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Toward a Better Understanding of the Evolution of the Iron Skeleton Frame in Chicago

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William Le Baron Jenney and the Home Insurance Building have been given a pivotal position in many of the early histories of modern architecture, a reputation that has been consistently embroiled in controversy during the building's 100-year history. The context of the Home Insurance Building in Chicago's commercial building milieu *immediately prior to Jenney's design of 1884 reveals that tall buildings constructed before the Home Insurance Building were called skyscrapers. Many of these earlier buildings, in fact, were even taller than the final height of the Home Insurance Building. A technical analysis of Jenney's final structural design reveals that it was neither conceived nor detailed as a rigid, independent iron frame. A recently discovered article on the potential of iron framing published by Chicago architect Frederick Baumann in March 1884, before Jenney even started designing the Home Insurance Building, not only disputes Jenney's reputation as the "father of the iron skeleton frame," but also exposes the antiquated nature of Jenney's actual structure and detailing.*

Fig. 1. William Le Baron Jenney, Home Insurance Building, Chicago, 1884. Exterior (J. W. Taylor, IChi-00989; Chicago).

THE ISSUE of the origin of the skyscraper and the role played by William Le Baron Jenney's design of the Home Insurance Building (Fig. 1) in Chicago has been the subject of considerable discussion, especially during the last few years as the building's centennial (1984) first approached and has now past. The Home Insurance Building has been credited by various authors as being everything from the first iron skeleton-framed building to the first skyscraper, and Jenney has consequently gained the reputation of being the "father of the skyscraper."[1] Actually, when one reads contemporary professional literature and examines the structure that Jenney designed, it is readily apparent that the Home Insurance Building was not the first building in Chicago to be called a skyscraper, nor did Jenney conceive or detail its structure as an independent iron skeleton frame. In fact, as will be documented, Jenney was not even the first Chicago architect to articulate the concept of an iron-framed skyscraper.[2]

1. A recent article by Theodore Turak attempted to confirm Jenney's priority of invention by comparing letters uncovered in the records of the American Institute of Architects to the unpublished recollections of Jenney's partner, William B. Mundie. Theodore Turak, "Remembrances of the Home Insurance Building," *JSAH*, 44 (1985), 60–65.

2. For the development of iron skeletal framing in America prior to the 1871 Chicago Fire see: Gerald R. Larson, "Fire, Earth and Wind—Part I," *Inland Architect*, 25 (September 1981), 20–29, and "Fire, Earth and Wind—Part II," *Inland Architect*, 27 (January/February 1983), 31–37.

Fig. 2. Solon Spenser Beman, Pullman Palace Car Building, Chicago, 1883. Exterior (J. W. Taylor; Chicago Historical Society).

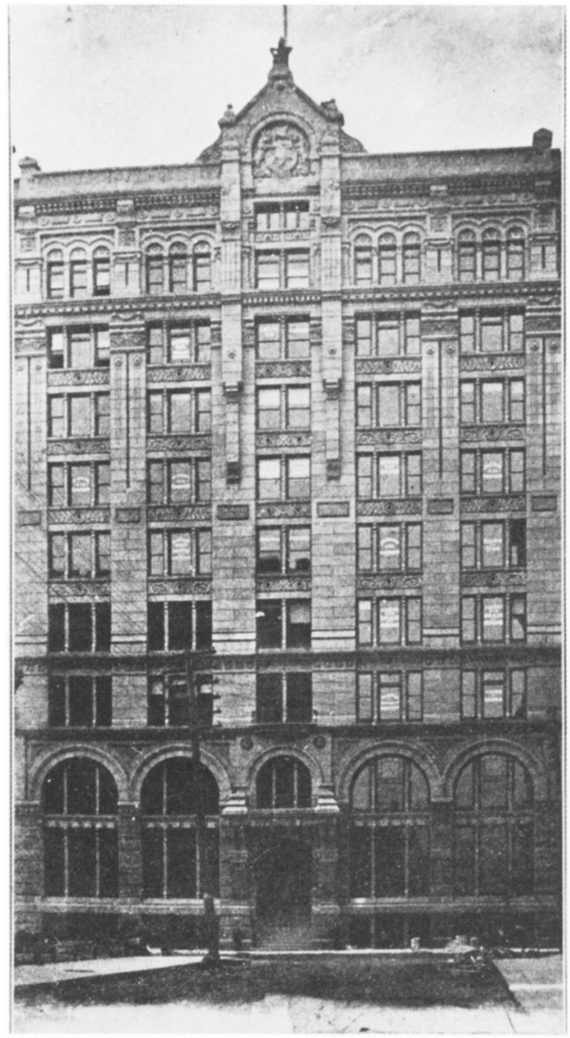

Fig. 3. W. W. Boyington, Royal Insurance Building, Chicago, 1883. Exterior (Gilbert and Bryson, *Chicago and Its Makers;* Art Institute of Chicago).

The term skyscraper, as used to describe a tall building, dates from at least 1884, when the 2 August 1884 issue of the Chicago magazine *Real Estate and Building Journal* contained an article, "High Towers and Buildings," which stated that "Veritable skyscrapers have been springing up here during the past couple of years almost with mushroom rapidity."[3] In addition to three towers designed by W. W. Boyington, the article also listed eight buildings that it considered to be skyscrapers, three of which (S. S. Beman's Pullman Palace Car Building, 165′ [Fig. 2]; Boyington's Royal Insurance Building, 164′ [Fig. 3]; and Burnham and Root's Insurance Exchange Building, 160′ [Fig. 4]) were not only taller than the projected height of 159′ for the Home Insurance Building,[4] but were also already completed by August 1884, when the Home Insurance Building was only two stories out of the ground and its exterior iron work had not yet started to be erected.[5] Therefore, Chicago's local professional press at the time identified skyscrapers as buildings that were built not only prior to and taller than the Home Insurance Building, but also did this before the iron members in the Home Insurance Building's exterior were publicly announced or erected. Consequently, the iron skeleton frame was not intrinsic to the original Chicago definition of "skyscraper;" the Home Insur-

3. "High Towers and Buildings," *Real Estate and Building Journal,* (2 August 1884), 364.

