the case was conducted in a way typical for Kraków judicial practice is well illustrated by the following entries from the construction site logbook<sup>11</sup>:

- Monday 9 December: Mr Stryjeński’s company prepared 50 kg sandbags, the individual weight of which was checked in the presence of the site engineer, Superintendent Nowicki; scaffolding under the floors whose load-bearing capacity was to be checked was prepared; master builder Mr Lipiński was entrusted with the task;

- Tuesday 10 December: on the first floor 50 kg sandbags were weighed and put against the wall next to the rehearsal rooms. Scaffolding was mounted under the ceilings to be tested. At 10 p.m. load-bearing tests were conducted in the presence of His Magnificence the Rector of the Lviv Polytechnic Mr. Thullie, the court expert Prof. Ekielski, site manager superintendent Nowicki, construction assistant Ostrowski, Building Adviser Stryjeński, deputy contractor to Mr. Zuliani – Mr. Pawlik; Mr. Stryjeński’s assistant – Słowik. The tests were partially completed by half past two p.m. The floor slab in section D above the mezzanine was burdened with a load and left like that until the following day.”

As seen from the above, the protagonists of this story all contributed to the completion of the project. The Museum finally opened on 23 February 1914.<sup>12</sup> At that time the way it was built was no longer a novelty because Warsaw could already boast of the building of Ludwik Spiess and Son Joint-Stock Company with a ferroconcrete framework constructed by engineer Gustaw Trzciniński after a design by architects Franciszek Lilpop and Karol Jankowski. In the Powiśle district

of Warsaw, the monumental ferroconcrete arches of the overpass of the Poniatowski bridge demonstrated both the structural and aesthetic possibilities of this construction material. Also German market halls (1906-8) and the Centennial Hall (1911-13) in Wrocław – an early ferroconcrete masterpiece in terms of the size and scale of the project – are certainly worth a mention here.

### Conclusion

Today, a hundred years after the event, one should not fail to step into the Kraków Academy of Fine Arts Department of Industrial Design at 9 Smoleńsk St. and marvel at what arose out of such an upheaval. What immediately strikes you is the slenderness and elegance of the main staircase, and – in the reading room – the finesse with which the ferroconcrete beams are arranged and made to look like a wooden structure, with bevelled edges and cuts when they meet their supports.

In addition to various analyses related to the stylistic and artistic value of this edifice showing its erstwhile innovative character, it is worth noting that the dramatic events connected with its completion marked the beginning of the separation between the two professions: the structural engineer and the architect.<sup>13</sup> The latter no longer had sufficient knowledge of the ferroconcrete mechanics and technology to be able to cope with the complex issues related to how to model its structure and performance, adopt the appropriate static scheme, calculate and dimension the structural elements. The management style dating back to mediaeval craftsmanship that seemed to prevail at the new Museum construction site rendered the efficient implementation of the project impossible, probably because of the lack of proper quality labour management. There was no person at the site who is today referred to as project manager, while architect Stryjeński had no qualification to act as one. Alongside the documents already mentioned, the surviving archival material also includes static calculations by Tadeusz Niedzielski and engineer Alfred Alexander of Lviv (dated August 1912) and draft calculations and drawings by Adolf Kiefer of Karlsruhe (dated February 1909). It was a common belief then that a building can be somehow made up of a variety of different elements, separately conceived and designed, whereas a building should in fact be perceived as a whole; after it has been built it behaves as a uniform structure which transfers and redistributes loads in its own way.

Taking the above into consideration, it is worth taking a closer look at Krakow’s problems with ferroconcrete – problems which its main victim was able to overcome; Tadeusz Stryjeński continued running his one-person business, notwithstanding his difficult situation, taking on

11. See: Archiwum..., op. cit. item. 9.

12. Lameński Lechosław, *Gmach Muzeum Techniczno-Przemysłowego...*, op. cit. item 6.

13. Olszewski Andrzej K., *Nowa forma...*, op. cit., pp. 70-73.



9. St. Mary's Church in Kraków, polychrome portrait sculpture of Tadeusz Stryjeński, leading the restoration works there in the years 1887-91, made according to a watercolour design by Jan Matejko (1838-93) and placed inside on a corbel under the high vaulted ceiling ogee at the side entrance from Mariacki Square. Photo by W. Affelt

new challenges.<sup>14</sup> Together with Wojciech Jastrzębowski (1884-1963), Stryjeński reconstructed a church damaged during World War I in Radłów, set up „Spółnia Budowlana Stryjeński – Mączyński – Korn” a limited liability company specializing in industrial construction, drew designs for an enormous office and commercial building commissioned by *Bazar Polski* and numerous residential buildings in Kraków;

14. See: Lameński Lechosław, *Z dziejów środowiska architektonicznego Krakowa*, [in:] Grygiel Tomasz (ed.), *Architektura XIX i początku XX wieku*, Wrocław-Warszawa-Kraków: Ossolineum 1991, pp. 34-37.

he also participated in architectural competitions. As time passed, progressive glaucoma forced him to work less, and finally to stop working altogether. His Swiss citizenship was very helpful to him, his daughter-in-law and grandchildren during World War II. A tomb he had designed himself many years before became his final resting place in 1943.

At the Sixth Congress of Polish Engineers in Kraków in 1913 engineer Czesław Kłose, started his paper, saying<sup>15</sup>: “While preparing a design the architect does not always give as much attention to concrete as this building material deserves. This might be partly because the idea of working in ferroconcrete is quite new and, in our country at least, has not yet been generally embraced by wider circles of architects, and, partly or even first and foremost, because the inevitable lack of specialist knowledge leaves the architect helpless against the new material, at the same time, making him question the durability and strength of the structure to be built.” In his concluding remarks, he said: “I want to mention a certain pest doing damage to ferroconcrete: the fitter of conductors, pipes, etc. Fitters have a tendency to pierce ferroconcrete just where the engineer is particularly interested in robustness and quality. With great skill they undercut supports, cut into the pillars, saw through floors and ceilings in any direction. More often than not the engineer specializing in concrete building is not notified of this damage and only sees the horror of the ravages when he visits the site after the work has been completed. It is only because of the great indestructibility of ferroconcrete structures that disasters caused by such abuses are not a common occurrence. Ferroconcrete structures will gain nothing through such practices, after all. Therefore, I appeal to my esteemed colleagues, who have some influence on the process of execution of such works, to make sure that they are carried out according to the principles of statics and the nature of ferroconcrete elements.”

These words might have been a reminder of the assessment of the events at the construction site of the Museum of Industry and Technology in Kraków that occurred on 8 December 1910...

15. Kłose Czesław, *Beton lub żelazo-beton w zastosowaniu przy budowlach miejskich*, “Przegląd Techniczny”, 1913, No. 14, pp. 171-172.