

Chicago and the Birth of the Skyscraper

Lecture Themes:

Conditions that give rise to innovation in Structure

Engineering role of structural innovation in the skyscraper

The birth of the steel 'skeletal' skyscraper form

Structural Art of Buildings (as opposed to Bridges)



photo credit: Richard Seaman



First Chicago School

Burnham & Root

credited with “the invention and mastery of steel framing and with the ... modern office building.” (Carl Condit)



Jenney



Adler & Sullivan



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Jenney



Adler & Sullivan



John Wellborn Root

*The business buildings of
Burnham & Root were the first
tall buildings in which the
conditions both of commercial
architecture in general and
of elevator architecture
in particular were
recognized and expressed.*

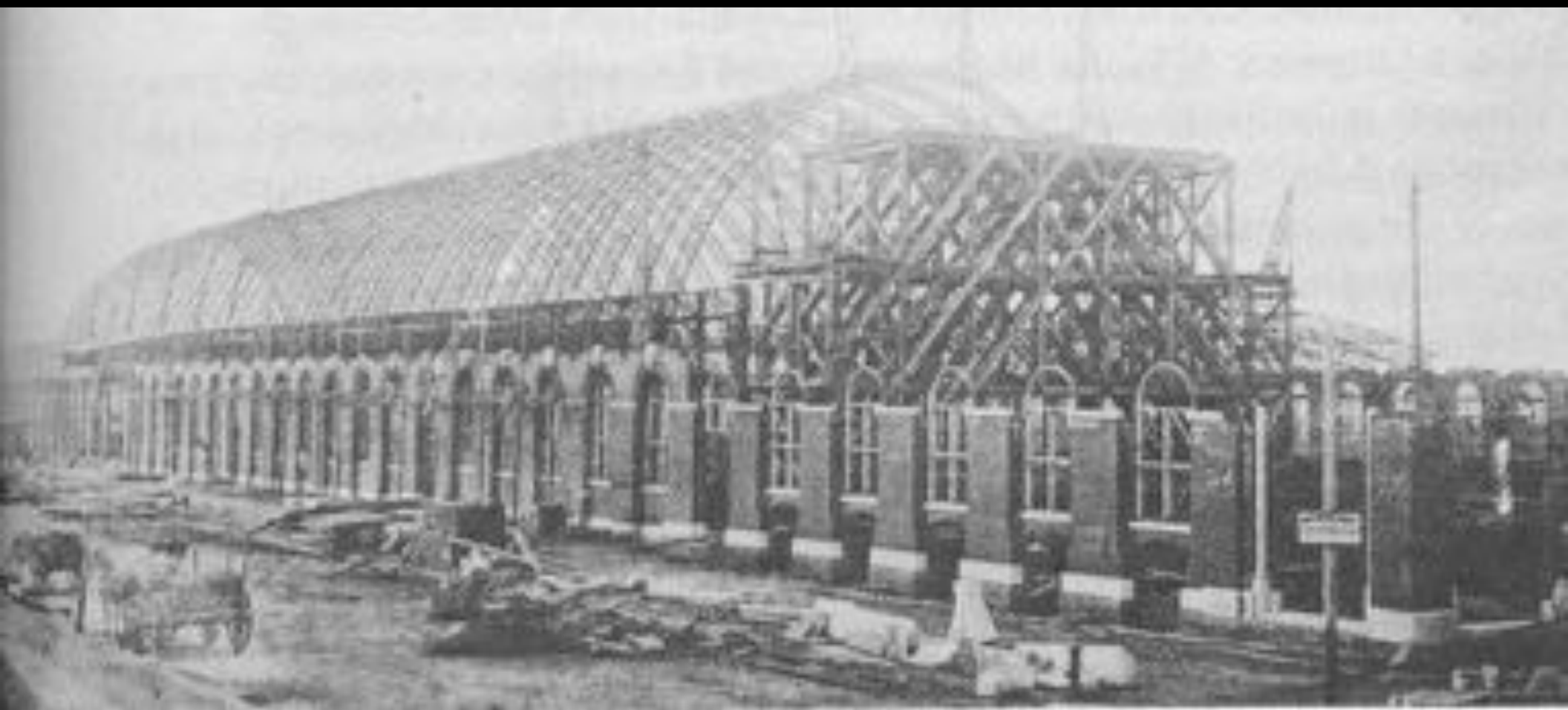
—Montgomery Schuyler, 1895

*Yes, we made all these
buildings together, but they
are chiefly his, for he it was
who did the designing. . . .*

—D. H. Burnham, 15 January 1891









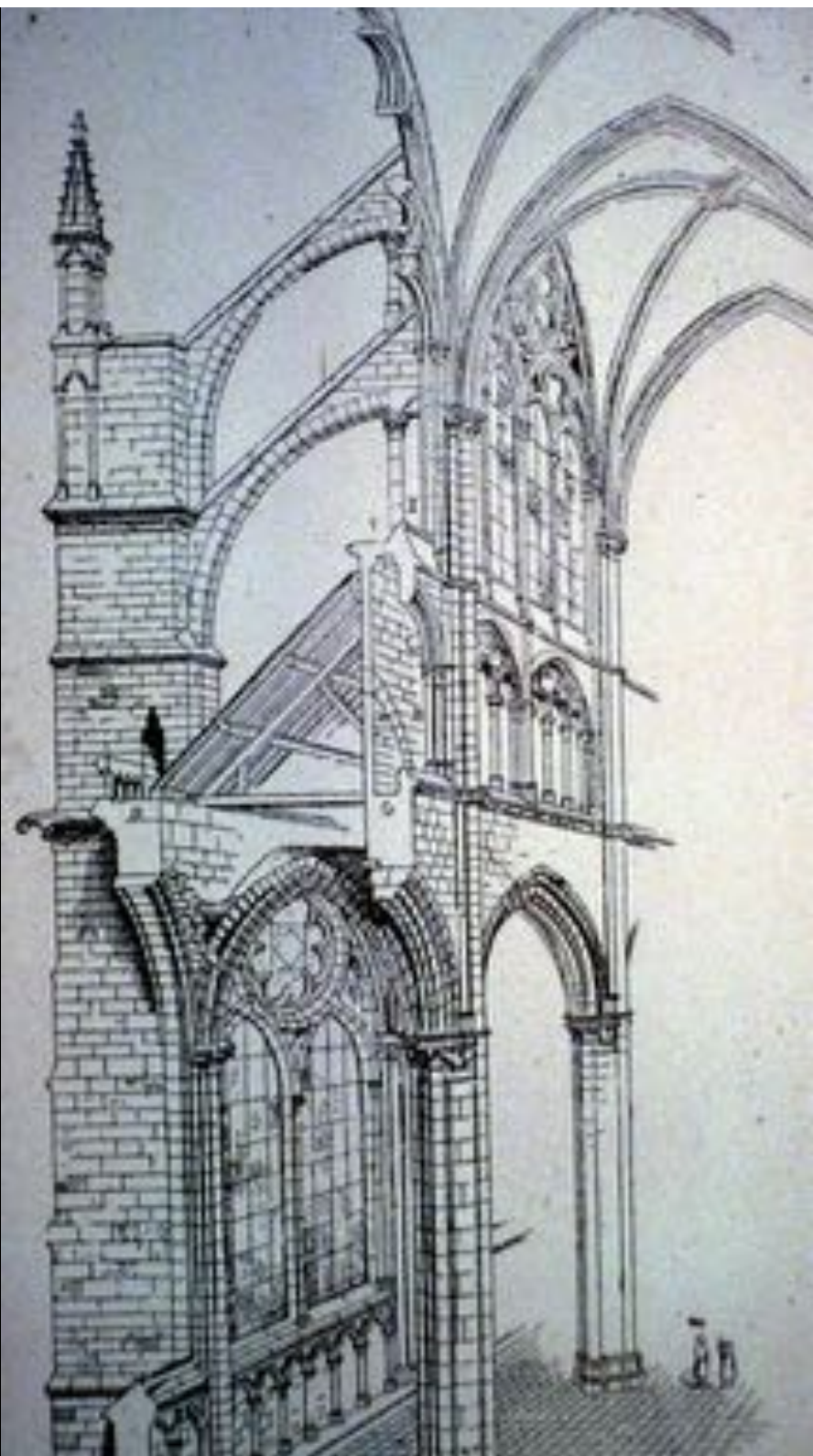
Viollet-le-Duc



Viollet le-Duc

structure makes form

“The extent to which buildings are beautiful, is the extent to which the special problem each confronted was solved in an optimal way.”









