Notes

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02. GUTIERREZ, Ramón, *Historia de la arquitectura del Paraguay 1537-1911,* Editorial Municipalidad de Asunción, Asunción, 2010, p. 51.

03. VERA, Salo, *El paraguayo (un hombre fuera de su mundo)*, Asunción, Paraguay, Editorial El Lector, 1996, p. 77.

04. MIRANDA, Estelbina, *Artesanías tradicionales del Paraguay, Análisis cualitativo y descripción socioeducativa de sus productos,* Asunción, Paraguay, Editorial Facultad de filosofía Universidad Nacional de Asunción, 2001, pp. 6-7.

05. VERA, Salo, op. cit., p. 112.

06. RUDOFSKY, Bernard, *Arquitectura sin arquitectos,* Buenos Aires, Argentina, Editorial Universitaria de Buenos Aires, 1976, p. 7.

07. PARRA, Nicanor, *Obra Gruesa*, Editorial Universitaria, Santiago, 1969

08. Extract from the conversation between Carlos Pita and the author of this article, in Asunción, on October 8, 2019. Recorded and transcribed document.

Images

01. "Slippers". The photograph has been captured during the construction process of the Coral housing of Grupo Culata Jovai. Source: © Federico Cairoli.

02. Texture of the prefabricated brick panels in the telethon children's Rehabilitation Center, work of the Gabinete de Arquitectura. The image shows the pouring of the mortar between the bricks and the appearance of the patina proper to the passage of time. Source: © The author of the article.

03. Harvest the mate in the ribera of Paraná, in Paraguay. Source: © Metal engraving by Hurel, drawing by Fuchs.

04. Bell Tower located in the mission of Trinidad, Paraguay. Source: © Adolfo Maria Friedrich.

05. Builder drinking terere under the shade. The photograph was captured during the rest time of the construction process of the Cootrapar Cooperative in Villa Hayes, a work by Elgué studio. Source: © Estudio Elgué.

06. "The hour of rest". The photograph has been captured during the process of the Ykua Bolaños Memorial, by Francisco Tomboly and Sonia Carisimo. Source: © Federico Cairoli.

07. "Slippers". The photograph has been captured during the construction process of the Coral housing of Grupo Culata Jovai. Source: © Federico Cairoli.

08. "Workman". The photograph has been captured during the work process of the Faculty of Architecture, Design and Art of the National University of Asunción, designed by the Gabinete de Arquitectura. Source: © Federico Cairoli.

09. "Portrait of a worker". The photograph has been captured during the construction process of the Takuru House of José Cubilla. Source: © Federico Cairoli.

10. Construction of the retaining wall of the Sotoportego House, work of the architectural laboratory. © Laboratorio de Arquitectura.

11. Fixing the ceramic panels with glue mortar, during the commissioning of the ceramic sunshade of the Clinic and Housing, Work of Estudio Elgué. Source: © Estudio Elgué.

12. Rest time during the construction process of the San Francisco House, of the Gabinete de Arquitectura. Source: © The author of the article.

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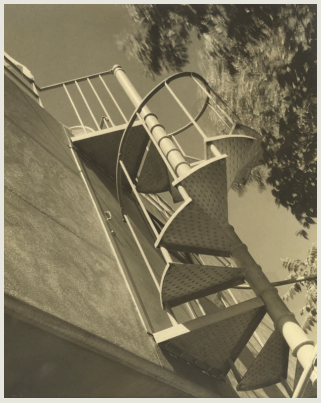
Pioneer materiality. Material Experimentation in the Domestic Architecture of A. Lawrence Kocher

Luis Pancorbo
Inés Martín-Robles

This text studies 3 architectural experiments developed, independently or associated with Albert Frey, by the North American architect A. Lawrence Kocher during the 1930's. These experiments were based on material innovation within the construction processes. The experiments were fostered by different industrial material producers to study the feasibility of the implementation of materials in the field of architecture: aluminum was tested in the *Aluminum House*, fabrics in the *Canvas Weekend House*, and Plywood in the *House of Plywood.* All of these buildings pioneered the idea of transforming the detached single-family house into a laboratory to experiment with materials produced by industries not traditionally associated with building technology. The later move by Albert Frey to the West Coast may have initiated a new chapter in material experimentation through the Californian residential architecture developed in the following decades.