4. In descending order of height, the skyscrapers were Boyington's Tower of the Board of Trade, 303′; Boyington's Water Works Tower, 175′; Boyington's twin towers of the La Salle Street Station, 170′; Beman's design for Marshall Field's ill-fated 13-story office building which would have topped the existing height record for a building of 165′—that of Beman's Pullman Building; Boyington's Royal Insurance Building, 164′; Burnham and Root's Insurance Exchange, 160′; Jenney's Home Insurance Building 159′; Burnham and Root's Counselman, Calumet and Montauk Buildings, 145′. Ibid.

5. *Real Estate and Building Journal* of 26 July 1884 (p. 352) reported that the first floor of the Home Insurance Building was nearing completion. The first published account of Jenney's intention to use iron members in the exterior of the Home Insurance was contained in the September 1884 issue of *Inland Architect* (p. 24), which also stated that the construction had reached the third floor, the point where the exterior iron was to begin erection.

Fig. 4. Burnham and Root, Insurance Exchange Building, Chicago, 1884. Exterior (*Inland Architect* July 1885; Art Institute of Chicago).

ance Building was not considered to be the first skyscraper in Chicago; and Jenney was not the designer of Chicago's first skyscraper. Boyington, Beman, and Burnham and Root had already built more and taller skyscrapers before Jenney and the Home Insurance Building ever entered the scene.

As early as 1892, Peter B. Wight, in the March issue of *Inland Architect,* began to link the technique of iron framing that Jenney used in the Home Insurance Building to the iron-framed buildings of James Bogardus and Daniel Badger that had been erected more than 30 years prior to the re-emergence of exterior iron framing during 1884 in Chicago:

> But while this system of building is new as applied to business structures, it is not entirely novel. There is a grain elevator in Brooklyn [Badger's U.S. Warehousing Grain Building, 1860 (Fig. 5)], that was erected 30 years ago, the exterior of which is constructed of a cast iron framework filled in with a light wall of brick, the iron showing on the outside. There is also a shot tower in New York City [Bogardus' shot towers for the McCullough Shot and Lead Company, 1855, and the Tatham and Brothers Company, 1856] which was built about the same time in the same manner.[6]

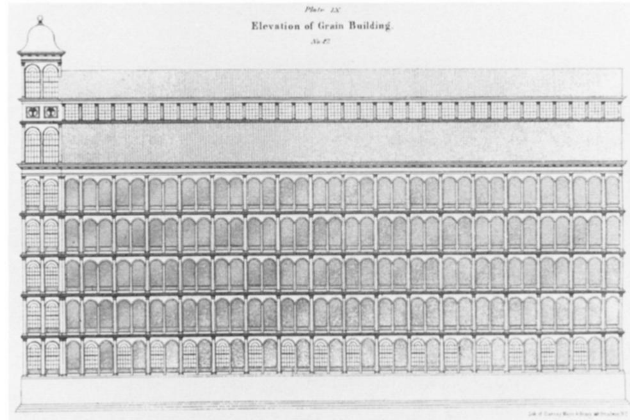

Fig. 5. Daniel Badger and George H. Johnson, U.S. Warehousing Grain Elevator, Brooklyn, 1860. Elevation (Badger, *Illustrations of Iron Architecture;* Art Institute of Chicago).

In fact, the only departure from standard construction of the early 1880s in the Home Insurance Building was in the two street façades.[7] The two rear masonry bearing party walls that ran the entire height of the building and the interior iron cage (Fig. 6) were typical for the period. In fact, even the first two floors of the street fronts consisted of rusticated granite piers, battered from 4′–0″ thick at the base to 2′–10″ at the third floor. Upon these were set story-high, hollow rectangular cast iron columns (Fig. 7), bolted one on top of another to support the upper seven floors and roof. The columns were filled with concrete[8] and surrounded with brick, which created a solid cross section in the building's exterior piers. Rather than describing this technique as wrapping or enclosing the iron column with a masonry skin, Jenney stated that he embedded the column within the masonry pier: "a square iron column was *built into* [emphasis added] each of the piers in the street fronts."[9] This conceptual difference from modern skeletal framing is even more evident in the way Jenney used the exterior masonry to stiffen the assembly of iron columns, mullions, and spandrels.

6. Peter B. Wight, "Recent Fireproof Building in Chicago—Part II," *Inland Architect and News Record,* 19 (March 1892), 22.

7. To ascertain the actual detailing of Jenney's structure, Larson examined Jenney's working drawings for the Home Insurance Building now on microfilm at The Art Institute of Chicago. He also examined the four-columned bay fragment that is in the collection of Chicago's Museum of Science and Industry.

8. Theodore E. Tallmadge, *The Origin of the Skyscraper—The Report of the Field Committee,* Chicago, 1934, 12.

9. "As it was important in the Home Insurance Building to obtain a large number of small offices provided with abundance of light, the piers between the windows were reduced to the minimum." William Le Baron Jenney, "The Construction of a Heavy, Fireproof Building on Compressible Soil," *Inland Architect and Builder,* 6 (December 1885), 100.