Montauk Block

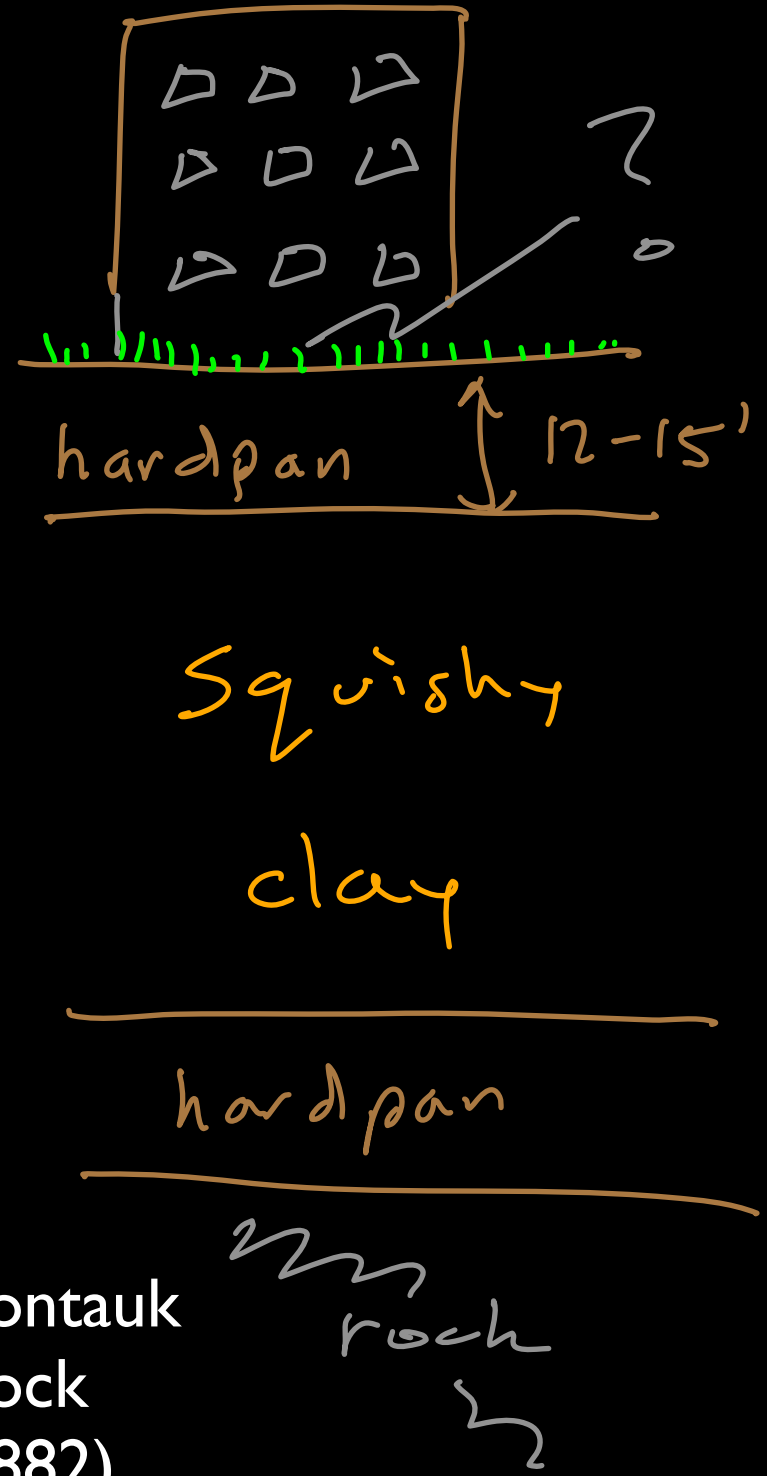
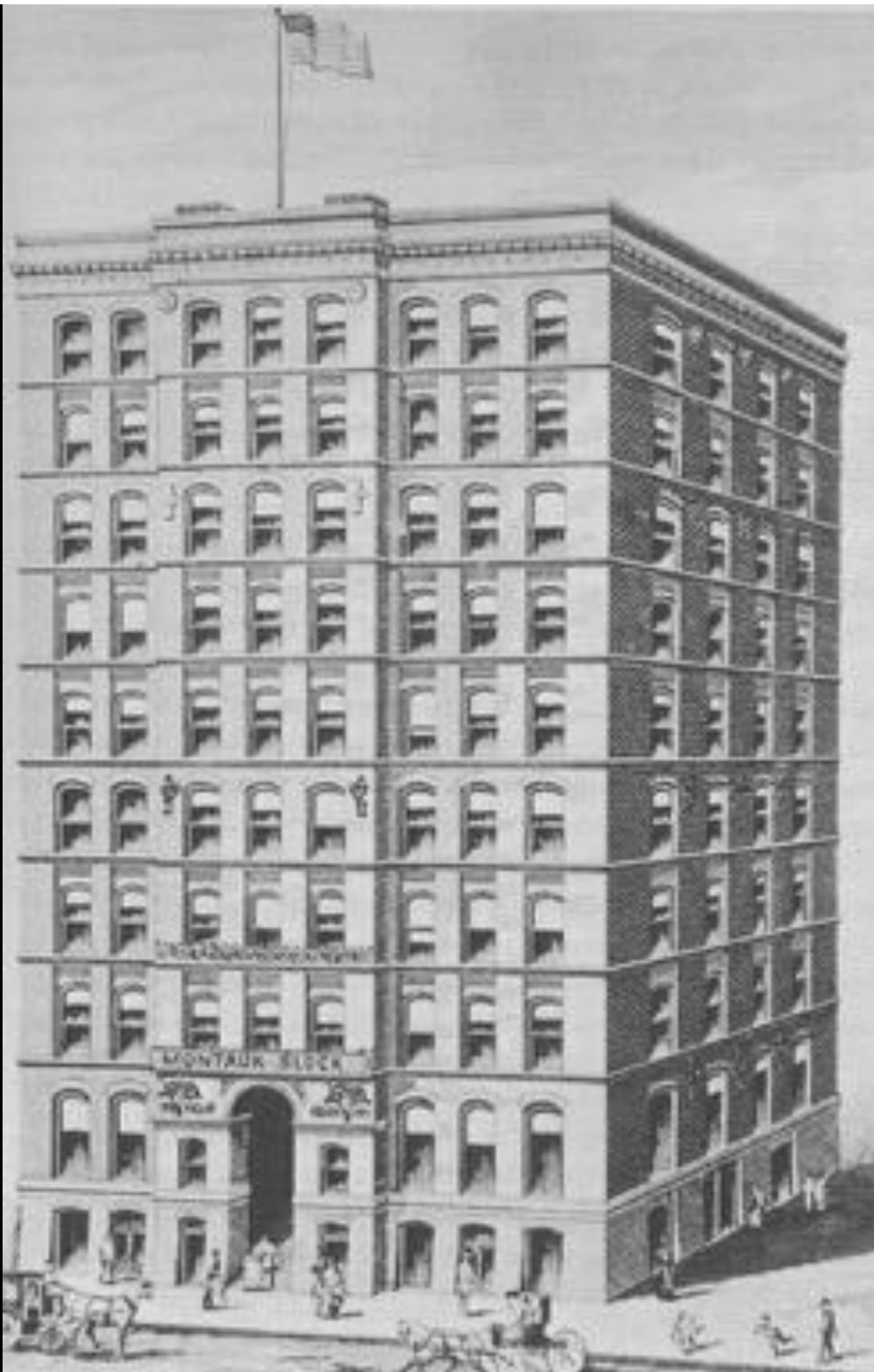
Rookery