CONTEXT. A. LAWRENCE KOCHER AND PREFABRICATION DURING THE AMERICAN GREAT DEPRESSION

The economic and social context in which this research is situated is that of the Great Depression, beginning with the stock market crash of 1929 and extending until the entry of the United States into World War II. Some of the effects of this crisis were a shortage of housing and impoverishment which put access to existing residential stock out of reach for many Americans. This condition resulted in the implementation of policies by public administrations and private industry that favored mass scale construction of housing, shortening construction deadlines and the reduction of costs. It is in this context that the figure of A. Lawrence Kocher takes a central role.

Kocher, who is usually overlooked by the critics analyzing his work in partnership with Albert Frey[1], was an accomplished scholar of both American vernacular architecture and modern industrialized construction[2]. Born in 1885 in San José, California, he studied history and architecture at Stanford, Pennsylvania State, MIT

and New York University[3]. Kocher had established a practice before his partnership with Frey and was the managing editor of Architectural Record magazine between 1928 and 1938. During this time, he transformed the magazine into a forum for modern architecture. Meanwhile, he also published numerous studies on American vernacular architecture[4].

Kocher remained open to a broad array of traditional and modern architectural precedents, while he advocated for modern architecture in his own designs prior to his association with Frey[5]. He was the author of a series of articles on standardized building element dimensions, minimal housing and prefabrication published in Architectural Record, some of which were written with Albert Frey.

Kocher's work as a pioneering pedagogue of the *Design-Build* concept is also relevant[6]. His teaching career includes the Pennsylvania State University, University of Virginia[7], Carnegie Institute of Technology in Pittsburgh, and Black Mountain College in Asheville, North Carolina.

Within the field of professional practice, Kocher can be considered one of the first modern architects of the East Coast for his works prior to his association with Frey, such as the Sunlight Towers or the Rex Stout house in Stamford (Connecticut) both of which were completed in the year 1929 and were designed in partnership with Gerhard Ziegler[8]. Finally, Kocher was a principal mediator and sponsor of the embrace of modern European architects in the American architectural field. His role as Frey's partner adds to his collaboration with Ziegler and coincides with his correspondence which facilitated Walter Gropius' arrival at Harvard.

The meeting between Kocher and Frey exemplifies the combination of two ways of understanding the interaction between industry and architecture that occurred in America upon the arrival of numerous European architects. The objective of the European Modern Movement could be summarized as a plastic experimentation seeking to obtain new forms and new architectural types compatible with new ways of life. The objective of design for European rationalists, and by extension for Albert Frey, is the architectural object itself and industrial production is subordinated to the demands of design. Industry would play a double role as facilitator of these formal experimentations and as an abstract reference for new forms. In contrast, American architecture until the 1930s, aligning itself with the rest of the country's productive activities, is an activity totally subordinated to industrial efficiency. From the formation of the American System of Manufacture to the arrival of Fordism, the focus of innovation shifted in America from the design of the object produced to the design of the production system[9]. Constant improvements in the means of production mean that the design objective ceases to be how to produce a better object and instead becomes how to better produce an object (faster, cheaper, in greater quantity)[10]. In an article about Kocher we can read the following quote in which he says that his objective as an architect, teacher and researcher is: "*Fact-finding investigation of the meaning of 'architecture' and 'the architect' with a view of discovering how architectural design may best be produced*"[11].

This quote indicates that Kocher's emphasis is on the means of production of architecture over design itself. The technical dimension of architecture occupies a preeminent place in all facets of its activity. His eagerness to experiment with new technological means and new materials guides both his professional practice and his writing and teaching.

The joint endeavor of Frey and Kocher produces a conceptual confluence that makes it especially valuable as the root of a new type of American architecture that is trying to answer two questions simultaneously: How to design new forms and architectural objects based on industry and how to optimize the industrial production of architectural objects based on design. Next, we study three built works by Kocher. The first two were designed in collaboration with Frey **(fig. 02)**.