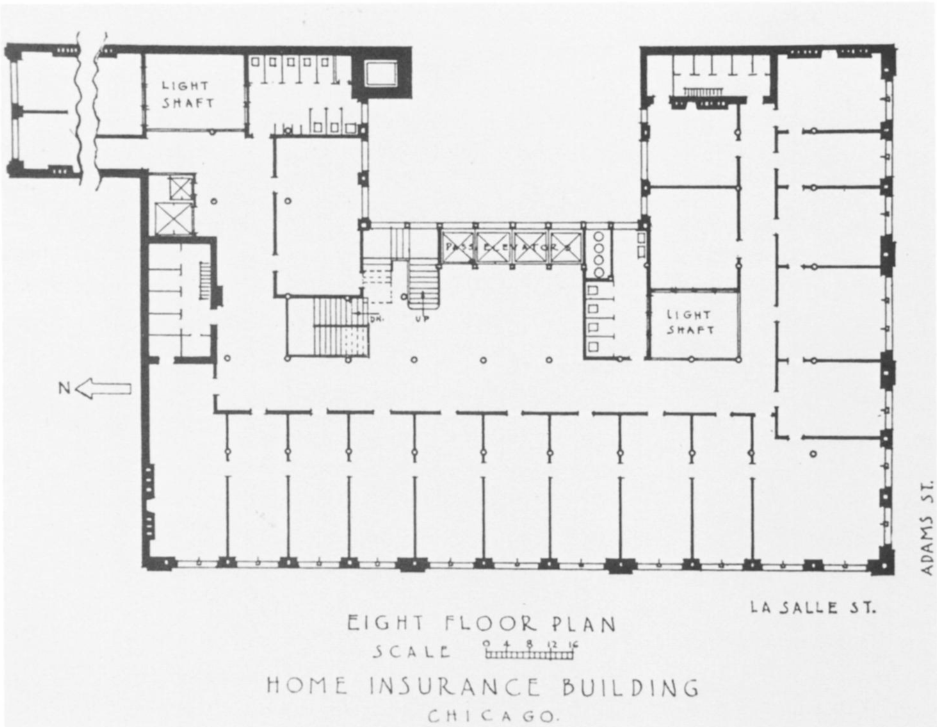

Fig. 6. Jenney, Home Insurance Building, typical floor plan. (Tallmadge, *The Origin of the Skyscaper;* Art Institute Chicago).

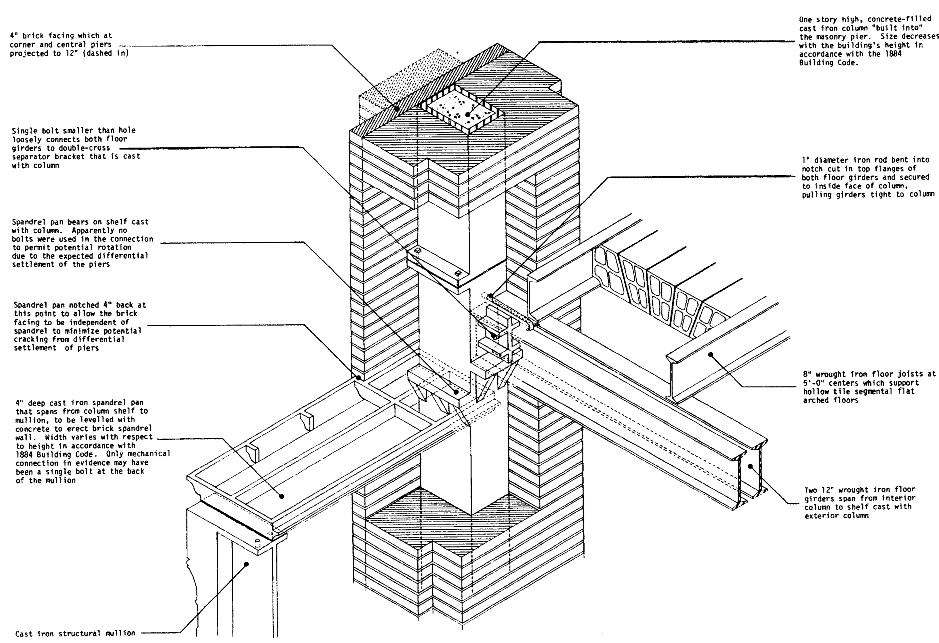

Fig. 7. Jenney, Home Insurance Building. Reconstruction of the structural detailing of the exterior piers. (Drawing by Deborah Cohen and Maxwell Merriman).

The columns were cast with projecting shelf brackets to receive the appropriate horizontal framing members. Two 12-inch wrought iron I-beam floor girders sat on the ledge at the interior face of the column. These were loosely bolted to the column by a single bolt that passed through each of the girder webs and a projecting bracket which was also cast with the column. As a good amount of tolerance was needed for site erection, the holes were larger than the bolt, leaving the connection with a considerable amount of play. Therefore, Jenney incorporated a clamp consisting of a one-inch diameter wrought iron rod that was bent at one end and placed into a notch cut in the top flange of both girders. At the other end, the clamp was bolted to the column by a nut placed inside the column, thereby pulling the girders tight to the column face. The floor girders supported eight-inch wrought iron I-beams at five-foot centers, within which were placed hollow tile floor arches.

To support the windows and masonry spandrels between the piers, cast iron lintels in the form of four-inch-deep hollow pans, also filled with concrete like the columns, spanned from a column shelf bracket to an intermediate cast iron mullion. The cast iron lintels were as wide as the masonry spandrel walls that were constructed on top of them. As if the street fronts were still considered to be bearing walls, the spandrels, for no other conceivable reason, increased in thickness along with the piers, as required by the building code, from 20 inches in the top three floors to 24 inches in floors 5–7, to 28 inches in floors 3 and 4.