Monadnock

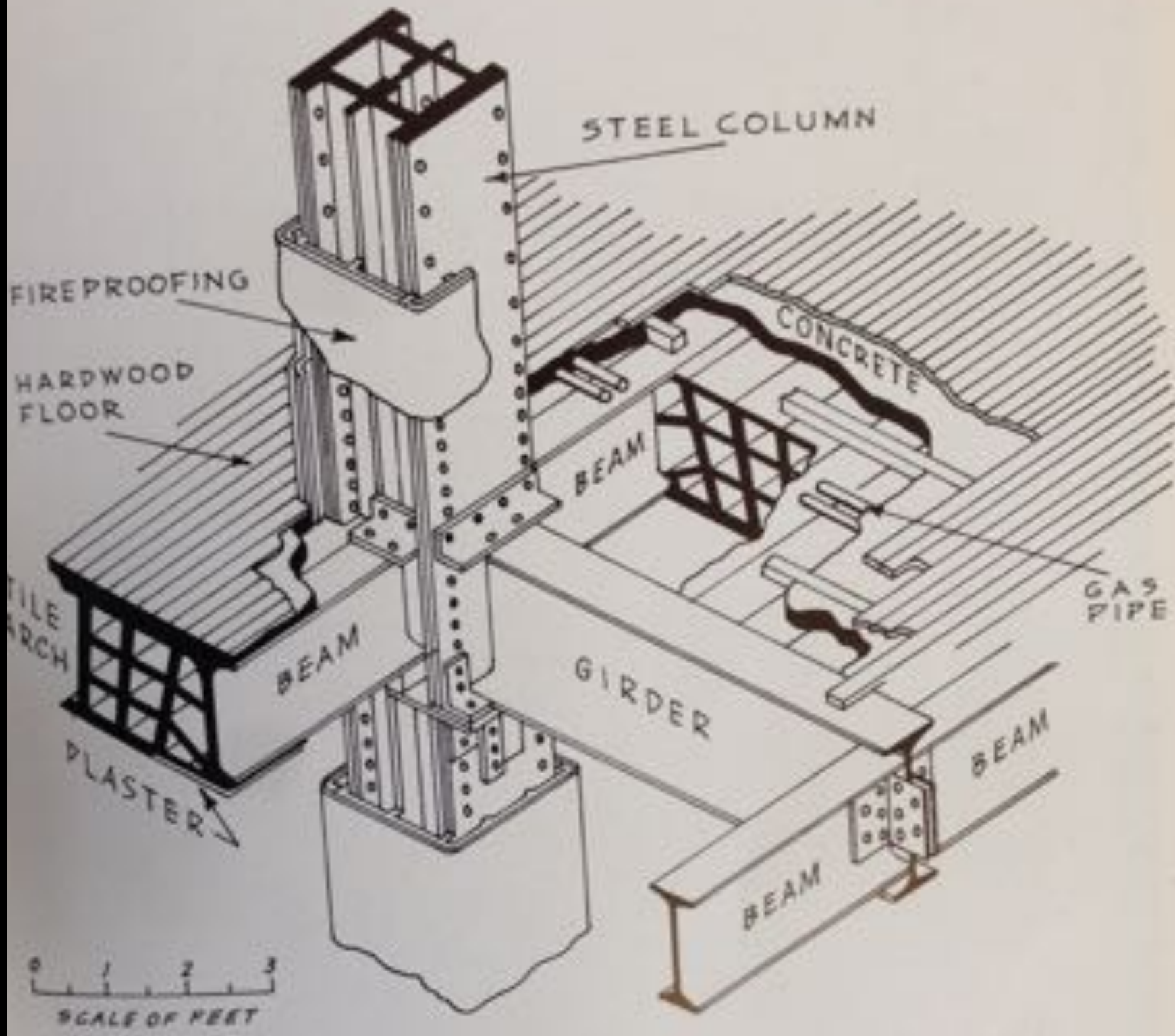
Rand McNally

Reliance

Denouement



Montauk Block (1882)