ALUMINAIRE HOUSE

The first of the homes produced by Kocher and Frey is also the best known: *Aluminaire House* **(figs. 03-05)**. In 1930, A. Lawrence Kocher enjoyed a remarkable academic reputation and served as managing editor of Architectural Record. In September of that year, Kocher was commissioned to design a facility for the annual Architectural and Allied Arts Exposition, sponsored by the Architectural League of New York, to be held at the Grand Central Palace in New York in 1931. Kocher partnered with newcomer Frey for this job[12], and together they produced a single-family home to be displayed at full scale. The house was intended to be industrially reproduced at a cost of $ 3,200. It was conceived as a laboratory to test new materials, prefabricated systems of industrialized construction, and a series of reconfigurable spaces transformed by moving furniture.

A peculiarity that speaks of the condition of the *Aluminaire House* as a technical object[13], is that during the entire assembly process there was never any engagement with a construction company. The house was designed to be able to be assembled and disassembled in a short period of time. The architects coordinated different contractors who donated the materials for the work exhibited in New York. All these subsystems formed a technological collage in which all the joints were screwed together. The use of aluminum was promoted by the Aluminum Company of America. Aluminum was used in the visible structural elements; the rest were made of steel. Aluminum was also used as a facade cladding material and as a heat reflecting membrane beneath the exterior cladding and roof. The house pioneered the use of aluminum in all these applications and was also the first non-industrial building to use the Ferrobord-type folded steel decks. All of the building materials were donated by different industrial companies[14].

The different uses of aluminum in the house have few precedents in the history of architecture[15]. The first case of use of aluminum as a facade cladding is recorded in the Roman church of *San Gioacchino* (1890-1898) by the architect Raffaele Ingami, in which aluminum is used as an external covering for the dome. Aluminum was used by Otto Wagner in 1903 on the facade of the *Die Zeit* newspaper agency and in 1906 as an interior covering on the Vienna Savings Bank. In the United States, Francis Plym's patents for aluminum window frames were first established in 1905, and the aluminum frame progressively replaced wooden frames. As for the structural use of aluminum in the field of architecture, there is only one precedent built in the United States, the new spire for the Smithfield United Church, Pittsburgh, designed by Henry Hornbostel in 1926. Richard Buckminster Fuller produced his designs for the Dymaxion House (1929) prior to the *Aluminaire House*, but these designs did not actually materialize until after World War II with the Wichita House, which was constructed entirely of aluminum. The first prototypes of the aluminum monocoque caravan of the Airstream company were manufactured in 1936, 4 years after the *Aluminaire House*. However, aluminum had already been widely used in aircraft construction, especially in the structure of airships in the late 19th and early 20th centuries. Thanks to the invention of *Duraluminium* by Alfred Wilm in 1910, aluminum was established as a basic material in airplanes as well; from 1936 on, airplanes were built exclusively in this material[16].

The *Aluminaire House* has overall dimensions[17] of 28'-9"x22'-8" (8.76x6.91 meters) and a neat area of 102 m^2 excluding garage and terrace. It has 3 floors with a reduced distance between finished floors measuring 9 feet or 2.74 meters. The structure is made up of six 5" (12.7 cm) columns supporting double-C shaped aluminum beams which are 7" (18 cm) deep and 5-3/4" (15 cm) wide. The beams which are not exposed are made of steel. These main beams cover two 14'-10 "(4.52m) center spans with two 3'-2" (0.97m) side cantilevers. The joists cover 13'-4+1/2" (4.08 m). A prefabricated

flooring from Truscon Steel Co. called *Ferrobord*[18] with 1+3/4" (4 cm) depth, 8" (20 cm) width and 12 '(3.66 m) manufacturing length is laid on top of the joists. The floors were fire-protected with 1" (2.54 cm) wood fiber panels from Thermax Corporation. The walls are a mix of balloon frame and non-structural steel frame with 2"x2" (5x5 cm) wood and steel angle studs at a distance of 1 foot (30.48 cm) encased in a rigid insulating panel on each side of half an inch (1.27 cm) thickness. The interior finish was fabric and the exterior cladding was a waterproofed paper covered with corrugated aluminum sheets screwed to the insulating panels. The flooring was multicolored linoleum. All together the materials of the house are extremely light. The total weight of *Aluminaire House* is only 47,310 pounds (21,459 kilograms) including appliances, furniture, and mechanical systems[19].