The cast iron lintels were not one continuous piece that spanned between the columns but were in halves that joined over the mullions. The lintel pans were evidently not bolted to either the column shelf brackets or the mullions, but simply rested on the bearing surfaces, apparently relying on the supported masonry knee wall, which was bonded into the masonry pier, to hold the iron armature in place laterally. The lack of bolts may have been a technique on Jenney's part to impart some rotational flexibility at the column/spandrel connection to accommodate differential settlement of the piers.[10] This flexible joint was augmented by notching the front of the iron lintel pan back four inches which allowed the pier's exterior face brick to continue past the lintel without actually sitting on it and minimized the potential of the face brick to crack if an iron spandrel rotated due to the settlement of an adjacent pier.

Therefore, the pier's brick facing (which was 12 inches thick in some locations) was continuously self-supporting from the granite piers at the third floor and was not supported at each floor on the iron column, as was the contention of the Field Committee.[11] If it was Jenney's intention to support the pier's brick facing on the frame, why did he intentionally notch the lintel pans precisely where they could have offered critical support to the facing as it turned the corner? While the iron lintels carried the weight of the masonry spandrels to the iron mullions and columns, the structure created by the lintel pans, mullions, and columns was far from being a rigid, self-supporting iron skeleton that independently carried its masonry envelope at each floor, which the Home Insurance Building was later claimed to have been.

This brings up the first of two extremely important points of interpretation. Jenney did not make the intermediate iron mullions a continuous vertical line of support to the foundation for two reasons. Principally, he wanted to avoid the inevitable uplift problems experienced by the lesser-loaded intermediate piers in buildings of the period. This resulted from the heavier-loaded major piers settling at a greater rate than the smaller mullions, transferring more and more load to the smaller mullions and usually creating major cracking in and around them.[12] The easiest way to avoid the problem was to prevent the mullions from becoming a continuous line of bearing by transferring the mullion loads over to the main piers before they reached the ground. If this could be done in a series of transfer beams, the mullion loads would be relatively uniform, and therefore the mullion cross section would not have to increase as the columns did, keeping the windows as large as possible.

Therefore, Jenney placed transfer beams (Fig. 8) to carry the mullion loads to the piers, immediately above the cast iron lintel pans at the fourth floor (four 7-inch I beams), sixth floor (three 15-inch I-beams), ninth floor (two 12-inch I-beams), and roof (two 15-inch I-beams). These transfer beams also nominally tied the columns together laterally (especially at the roof), thereby creating what one might call a skeleton. However, if it was Jenney's intention to actually create a rigid iron skeleton frame in the street fronts, these beams should have been introduced at every floor. The framework as built was not rigid independent of the masonry, for the columns in floors 6–8 extended unbraced for three stories. Since the lintel pans were not bolted to the columns, their action in this vein was negligible at best. Consequently, without the masonry

10. "As the building must settle . . . the first settlement must be uneven, therefore every care must be taken to make the construction elastic." Ibid.

11. The Trustees of the Estate of Marshall Field, Sr., planned to demolish the Home Insurance Building in 1931 in order to erect the 46-story Field Building designed by Graham, Anderson, Probst and White. With hopes of gaining a special historical prominence for the site of the new building, they assembled a respected committee of six architects, a contractor, and a realtor, to ascertain the true construction of the Home Insurance Building during its demolition.

12. For a complete description of this problem see Frederick Baumann, *The Art of Preparing Foundations*, Chicago, 1873, 17–22.

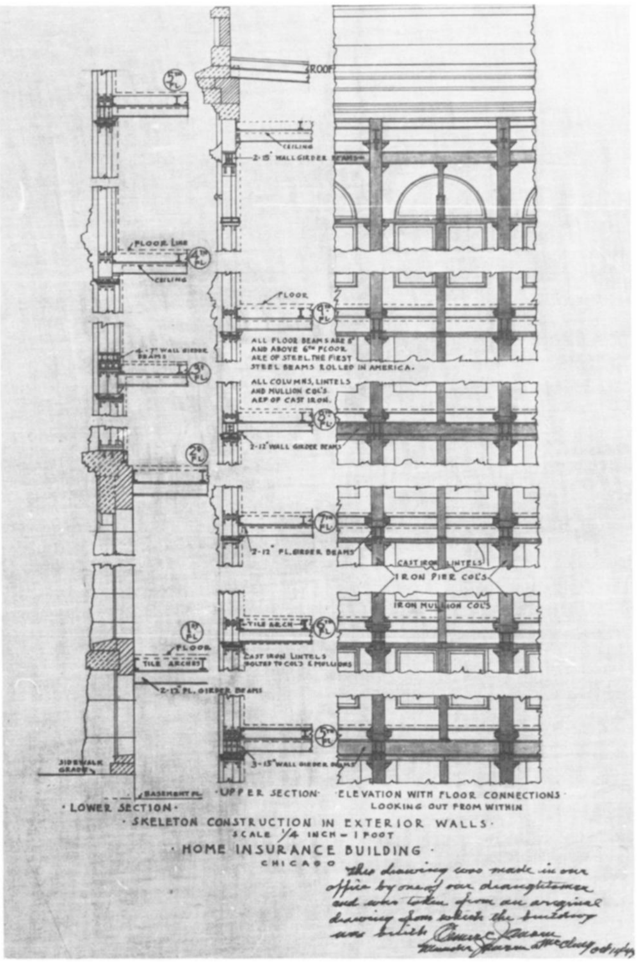

Fig. 8. Jenney, Home Insurance Building. Elevation of structural iron members in the exterior, showing the location of the transfer beams at Floors 4, 6, 9, and roof (Jensen & Halstead, Ltd., Chicago).