Montauk Block

Rookery

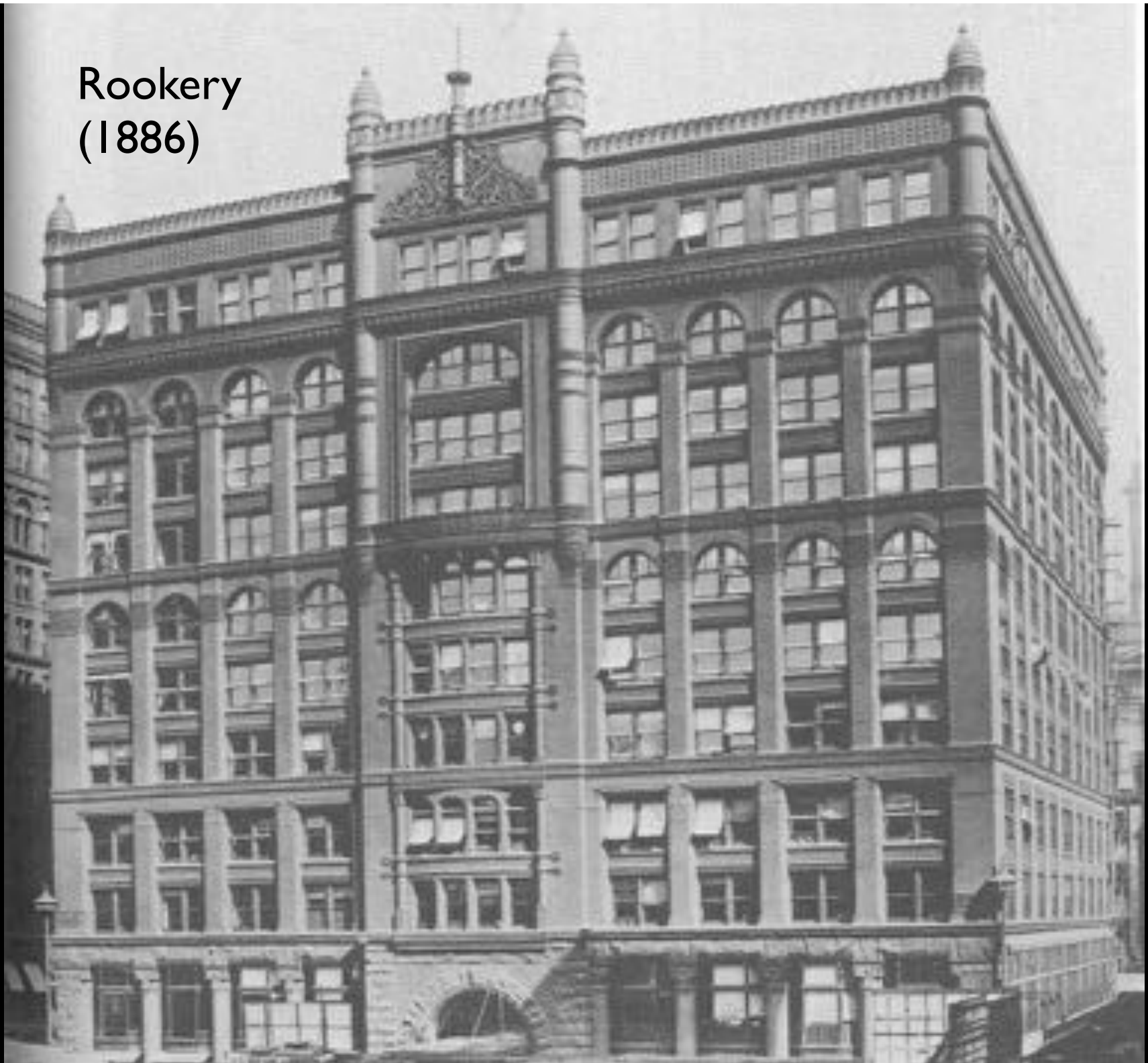
Monadnock

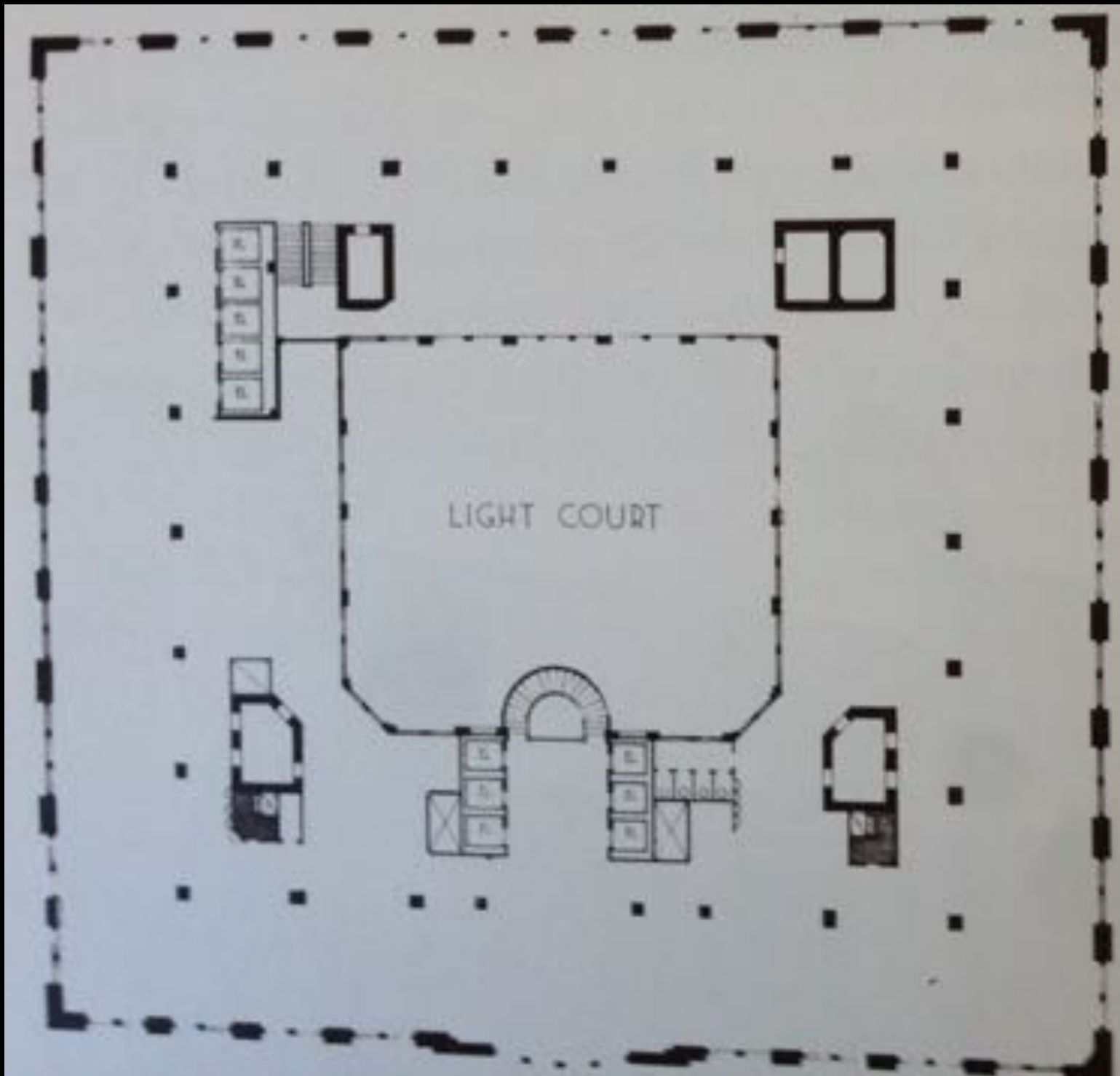
Rand McNally

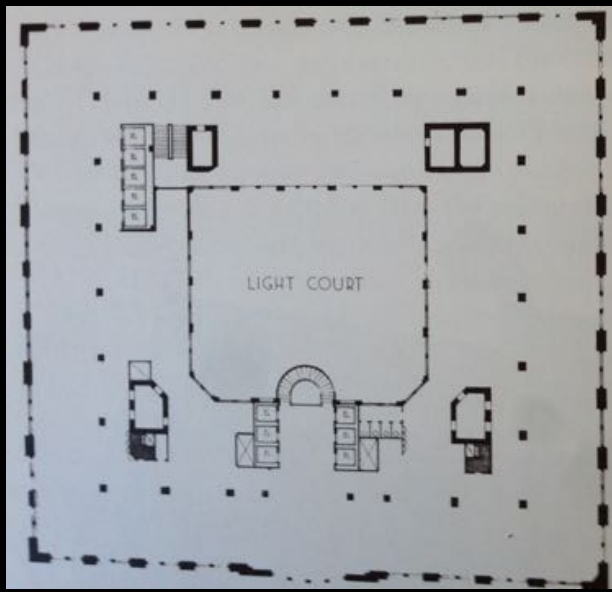
Reliance

Denouement

Rookery
(1886)











HABS # ILL-1030

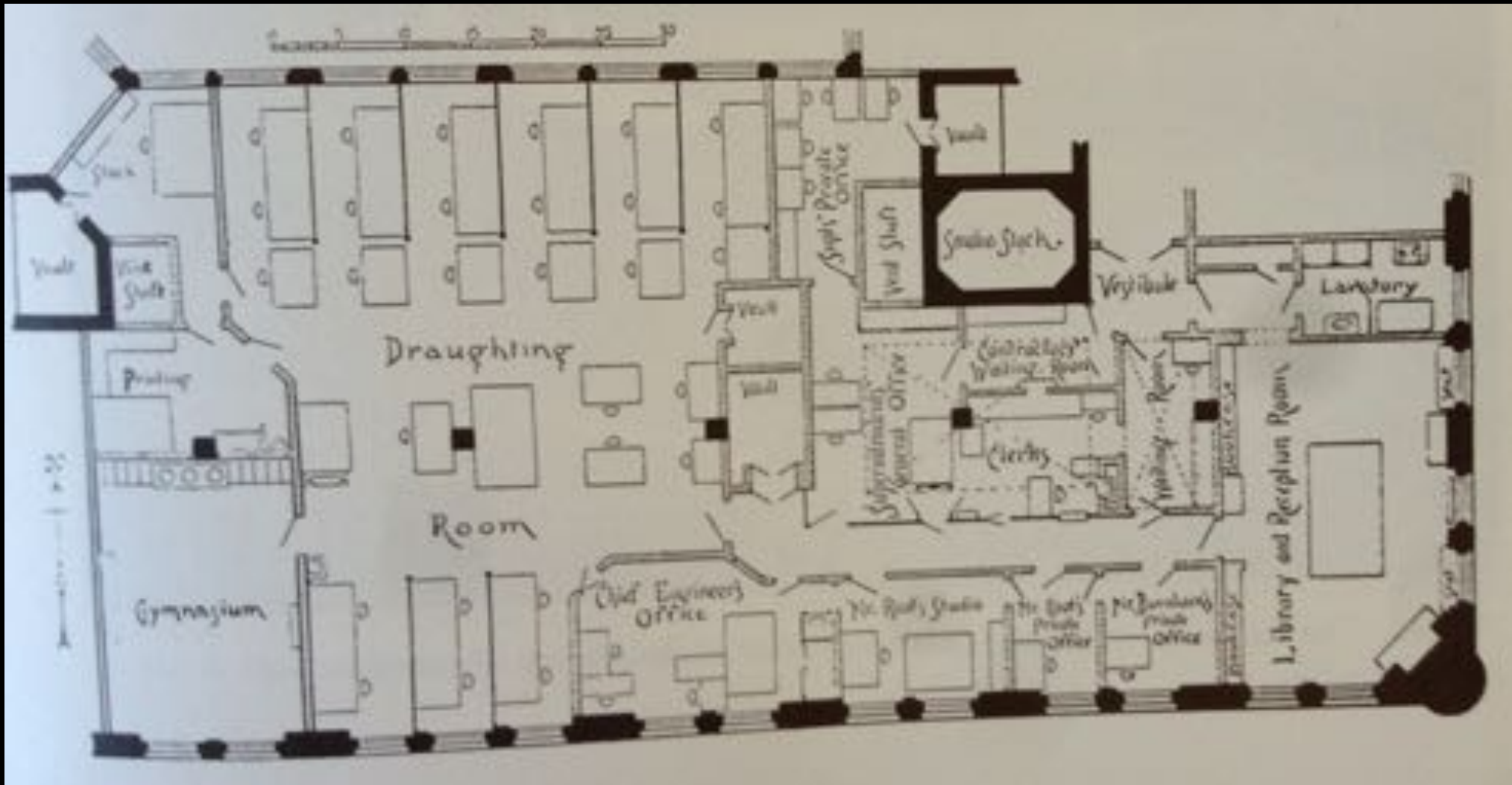


Buildings are harder to dissect as Structural Art than Bridges

Consider the Social Category

- **Bridge**
 - Impact on two communities/sides being connected
 - Cost of construction
 - Modes of transportation allowed on bridge
 - ...
- **Building**
 - (You fill in)

Burnham & Root offices in the Rookery



Burnham "... don't you know that you can hire any number of civil engineers, mechanical engineers, and electrical engineers, who will be absolutely contented to spend their whole lives doing routine?" [Collapse of a Burnham designed ballroom in Kansas City a few years later had him rethinking things a little bit...]