The different stages of this itinerant home's existence are especially valuable to understand its character as an object which is more technological than architectural. To begin the story, we paraphrase the brief timeline offered by the architects in their candidacy for the *R.S. Reynold Memorial Award* 1960[20].

The project was developed by Kocher and Frey between November 1930 and April 1931. The house was assembled in the exhibition hall between April 11th and 18th 1931 and exhibited from the 18th to the 25th of that same month. It was dismantled in just 6 hours on April 26th, 1931. The house was next purchased by the architect Wallace K. Harrison and its disassembled pieces which had been numbered with chalk were transported in a single truck to a new location on Long Island. According to Joseph Rosa, the house was stored in the open air in its new location and a torrential rain washed off the chalk numbering. This incident increased the time and cost of the reconstruction, and it meant that the house was assembled in a way which did not guarantee structural stability[21].

The buyer of the house, Wallace K. Harrison, was a partner in Allied Architects, the firm which designed Rockefeller Center in New York. Harrison was later the designer of the Alcoa Building in Pittsburgh[22] (1953), which explored the possibilities of aluminum as building material. He may have been influenced by his experience as owner and occupant of the *Aluminaire House*. In 1931, Harrison and his wife Ellen purchased an 85-acre plot of land in Long Island. As they did not have enough money to build a new home, they chose a ready, cheap solution: encouraged by their friend Kocher, they bought the *Aluminaire House* for just $1,000. The couple lived in the reassembled house for 8 years until they could complete construction of their own, "permanent" residence. During the period of the Harrison's occupation, *Aluminaire* was the object of successive extensions, which also reflected the different phases of the new house's construction.

Having played its part as a "nursery home", *Aluminaire* was moved and reassembled on the slopes of a small hill elsewhere on the Harrison's land. Adapting it to the slope, it was used both as a guest house and for storage. It was allowed to deteriorate slowly over the course of more than 40 years. The Harrison property changed hands twice and *Aluminaire House* came to be forgotten and abandoned, until 1986, when a new owner asked for permission to demolish it. After a great media campaign led by Joseph Rosa, the house was purchased by the New York Institute of Technology. *Aluminaire* was disassembled once more, so that it could be restored to its original state and was then rebuilt in 1987 by professors and students on the campus of the NYIT School of Architecture in Central Islip, Long Island. In 2004, the NYIT sold the land and the house was donated to the *Aluminaire House Foundation* founded in 2010. In 2012, it was dismantled again and stored in a container. The foundation has long been seeking a new site for the house's reconstruction and the most recent plans for reassembly are set for 2020 in a park in Palm Springs, California.

The leaps in this migratory biography speak clearly of an industrial object that is completely alienated from geographical specificity, from constraints arising from a site, a climate or a given cultural medium. The *Aluminaire House* is not an architectural object; it is a technical object which, like an automobile, a motor home or a prefabricated house sold via catalogue, does not undergo any formal alteration due to its friction with a certain physical location. It does quite the opposite; a place must be transformed in order to allow the object to settle without modification, and measures must be taken to ensure that it functions correctly.

There are various characteristics which explain Aluminaire's constant fluctuation between assembly and disassembly, and they can all be classed as technological: experimentation with new construction materials, use of construction subsystems that are prefabricated and assembled in situ, its designed assembly with a low level of technical complexity enabling assembly by non-specialized workers, and a production process with interchangeable parts that are coordinated but independent.

Meanwhile alienation from the site does not suppose independence from tradition. As we have argued, the house is well situated in the contemporaneous line of American industrial and architectural research, which focused on portable housing. It also demonstrates the undeniable influence of Le Corbusier and Pierre Jeanneret. It is strongly linked to two of their residential works which Frey collaborated on most intensely: *Villa Savoye* and the *Loucheur* houses.

KOCHER CANVAS WEEKEND HOUSE

Subsequent to the positive media attention garnered by the *Aluminaire House*, Kocher received a commission from Charles Everett of the Cotton-Textile Institute to research the potentials of cotton as a building material. In 1932, Kocher and Frey presented two residential proposals for the *Cotton-Steel Houses*: one was for a weekend house and the other was a more conventional family residence comprised of five rooms. Both proposals shared a lightweight construction system and presented an exhaustive experiment in the use of cotton. The project description lists the uses of cotton within and enveloping the house: cotton is used as a waterproof finish for interior and exterior walls, as a finish for floors and ceilings, as a finish for doors, furniture, and banisters, and it forms both dividing curtains and awnings. Despite the project's original name, the structure depicted in the publications of the *Experimental Weekend House* **(fig. 06)** was comprised of balloon frame walls and wooden floor structures. The *Experimental Weekend House* was never built.