and the concrete filling, the exterior iron framework was not inherently rigid, and it would have been very difficult, if not impossible, to erect it "two or three floors ahead of the brick walls."[13]

This raises the second point of judgment: the actual intent and role of the masonry in the pier and the corresponding stability of the iron frame independent of the masonry. It can be argued that most of the pier masonry was supported on the iron columns because of the manner in which it was constructed around the lintels. However, the 4-inch exterior facing, which increased to 12 inches at the corner and entrance piers, enjoyed no similar support as the lintel pans were notched back at the piers to allow the facing to be independent of them, thereby allowing the facing to be continuous from the granite walls for eight stories. Jenney went so far as to specify a very conservative technique of bricklaying to achieve a stronger-than-usual assembly to keep the cross section of the masonry piers to a minimum. Selected hard-burned brick was used with a strong cement, not lime, mortar and was laid up in very tight, solidly packed joints. This would have been entirely unnecessary if Jenney was supporting the face brick at each level.

We can therefore conclude from at least five points that the iron framework in the Home Insurance Building was not conceived or erected by Jenney as a modern skeletal frame that is entirely self-sufficient and independent of its masonry enclosure. First, he initially did not refer to the masonry as a covering but always stated that he embedded the iron column within the masonry pier in order to reduce its size and maximize the amount of daylight. Second, as the lintel pans were not bolted to the columns, rigidity of the mullion/lintel assembly was gained through the masonry spandrel wall. Third, the exterior brick facing of the piers was not supported on the iron column at any point; therefore, it was continuously bearing from the granite piers. Fourth, as the columns typically extended laterally unbraced for two stories (the spacing of the mullion transfer beams), and in the middle of the building for three stories, they relied solely on the rigidity of the spandrel masonry interacting with the masonry pier for lateral stability. Finally, without the rigidity of the two rear masonry bearing party walls and the masonry piers, the iron frame with its loosely bolted and clamped connections could not have resisted any wind loads. Therefore, the historical significance of the Home Insurance Building's structure is that it was the first extensive use of iron in the U.S. in the exterior of a multistory building to support a portion of its masonry enclosure since Badger's Grain Elevators of 1860 and 1862.

Because of the later controversy surrounding the Home Insurance Building and the issue of the origin of the iron skeleton frame, Jenney's professional position in the Chicago architectural scene of the early 1880s has been greatly inflated. The Home Insurance Building was not only Jenney's first tall building, but also his first major commission in the 11 years that followed the completion of the Portland Block and the Lakeside Building in 1873. To even better appreciate the fortuitous nature of his Civil War acquaintance with Arthur C. Ducat, the Chicago agent of the Home Insurance Company of New York, one must recall that the Home Insurance Building was Jenney's only tall building during the 16-year period be-

13. William Mundie, *Skeleton Construction, Its Origin and Development Applied to Architecture,* Roll 23, Chicago Microfilm Project, Art Institute of Chicago, frame 27. This disputes Mundie's recollection of not only the type of construction employed in the Home Insurance Building, but also the chronology of its erection. Mundie said that "the iron framework was up to the sixth floor of the building and two or three floors ahead of the brick walls" in August 1884. Ibid. In reality, the ironwork did not start to be put into place until September 1884. "Our Illustrations," *Inland Architect and Builder,* 4 (September 1884), 24. As will be seen, this is not the only error contained in Mundie's unpublished manuscript of 1931, which throws suspicion on his accuracy and motives.

Fig. 9. W. W. Boyington, Chicago Board of Trade, Chicago, 1882. La Salle Street south from Adams Street, late 1880s (IChi-00253; Chicago Historical Society).

Fig. 10. Peter B. Wight, fireproofed wrought iron Phoenix columns in the Chicago Board of Trade Tower. (*Brickbuilder,* August 1897; Art Institute of Chicago).

tween the Portland Block and Lakeside Building and the Second Leiter Building of 1889.[14]

In stark contrast stand the records of Chicago's four premier firms, W. W. Boyington, John M. Van Osdel, S. S. Beman, and Burnham and Root, who were responsible for the vast majority of Chicago's early skyscrapers. Quite simply, Jenney no longer enjoyed the reputation he had had in the early 1870s, as one of Chicago's foremost office building designers. The true measure of the Jenney office's professional stature in the early 1880s is best exemplified with the Montauk Block of 1881. The owner of Jenney's Portland Block, Peter C. Brooks of Boston,[15] did not turn to Jenney when he was ready to build Chicago's first skyscraper, the ten-story Montauk Block. Instead, Brooks gave the honor to the young upstart firm of Burnham and Root, in association with Peter B. Wight, their former employer, who was to be the fireproofing contractor for the Montauk Block.