Montauk Block
Rookery

Monadnock

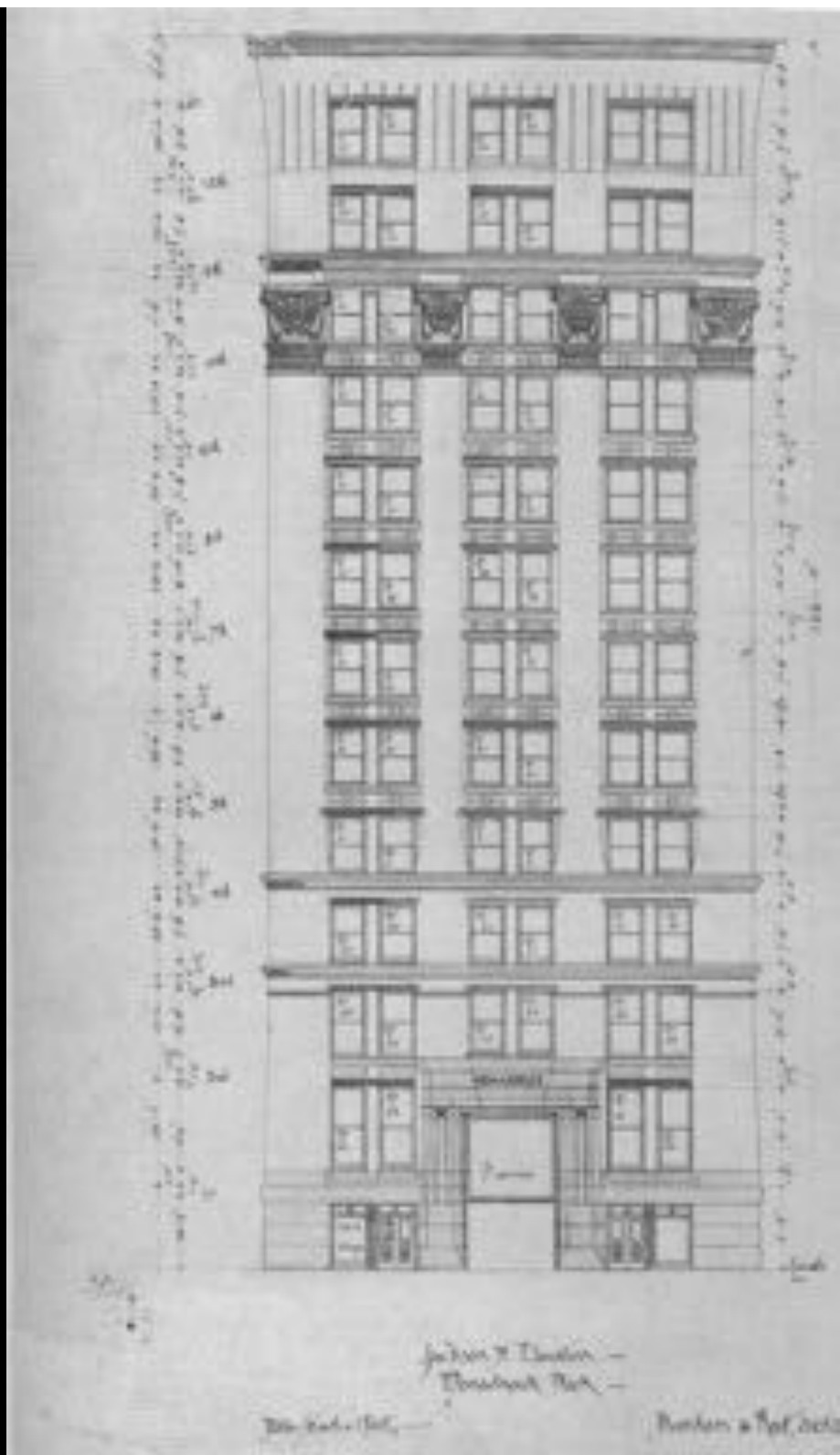
Rand McNally
Reliance

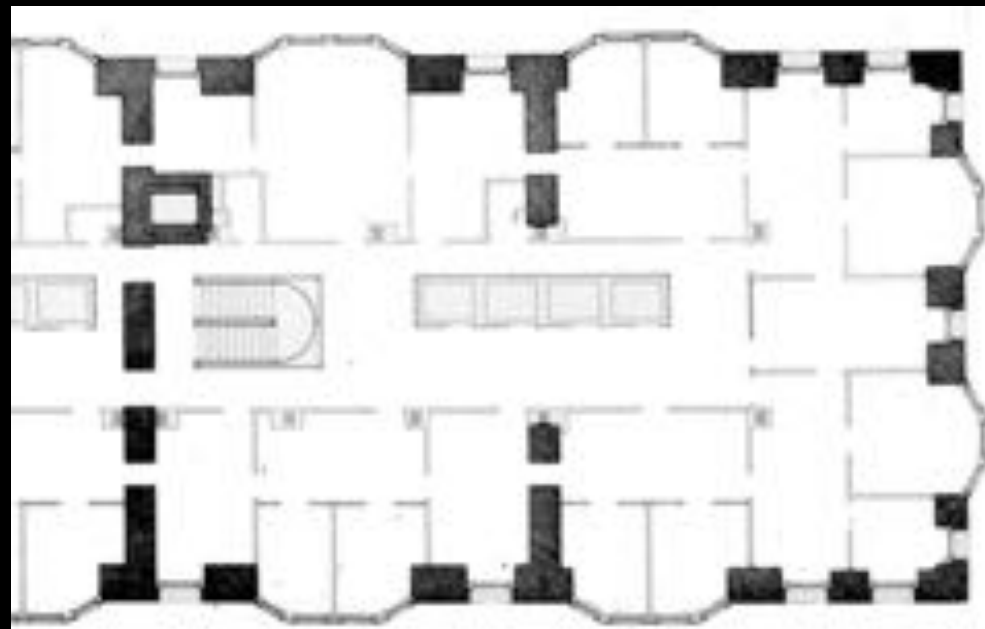
Denouement



“this is the thing, itself”
-Schuyler

Monadnock
Building
1891
Root & Burnham





plan view (partial)