This theoretical exploration was accompanied by several proposals published in *Architectural Record* by the architects during those same years.[23] In the April 1934 issue of *Architectural Record*[24], Kocher and Frey published a project titled *Subsistence Farmsteads*, designed to be located on farms owned by urban or unemployed workers who would like to have a garden for their own consumption, which would not compete with productive farms. Regarding construction, Kocher and Frey proposed a wooden structure and used cotton intensively in a solution practically identical to the one proposed for the *Cotton-Steel Houses*. This project can be seen as a parallel experiment using the same construction systems proposed in the *Experimental Weekend House*. The *Experimental Weekend House* functioned as a prototype for the *Canvas House*, built on Long Island in 1935 as a vacation home for Kocher himself.

The *Canvas Weekend House* **(figs. 07-09)** had slightly more generous dimensions than the Experimental Weekend House. It featured a prefabricated spiral staircase which provided access to all floors. The structure was a near replica of its prototype, but it used 4" (10 cm) diameter steel columns to support a primary structure of wooden double beams. The exterior face of the balloon frame was enclosed using wooden boards arranged on the diagonal to provide lateral bracing. The walls were insulated with an intermediate layer of aluminum foil. On the interior walls were comprised of plywood

boards finished with cotton canvas. The exterior façades and roof were painted with lead paint and finished with water and fireproofed cotton canvas which, as seen in photos of the construction process, was applied horizontally from bottom to top and fixed with copper headed nails every 6" (15 cm). Images of the house's construction, published in Alfred Roth's book *The New Architecture*[25], show that construction of the deck was extremely conventional. The House made interesting use of color, which is described in various publications but is impossible to appreciate in the black and white photographs of the time[26]. The building's façades were painted with aluminum paint; the pillars and handrails were painted green; the window frames were painted red to match the color of the awnings; and the rooftop solarium was green to avoid the glare caused by the reflection of sunlight. In contrast, the materials on the interior were left in their natural state. This profusion of color was a completely distinctive trait of the house and contrasted with the sober monochrome palette of the *Aluminaire House*. This house was demolished in the 1950's.

The use of fabric in architecture is of course as old as the discipline, but the *Canvas House* is a pioneer in its use of textiles as waterproof material for facades and roofs. This use is an import from the nautical field, since similar solutions were already used on the decks of American navy ships in previous years[27].

HOUSE OF PLYWOOD

Following the pattern of collaboration between industry and architecture established by the Aluminaire and canvas homes, Kocher designed the *House of Plywood* for an exhibition entitled *The Town of Tomorrow* at the 1939 *New York World's Fair* **(fig. 10)**. The design was commissioned by the *Douglas Fir Plywood Association*. In this house he investigated the use of plywood as an architectural material. The construction was financed in the same way as the *Aluminaire house*; materials were donated by various companies that were listed in a promotional brochure. Although this house was not formally related to the previous projects developed by Kocher, it shares a common interest in prefabrication and material experimentation.

The use of plywood has parallel histories in Europe and in the United States. The first European patents were those of Otto Hetzer (1901 for straight beams and 1906 for curved parts). The use of the material became widespread in central Europe after the Universal Exhibition in Brussels in 1910. The patent reached to the United States in 1923 but had little success. The first building to use the patented material, a gym in Peshtigo, Wisconsin, was built in 1934.

Meanwhile, in the United States, the Portland Manufacturing Company had been manufacturing plywood doors and boards since 1905[28]. The market expanded into the automobile industry and grew into 17 plywood factories in the American Northwest producing approximately 33 million square meters of board per year. These manufacturers associated in 1933 forming the *Douglas Fir Plywood Association*, which struggled to survive until 1938, when they managed to market plywood as a standardized commodity rather than a collection of individually branded products. In addition, a new waterproof adhesive developed that same year resulted in approval of outdoor use[29].