By this time, iron construction was being given more exposure in the local architectural press. Across the street from the Montauk, then under construction, Haverly's Theater was being erected. Although the exterior consisted of solid brick walls, the supports of the galleries were all iron, leading the *Real Estate and Building Journal* in 1881 to state: "It is possible and feasible to construct the auditorium entirely of a light iron framework, which would make it practically fireproof, and every theater should be built this way."[16] The same issue contained an article on the newly constructed Cape Henry Lighthouse on Chesapeake Bay: "It is 155′ from base to top, 30′ in diameter at the base, 16′ at the top. The exterior, which is octagonal in shape, is constructed of cast iron. Every story is solidly bolted together by heavy cast iron floor plates . . . 7,000 pounds of bolts were required."[17]

This article may well have been the inspiration for Chicago's tallest building, the Board of Trade Tower (Fig. 9), whose ironwork was a direct prelude to the Home Insurance Building. Designed by W. W. Boyington early in 1882, the tower was 303 feet high, although it was only 32 feet wide at its base. The mammoth tower was supported by the largest iron columns built during the 1880s. These were 12-sectioned Phoenix wrought iron columns (Fig. 10) that were 3 feet, 3 inches in diameter and 90 feet high and fireproofed with Wight's patented terra cotta casings.[18] As the base of the tower was only 32 feet wide, these columns must have supported some, if not all, of the masonry in the tower's exterior. If not, the thickness of the walls and the columns would have taken

14. Jenney admitted the importance of his prior relationship with Ducat in his success of gaining the commission for the Home Insurance Building: "In 1883, when the Home Insurance Company proposed to erect a building in Chicago, Ducat (who was the agent of the company in Chicago and the leading agent in the West) kindly recommended me to be their architect." Letter of William Le Baron Jenney, printed in Arthur C. Ducat, *Memoirs,* 65.

15. *Land Owner,* 5 (June 1873), 99.

16. "Theatre Construction," *Real Estate and Building Journal,* 23 (July 1881), 323.

17. "A Gigantic Lighthouse," Ibid.

18. Wight, "Fireproof Building," 22.

up almost all of the floor area at the ground floor.

In December 1883, three months before Jenney started to design the Home Insurance Building, the Board of Trade's columns were considered to be Wight's finest installation. In contrast to the ironwork of the later Home Insurance Building, for which Wight was also the fireproofing contractor, the Board of Trade Tower's iron was put in place before the masonry facing was added. The tower was under construction from December 1883 to August 1884, a period that parallels Jenney's gestation of the Home Insurance design for a site only two blocks north of the Board of Trade. In fact, the ironwork of the tower had been completed just before the first exterior iron columns of the Home Insurance Building were put into place.[19]

Even more revealing of the environment in which Jenney designed the Home Insurance Building is an article, "Improved Construction of High Buildings," in the 15 March 1884 issue of *Sanitary News,* recently uncovered by Dr. Geraniotis.[20] This article documents beyond the shadow of a doubt that Chicago architect Frederick Baumann had indeed clearly defined and articulated the concept of an independent iron-framed tall building before Jenney incorporated a watered-down version of the idea in the design of the Home Insurance Building. In 1873, Baumann had already established his reputation as Chicago's leading theoretician on construction with his pamphlet, *The Art of Preparing Foundations,* in which he was the first to clearly articulate the principle of the uniformly stressed, isolated pad foundation, Chicago's other important contribution to building construction.[21] Therefore, it comes as no surprise to find Baumann writing about the iron skeleton framed skyscraper prior to Jenney's design of the Home Insurance Building. As the newly discovered article is dated 15 March 1884, and moreover, it reports that Baumann had already publicly presented his scheme, Baumann's first public discussion of his ideas would have necessarily preceded the article by, shall we say, at least two weeks to account for writing, editing, and printing. This, then, pushes Baumann's date conservatively back to at least 1 March 1884, if not even earlier. Such a date would confirm Baumann's statement that his ideas coalesced during the Home Insurance competition and also lends credence to his claim that he experimented with the idea in an 1883 design for a building at the Southwest corner of Clark and Jackson.[22]

In contrast, the first mention of the Home Insurance Building in Jenney's personal notes is dated 19 February 1884. The building at this date was to be only six stories plus a basement:

> The basement story to be one step up from the sidewalk, similar to the Boreel Building [in New York]. . . . This would make the building 84′–5″ high [six stories plus basement], if another, [it] would be 96′, which is high enough and I would object to it being any higher. . . . The basement to be of some suitable stone to be decided upon. The rest of the building to be of brick with terra cotta or molded brick trimmings.[23]

When the building committee from New York arrived in Chicago during the first week in March (meaning they met after Baumann's initial presentation of his ideas) to review the competition drawings for the new building reported to be submissions by three different architects, they apparently had already increased the height of the building because a permit was obtained on 1 March 1884 for an eight-story plus basement structure.[24] The premature permit—for Jenney's design was not "officially" chosen for another two weeks—was forced by a pending building ordinance that threatened to limit the heights of all new buildings to 100 feet. Suspiciously, it was reported that even though the winner had not been chosen, the permit was taken out upon the plans of Jenney, and that he, upon the orders of the company (and undoubtedly at the encouragement of Jenney's friend, Ducat), had already begun to let the contracts for the cut stone and other materials.[25]

19. "Synopsis of Building News," *Inland Architect and Builder,* 4 (September 1884), 28.

20. "Improved Construction of High Buildings," *Sanitary News,* 3 (15 March 1884), 123. Baumann later published his ideas in a three-page pamphlet: Frederick Baumann, *Improvement in the Construction of Tall Buildings,* Chicago, 1884.

21. Frederick Baumann was born in Angermünde, East Prussia, on 6 January 1826. He studied architecture and building in Berlin, first at the Gewerbeschule and then at the prestigious Königliches Gewerbeinstitut. He also acquired extensive practical experience during periods of apprenticeship with master masons, master carpenters, and an uncle who was the government building inspector in Bromberg. Baumann joined many Germans in immigrating to the U.S. following the 1848–49 revolution. He traveled directly to Chicago, arriving in the summer of 1850. After working with John M. Van Osdel and Edward Burling, he formed a partnership with Van Osdel in January 1855, which lasted until the onset of the 1857 panic. Subsequently, he worked as a building contractor with August Wallbaum; he returned to architectural practice in 1864, eventually becoming a leading figure in the Chicago architectural community during the last third of the 19th century.