Monadnock
Building
1891
Root & Burnham





Home Ins.
Building
1885
Jenney



Montauk Block

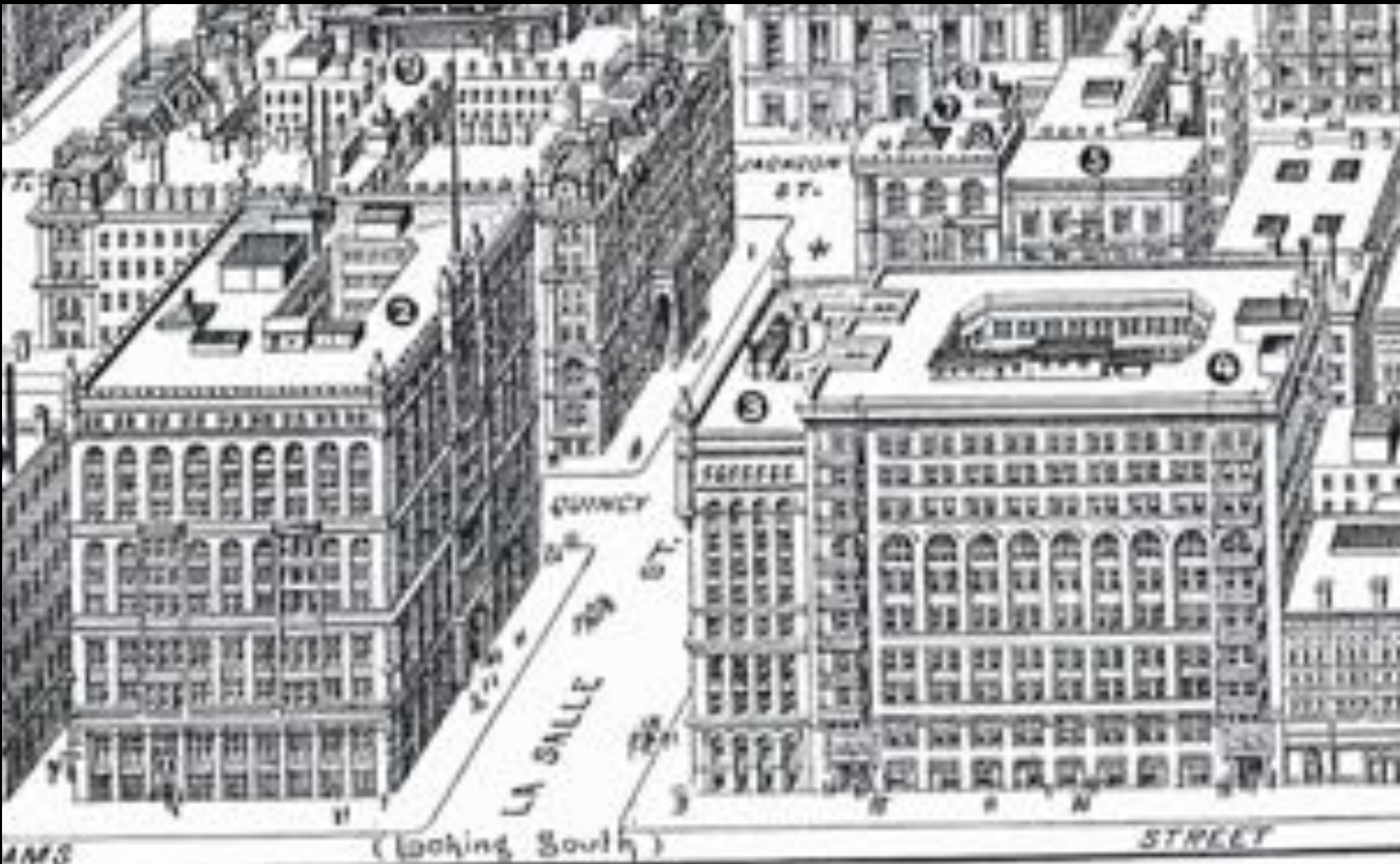
Rookery

Monadnock

Rand McNally

Reliance

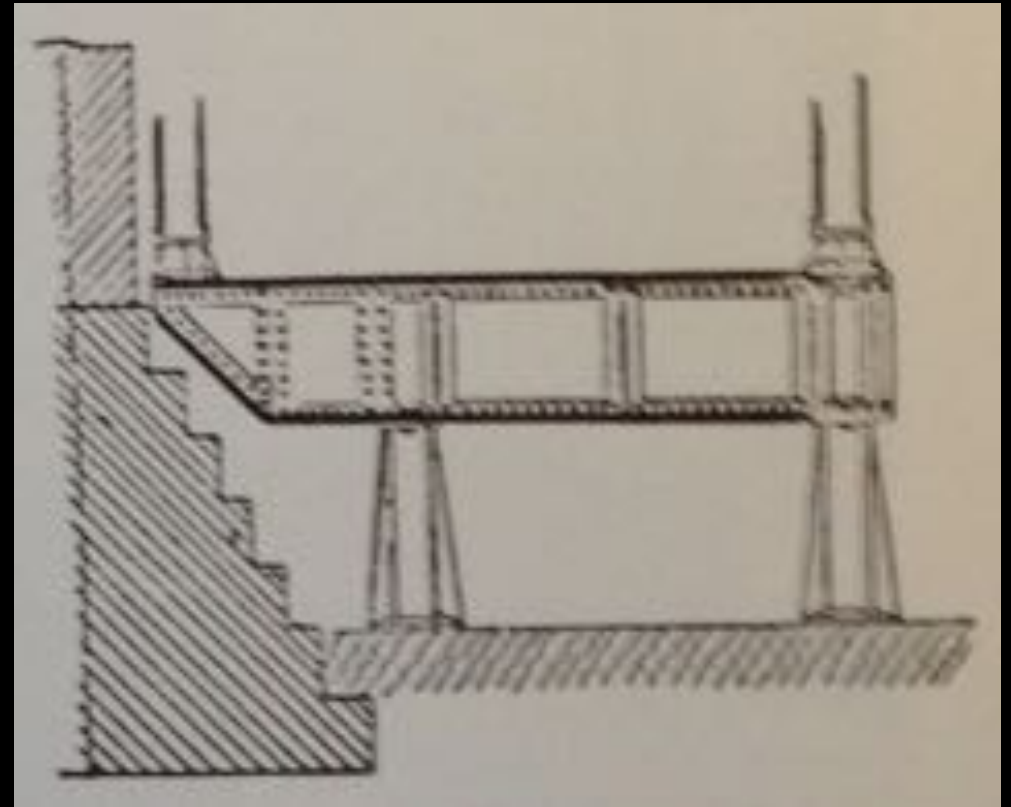
Denouement



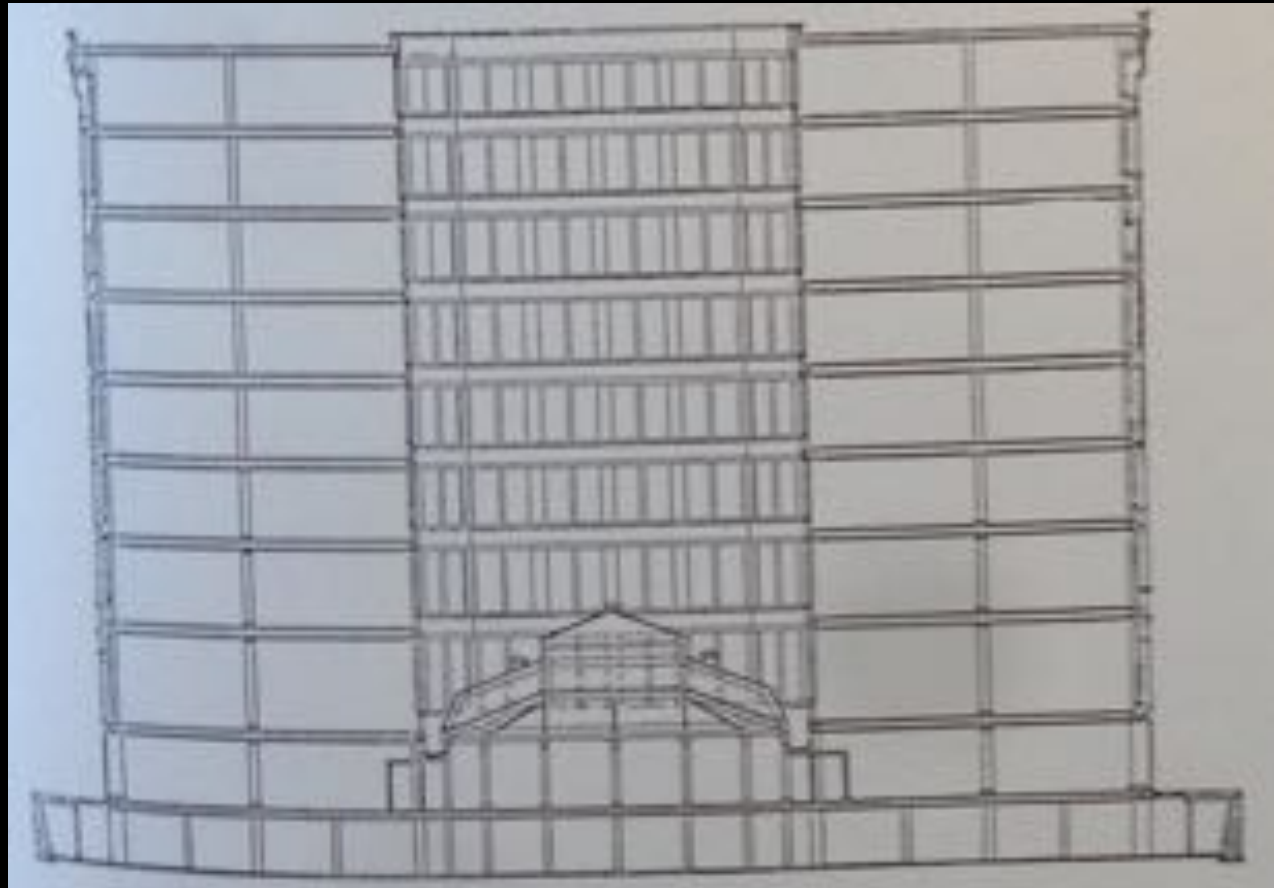
A.M.S.

(Looking South)