It was at this time that the Douglas Fir Plywood Association commissioned Kocher to design the first of many demonstration houses for their products. Plywood house modeled the use ofsub-base for flooring and finishes (PlyScor), ceilings and walls (PlyWall), furniture panels (PlyPanel), and facade finishes (PlyShield).

The list of companies that donated other materials for the Plywood House included the Truscon Steel Company, which, supplied the steel sashes as it had done in Aluminaire and Canvas Weekend House. A further 1o companies, including General Electric donated materials and supplies.

The house was organized on one level and although modern, it was less radical than its predecessors. It had an L shape in which separate sides were devoted to day and night activities, leaving the access areas between them. The living area had a clerestory and greater height and was capped by the kitchen and a semicircular dining room. The program was more ambitious than in the previous houses; it included two bedrooms, one bathroom, a living room, dining room, kitchen and mechanical room. The estimated budget for the construction was between $ 4,000 and $ 5,000.

Since the 1939 New York World's Fair in which the Plywood house was exhibited, over a million houses have been built with dry-mount plywood systems[30]. This trend accelerated with the advent of World War II and restrictions on the use of other construction materials such as steel.

CONCLUSION

At the beginning of the text we have indicated the role of these houses as transmitters of the modern European tradition, especially of Le Corbusier's architecture, and as a means for its integration into the American industrial system, but we must also highlight their pioneering role in various other aspects.

On the one hand, these houses inaugurated the use of a series of materials from other fields into architecture. Aluminum, cotton canvas, and plywood were previously nonexistent or very minor materials in American construction technology. The Kocher and Frey homes opened up a new spectrum of application of these materials which results in numerous new applications.

On the other hand, the houses also inaugurated a new type of material sensitivity, which, driven by the precariousness of the Great Depression and its need for innovation, reached a programmatic character in most of the subsequent American domestic architecture. This new light materiality gives modern American residential architecture a character of provisionality and temporality and reconnects it with the nomadic tradition of American domesticity studied by many authors[31], hybridizing it with the modern European tradition.

The influence of these houses can be traced in the experimental houses built at the Chicago World's Fair in 1933-34, especially in George Fred Keck's House of Tomorrow and Crystal House. After Frey's move to California in 1934 we can trace this influence on the Case Study Houses. These houses share the type of minimal and ephemeral materiality. This similarity is in some cases literal. The Eames House for instance, uses exactly the same construction systems as the Aluminaire House, except for the use of aluminum[32].

A. Lawrence Kocher also inaugurates a new relationship between industry and architecture. This new model, based on the construction of domestic prototypes in which to investigate not only new space systems, but new building systems and materials coming in many cases from other disciplinary fields. The scope of this new relationship between architecture and industry extends not only to the professional field, but also to the pedagogical field, with the implementation in the American architecture schools of the "Design-Build Studio"[33] system, in which Kocher is also a pioneer.

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Notes

01. For instance, Joseph Rosa, quoting Phillip Johnson, says that: "*It was commonly known that "Frey was the designer and Kocher was the writer and the front man*". ROSA, J. *Albert Frey, Architect*, Rizzoli International Publications, Nueva York, 1990, p 26.

02. Ibid.

03. According to K. Edward Lay, Emeritus Professor of Architecture at the University of Virginia, in his text: "History of the A. School. A School Built Upon the Foundation of Mr. Jefferson's Principles of Architecture", Kocher attended also to classes in the Bauhaus in Germany, without specifying dates. We have not found further references to this fact in our research. https://issuu.com/uvaschoolofarchitecture/docs/aschoolhistory_1a757995fd80a6. Accessed 3.9.2019.

04. As his article, divided into 15 chapters and entitled "Early Architecture of Pennsylvania", published between 1920 and 1922 or his articles about the American Cottage of 1925 and 1926.

05. See the projects delivered along with Gerhard Ziegler: Sunlight Towers 1929 and the house for the writer Rex Stout in Connecticut 1929.

06. The design-Build is present nowadays in almost all the American Architecture schools. *Design-build* is a kind of architectural education in which the student not only designs the buildings but also builds them.