22. Letter, Frederick Baumann to Glen Brown, 14 December 1907, Archives, American Institute of Architects, Washington, D.C. as quoted in Turak, "Remembrances," 62. See also Baumann's autobiographical essay, "Life, Reminiscences, and Notes," *Construction News,* 4 (15 January 1916), 9.

23. Roll 9, Jenney Collection, Chicago Microfilm Project, Art Institute of Chicago, frame 424. Jenney's first entry that pertained to the Home Insurance Building correlates with the first published mention of the project which occurred in the 23 February 1884 issue of *Real Estate and Building Journal* (p. 88). This pushes Jenney's conceptualization period for the Home Insurance Building back to the Spring of 1884 and contradicts Jenney's failing memory in his later years when he claimed he received the commission in 1883; see n. 14.

24. *Real Estate and Building Journal,* 8 March 1884, 114.

25. "Architectural and Building Notes," *Inland Architect and Builder,* 3 (March 1884), 23.

The following month, *Inland Architect* reported that Jenney's design had indeed been chosen the winner from plans submitted by a half dozen of Chicago's best architects.[26] The design continued to be refined during the spring of 1884; the final height was set at 150 feet with nine stories plus basement on 28 April 1884.[27] Using Jenney's notes, it appears that as the building increased in height from the initial seven floors of 19 February, to the final ten stories of 28 April, he became concerned about the size of the masonry piers and most probably realized during the latter part of this period that he could keep the piers' cross section within reason by embedding iron sections in the piers. The first mention and calculation of the exterior iron columns in his notes is dated 17 April 1884, over a month after the article on Baumann's skeletal frame idea was published.[28] In fact, the erection of the iron in the street fronts was not started until September 1884,[29] over five months after the publication of the article describing Baumann's ideas.

The primitive nature of Jenney's iron framework is evident when compared to Baumann's ideas of modern skeletal framing:

The design is to erect on foundations a firm and rigid skeleton, or hull, of iron, and cover it at once with a proper roof. The enclosure, whether of stone, terra cotta, or brick, or any combination of these materials, may be erected at the same time the iron structure is being put in place. But the latter might proceed much faster than the former; while the hull might be roofed within two months, the enclosure might not have proceeded further than the fourth story. Thus there need be no delay to a steady progress. Derricks may be set on the roof for finishing the enclosure in a convenient manner. . . .

Mr. Baumann claims that this method would render the work more independent of the weather than by the usual construction; the erection of the iron hull is, in its nature, a rapid process. The practicability of erecting buildings on Chicago soil, twelve and more stories high, then becomes a fact. Light, the great desideratum in all city buildings, is secured, even on the lowest—the most valuable—floors, whereas, otherwise, the necessarily broad piers would be a hindrance. The piers may not only be made narrow, but shallow—twenty-seven inches at the most, thus, again making a saving of light. [Was this not the exact logic Jenney used to explain his later design for the Home Insurance Building?]

The iron uprights are to be provided with a series of projecting brackets for the purpose of anchoring and supporting the parts forming the exterior enclosure. These supporting brackets will be so arranged as to permit an independent removal of any part of the exterior lining, which may have been damaged by fire or otherwise. [Contrast this with the lack of any structural support for the masonry facing in the piers of the Home Insurance as well as the structure's dependence on the masonry for rigidity]. The iron-floor girders are securely fastened [riveted fixed connections] to the outer posts at both ends. This imparts firmness to the structure; further, it increases the bearing strength of the girders at least to one-half of their usual strength. The iron floor-beams are fastened to the sides of the girders, and will gain thereby at least 20 percent in strength [compare Baumann's fixed connections to the friction clamp and single bolt used by Jenney]. . . .

Mr. Baumann holds that there will thus be a saving in the four most important items in construction—light, convenience, space and time. Structures wholly constructed of iron would in this light, be the most preferable, were it possible to clothe them with proper elegance, and were they proof against neighboring fires.[30]

The date of this article disputes William Mundie's claim that Baumann published his pamphlet on skeleton framing after he had allegedly intensely questioned Mundie, then a draftsman for Jenney, in the early summer of 1884 about Jenney's details for the Home Insurance Building while it was "under construction."[31] As construction didn't start until 1 May 1884,[32] Baumann's ideas had been already published for at least six weeks. The chronology of events surrounding the publication of Baumann's ideas and Jenney's initial thoughts for the Home Insurance Building contained in his own notebook suggest just the opposite of what Mundie later tried to prove. Apparently, Jenney used Baumann's ideas for the first time in the Home Insurance Building. Perhaps these points shed some light on the words of another Jenney employee, Elmer C. Jensen, who was always puzzled over the fact that "Major Jenney never made any claim that he had originated the skyscraper principle."[33]

26. "Synopsis of Building News," *Inland Architect and Builder,* 3 (April 1884), 42–43.

27. Roll 9, Jenney Collection, frames 426–434. Jenney's notes correlate with the 1 May 1884 start of construction as published in Tallmadge, *Field Report,* 10.

28. Jenney Collection, frames 426–443. The first shop drawing of the ironwork by the Dearborn Foundry was approved by Jenney on 24 May 1884. Ibid, 443. There is no evidence in Jenney's notebook to support Mundie's allegation that Jenney originally intended to use iron framing in all the walls but was prevented from doing so in the party walls by the City Building Commissioner. Mundie, *Skeleton Construction,* frame 25. Since the building permit was granted on 1 March 1884, a month and a half before the first mention of iron columns in Jenney's notes, Mundie's chronology once again appears to be faulty.