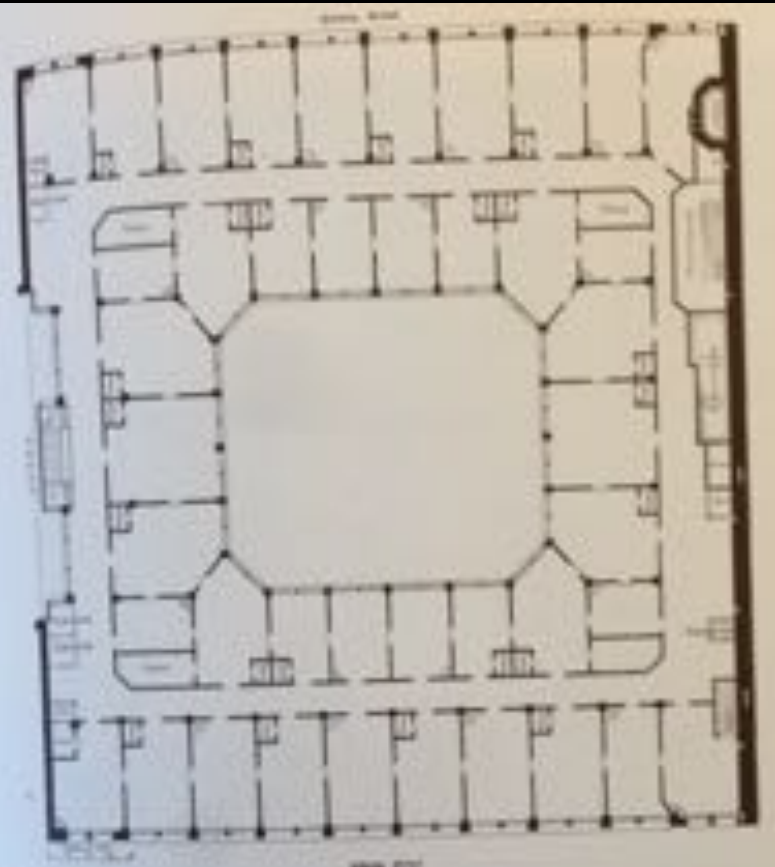
STREET



Rand McNally
Building
1890
Root & Burnham

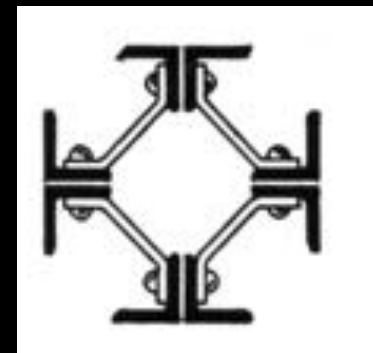
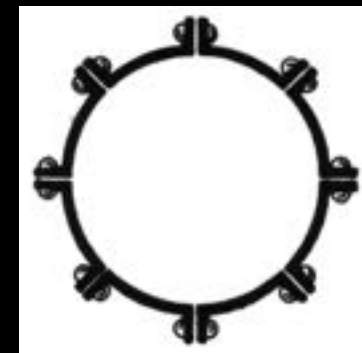
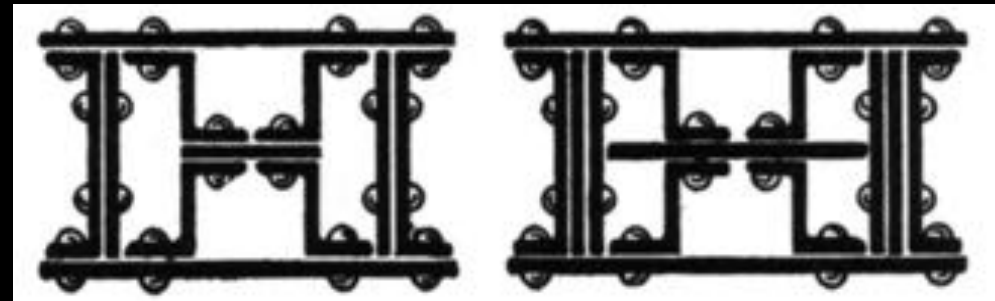
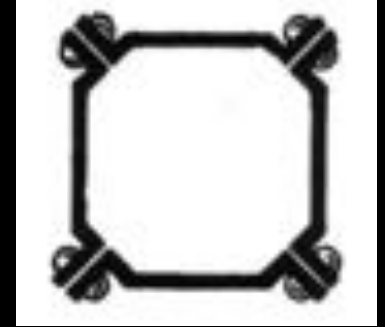
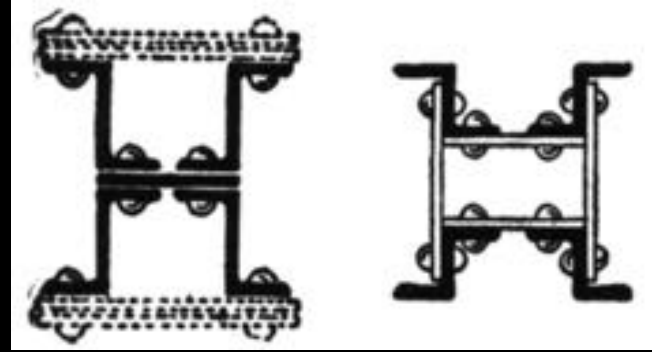


elevation section through center



plan

Steel columns

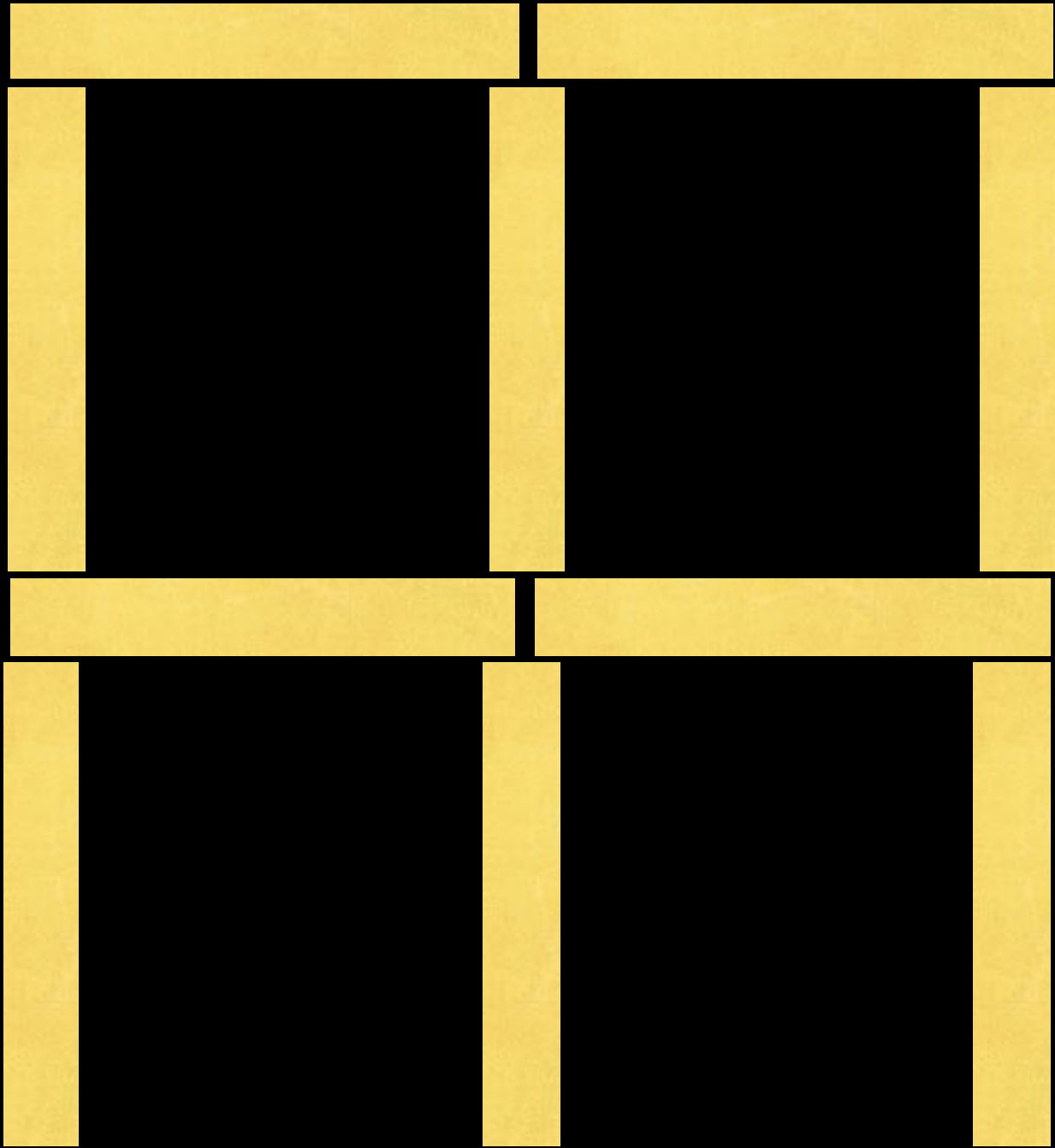


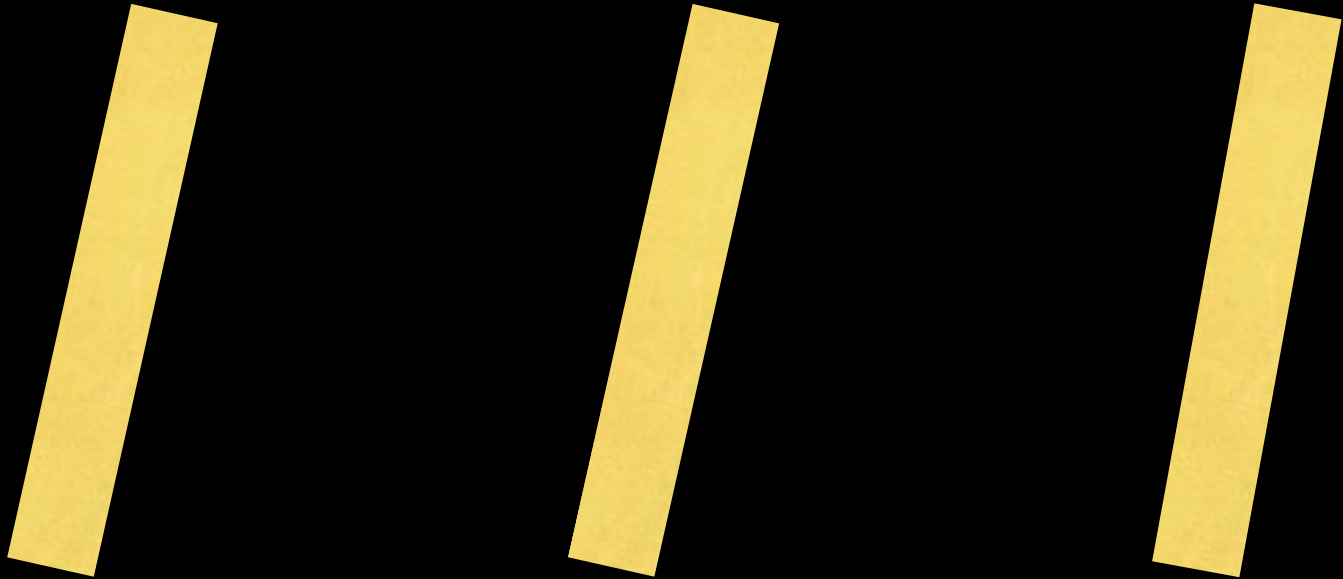
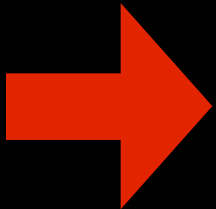
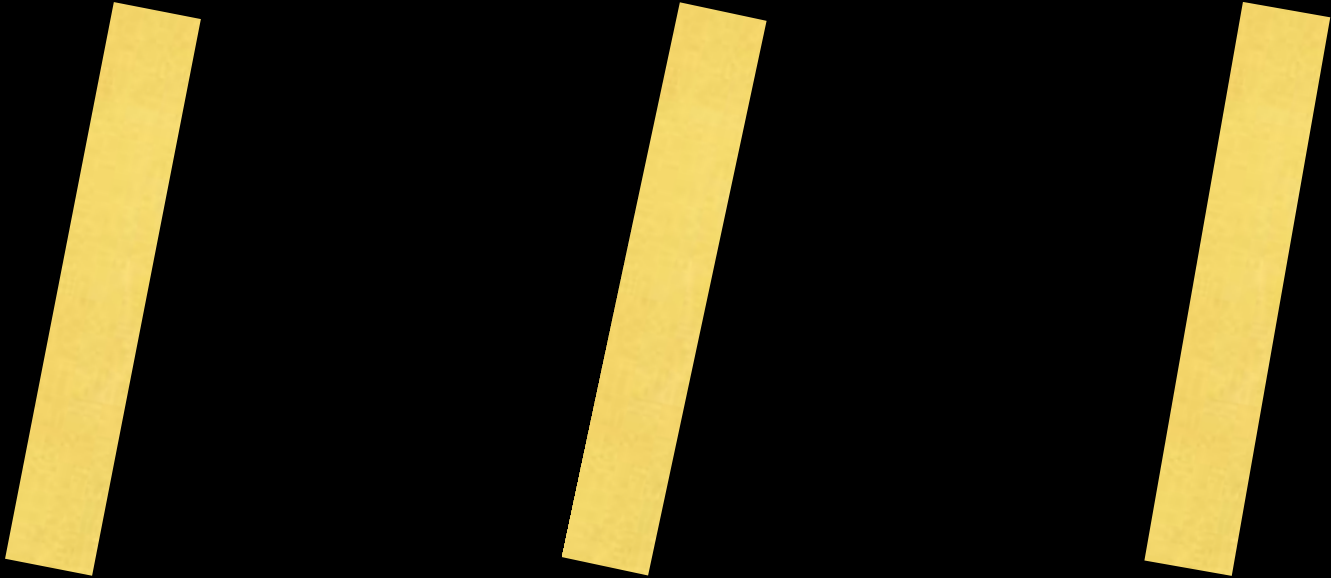
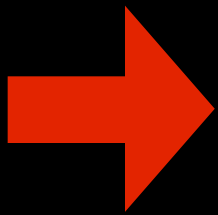
Rand McNally
Building
1890