07. Kocher was the director of the Department of Architecture at *Pennsylvania* and Dean of the School of Architecture of the University of Virginia. According to Lawrence Wodehouse, Kocher's hiring at Virginia was announced in the University student's magazine (*College Topics*) in the issue of October 1st, 1926 and his resignation in the same magazine dated June 14th of 1927, Although he remained linked to the University until 1928. WODEHOUSE, L. "Kocher at Black Mountain". *Journal of the Society of Architectural Historians*, Vol. 41, No. 4 (Dec) 1982, 328-332. P 328.

08. Joseph Rosa considers this house to be the first in using on-site casted concrete in the East Coast. ROSA, J. *Albert Frey, Architect*, Rizzoli International Publications, Nueva York, 1990, p 26.

09. See: HOUNSHELL, D. A. *From the American System to Mass Production, 1800-1932: The Development of Manufacturing Technology in the United States*, John Hopkins University Press, Baltimore, 1984.

10. The best example of this is the Ford Motor Company, which produced the same model, the Ford-T during 19 years, increasing annually the production from 10.666 units in 1909 to 1.911.705 units in 1925 and decreasing the price from the initial $850 to $260 in 1925. Source. R.E. Houston, Ford Production Department, 3 de Agosto, 1927. https://www.mtfca.com/encyclo/fdprod.htm

11. GOODMAN, A. "Making Prefabrication American. The Work of A. Lawrence Kocher". *Journal of Architectural Education* 71(1): January 2017, p 22.

12. In many news referring to the exhibition, Albert Frey's name is omitted or misspelled Herbert Frey. For instance: Helen Appleton Read. "Exhibition at Grand Central Palace Fails to Emphasize International Style-House Machine Outstanding Exhibit". Brooklyn Eagle. April 17th 1931.

13. This is the only architectural work listed in the *National Register of Historic Places* that is protected without including the site in which it is rooted. This gives a clear idea of the migrant character of this house and its design totally unrelated to a specific location.

14. The list of manufacturers that appears in the exhibition brochure lists 46 participating companies. The main suppliers were: *Jones & Laughlin Steel Corp*. y *McClintic-Marshall Corp*. that supplied the steel structure, *Truscon Steel Co*, that installed all the window steel frames and decks, *American Window Glass Co* y *Mississippi Glass Co*. which supplied the glasses and *Aluminum Company of America* that supplied the aluminum elements..

15. These historic precedents have been obtained from: RODRIGUEZ CHEDA, Jose Benito. "El Aluminio en la construcción". *Tectonica 22. Aluminio*. ATC Ediciones, Madrid, 2006. Kocher and Frey used aluminum as termal insulation also in the Ralph-Barbarin House in 1932.

16. Duraluminium is an alloy of aluminum, magnesium, and copper with a mechanical strength similar to that of medium strength steel.

17. The dimensions of the house responded only to the needs of the room where it was going to be exhibited. Among the project documentation there is a plan of an external staircase that served to access the terrace during the exhibition and offered alternative access and exit to visitors, avoiding crossings in the circulation of the public.

18. In document number 39 of the Project, it is named wrongly as "ferroboard".

19. We do not include in this weight the Alberene stone floor for the first floor (8,000 pounds) as it rests directly on the ground. To give a reference to the weight of the Aluminaire House: a Classic Airstream trailer weighs 10,000 pounds including furniture, appliances and full water tanks.

20. John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection. Box 4. Folder. "Aluminaire House. List of Materials. Description. Handwritten notes, Typed transcripts of news & periodical articles".

21. As explained by Joseph Rosa in his book on Frey. Ibid. P 28.

22. As partner at the firm Harrison & Abramovitz. The Alcoa building is located across the street from the Smithfield United Church of Christ in Pittsburgh.

23. In 1931, Kocher and Frey designed a proposal for *Low-cost Farmhouses*. Published in *Achitectural Record* in January of 1934.

24. Kocher, A. L: Frey, A. (1934) *Subsistence Farmsteads*. Architectural Record. Vol 75, No 4. Abril. 349-352.

25. Roth, A. (1940) *The New Architecture. Examinated on 20 examples*. Zurich: Verlag Dr. H. Girsberger. P 11-16.

26. Ibid. p 12

27. The American Navy used waterproofed, fire retardant, and painted cotton canvas on the decks of certain vessels.

28. Previously, plywood patents already existed in the United States, although they had had no commercial success, such as John K. May 1986.