29. "Our Illustrations," 24.

30. "Improved Construction," 123.

31. Mundie, *Skeleton Construction,* frame 98. In fact, Baumann's article was published on 15 March 1884. Mundie was not even in Chicago then; he arrived two weeks later on 1 April 1884. Ibid., frame 4.

32. Tallmadge, *Field Report,* 10.

33. As quoted in Purcell, "First Skyscraper," 36. Although Purcell did not give the source of Jensen's quote, the essence of it was contained in an earlier article written by Jensen:

"Apparently Mr. Jenney either was not conscious of the important contribution he was making to the world at the time or his modesty prevented him from making any mention of it [the invention of the iron skeletal frame] in the press and technical papers." Elmer C. Jensen, "Origin of the Skyscraper—Part II, "*Union League,* October 1950, 17. Jensen entered Jenney's office in March 1885 as an office boy, becoming a partner in the firm in April 1905.

APPENDICES

APPENDIX I

Professor Larson presented a shorter version of this article in a paper delivered at the 1983 Annual Meeting of The Society of Architectural Historians in the session "Commercial Architecture Before 1914," chaired by Sarah Bradford Landau. Larson is working on a book, *Earth, Fire and Wind,* which documents architectural developments in Chicago prior to 1879. The Graham Foundation has helped to fund some of this research. Dr. Geraniotis is preparing a book on the German architects in 19th-century Chicago for the Architectural History Foundation. The authors would like to acknowledge the efforts of John Zukowsky, Curator of the Department of Architecture, The Art Institute of Chicago, in introducing the work of each author to the other. The joint results of Larson's research of Jenney's chronology during the design of the Home Insurance Building and Geraniotis' research which uncovered the article by Chicago architect Frederick Baumann have established the priority of events presented in this article.

APPENDIX II

On the key question of the piers' masonry facing, the Field Report stated: "In the important matter of the masonry piers, the conclusion is not so obvious. . . . Accordingly, the two typical piers were stripped or girdled, one midway between the fourth and fifth floors, and the other in the third story at the top of the window level. In each case the masonry was entirely removed for a space of two feet, completely exposing the column; the masonry piers above remaining undisturbed to the height of the remainder of the story on the fourth floor and a full story on the third floor. The stripping was left undisturbed and unshored until the building was wrecked down to that point, a matter of one day. No cracking of the piers or other failure of the masonry was apparent during the interval. This indicates to the Committee that regardless of Major Jenney's intention in the matter, and of the opinions of various commentators on the building, the piers, were, in fact, supported by the structural skeleton . . . the typical masonry pier was eight hundred square inches, and of this six hundred and forty square inches was supported directly by the cast iron lintels and the doubled twelve inch spandrel beams and the doubled twelve inch floor girders. The remaining one hundred and sixty square inches, one-fifth of the area, represents in typical cases the pier facing four inches in thickness and three feet, six inches in width. As this facing was bonded into the pier, it could not help but be supported by the corbel action from the main body of the pier. There was in addition, though unessential to its support, considerable adhesion to the iron columns to which the brickwork was closely pressed. Furthermore, at certain places stone lintels and stone belt cornices directly supported by the iron framing traversed the piers and was bonded into them, forming a cantilever and a beam action which aided in the support of the brick facing in the function of a shelf. An important exception occurs to the typical column design in the three street front corner piers. In these columns, at each floor, an iron flange extends four inches from the outside faces of the columns into the masonry pier, which at this point is twelve inches in thickness. This obviously was intended to support at least part of the pier." Tallmadge, *Field Report,* 14–15.

The Committee's interpretation of this last detail is in error, for this specific condition was the logical result of having to bolt the corner columns through flanges in the directions of both street fronts, which unintentionally forced the flanges to project into a corner pier's facing. This is quite evident when one examines the photo of the demolition (Plate III—Tallmadge, 22). Another error contained in the report was the Committee's extensive yet unconvincing explanation about the stone belt courses' structural capacity. Jenney's own words about the "cantilevered" stone lintels' potential to carry the masonry facing, which were even, surprisingly, reprinted in the Committee's report stated: "Stone lintels must have short bearings on the piers, that there may be some movement without fracture." Ibid, 32. Obviously, the short bearing of the lintel would have prevented any cantilever action and thus, no support to the masonry facing would have been available. Incredibly, the Field Report even contained a close-up photograph of the stone lintels in question that visually contradicted the committee's argument. This shows a vertical joint in the stone coursing directly over the corner of the masonry piers, the exact location where a joint could not occur if the committee's argument was correct. The location of this joint obviously would have prevented any beam action in the stone coursing, which would have been necessary to carry the pier's face brick as the Committee imagined. Ibid, 4.

Irving K. Pond also argued that the piers' facings were loadbearing and not supported on the frame, noting that "no masonry pier could have been installed until that immediately beneath was in place," Irving K. Pond, "Neither a Skyscraper Nor a Skeleton Construction," *Architectural Record* (August 1934), 32. The most cynical response to the Field Committee's attempt to prove the iron column's support of the masonry facing came from William G. Purcell in a letter to his partner George G. Elmslie:

"See the picture on page 21 where a small square cast iron column is seen, during demolition, to be supporting a few cubic feet of brick masonry which clings to it. Well, naturally, George, when they were taking down the building the brick piers ceased to support that which was no longer resting upon them and their reinforcing metal naturally had enough strength to hold up a cubic yard of rubble" . . . William G. Purcell, "First Skyscraper," *Northwest Architect* (January 1953), 5.