29. Invented by chemist James Nevin, who worked for the Harbor Plywood Corporation of Aberdeen, Washington.

30. *Dri-Bilt With Plywood.* Source: https://www.apawood.

org/apas-history . Accessed 22-1-2020.

31. Authors like Reyner Banham or John Brinckerhoff Jackson. The impermanence of American housing is paradigmatic and continues today. The relevance of this fact is increased if the social context of this country is taken into account, in which a tenth of the houses is a portable accommodation and almost all the rest is built with light and transportable systems derived from the balloon frame. WALLIS. A. D. *Wheel State. The Rise and Decline of Mobile Homes*. Oxford University Press, New York-Oxford, 1991, p. 13.

32. ZHAW Institut Konstruktives Entwerfen. *At Home In Steel*, Park Book, Zurich, 2019.

33. Kocher developed this kind of workshop at the Schools of Architecture of Pennsylvania State, Carnegie Institute of Technology de Pittsburgh y Black Mountain College en Asheville, Carolina del Norte.

Images

01. Lawrence Kocher y Albert Frey. Kocher Canvas Weekend House. Spiral stair. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

02. Lawrence Kocher and Albert Frey during the presentation of the *Cotton-Steel Houses*. 1932. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

03. Kocher and Frey. Aluminaire House. Project floor plans. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

04. Kocher and Frey. Aluminaire House. Built house at the *Architectural and Allied Arts Exposition*. Source Metal Progress. June 1931. Pag 94.

05. Kocher and Frey. Aluminaire House. Picture of the house as erected at W.K. Harrison's property. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

06. Kocher and Frey. Experimental Weekend House. 1932. Pictures of the model. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

07. Kocher and Frey. Kocher Canvas Weekend House. 1935. Pictures of the construction. Source: Roth, A. (1940) *The New Architecture*. Examinated on 20 examples. Zurich: Verlag Dr. H. Girsberger. P 11-16.

08. Kocher and Frey. Kocher Canvas Weekend House. 1935. Picture of the finished construction. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

09. Kocher and Frey. Kocher Canvas Weekend House. 1935. Floor plan and facade sections. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

10. Kocher. House of Plywood. 1939. Promotional brochure. Source: John D. Rockefeller Jr. Library. Williamsburg. A. Lawrence Kocher Collection.

12

Steiff Factory, 1903. The story of a pioneer

Blanca Lleó

Progress in all its facets evoked collective enthusiasm a century ago. Back then, glass and steel architecture was held to be the symbol and expression of the highest aspirations of material and spiritual freedom. With the passage of time, our conscience and sensibilities have undergone a change and it is today with a sense of guilt that we hold ourselves responsible for having incentivised an incalculable waste of energy owing to the uncontrolled use of those shining materials. *Man is a god when he dreams and a beggar when he reflects*. These lines of Hölderlin's poetry exhort us to look back to the horizon, since we do not know what past awaits us. This article takes us back to the incandescent beginnings of glass architecture in order to discover an unusual creation, the Steiff factory of 1903.

"What was the first modern building?" asked Alison and Peter Smithson in 1980.

The response had lain implicit years ago in their *family album* entitled "The Heroic Period of Modern Architecture (1910-1929)"[1]; that selection of pioneering works of modern architecture designed by young architects between 1955 and 1956, that deliberately opened with seven photographs of the Fagus factory by Walter Gropius and Adolf Meyer.

All origins are mythical and all myths are human creations. The modern architecture movement is no exception and its beginnings, now more than a century old, were as mythical as the birth of Venus. In the same manner that Boticelli's sublime work of art embodied the advent of the goddess of love within the Renaissance, a carefully curated image of the Fagus factory was, for decades, a powerful symbol of the moment when the new architecture was born.

This article deals with a practically unknown building that, being older than the Fagus, opens up a new perspective through which to rethink the incipient 20th-century architecture. We are talking about the Steiff factory, an unusual work of great purity and admirable social significance, a visionary creation conceived and executed in 1903, that incorporates exceptional architectural innovations. This edifice, far removed from the landmarks highlighted by the official genealogy of the modern architecture movement, was the first glass box inhabited by manual workers in the course of their daily tasks. What is truly surprising is that this architecture has been ignored and passed over by historians and critics throughout the 20th century[2], or perhaps it was an intentional act of silencing.