Root & Burnham

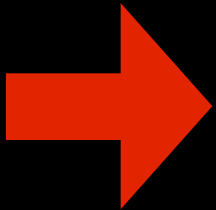
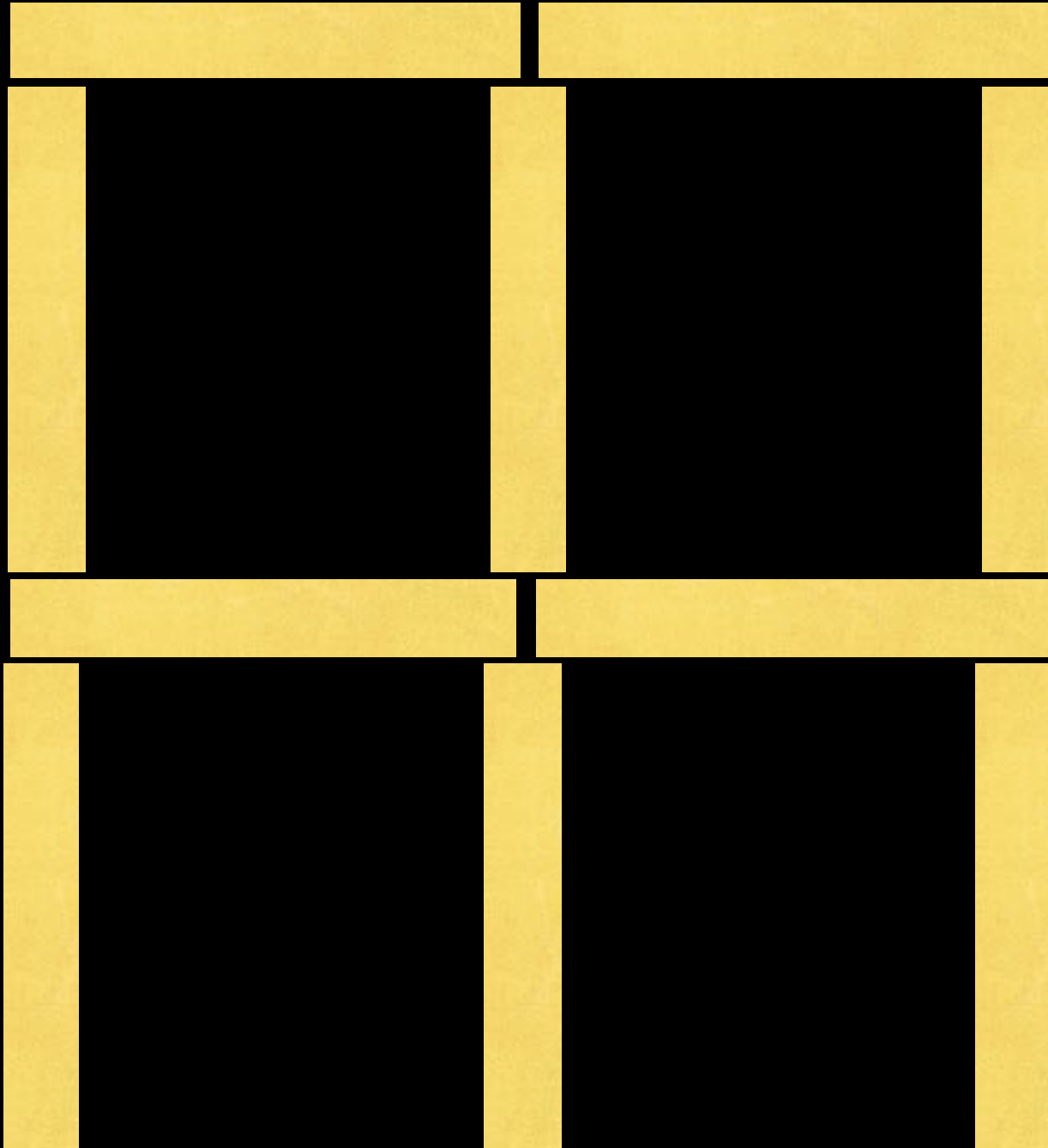
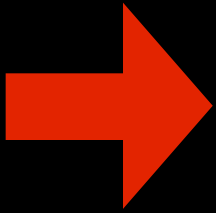
Need to improve wind design

The *Engineering Record* [in 1893] noted, “the construction of skeleton buildings has but recently been commenced hence but little opportunity has been afforded to test them in the face of ordinarily destructive winds. As a general rule, how-ever, it may be considered very indifferent engineering that is fortified only by a lack of failure. If a construction is sound in principle it can be shown to be so, but if its character is not capable of a clear defense, it can only be regarded with well-grounded suspicion.”





Improve this structure!



TYPES OF WIND BRACING

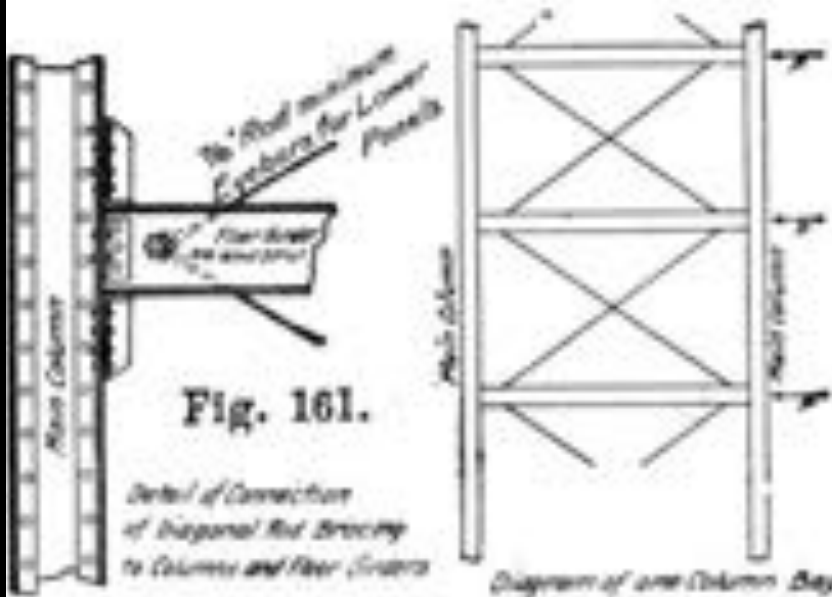


Fig. 161.

Detail of Connection of Diagonal Rod Bracing to Columns and Floor Girders

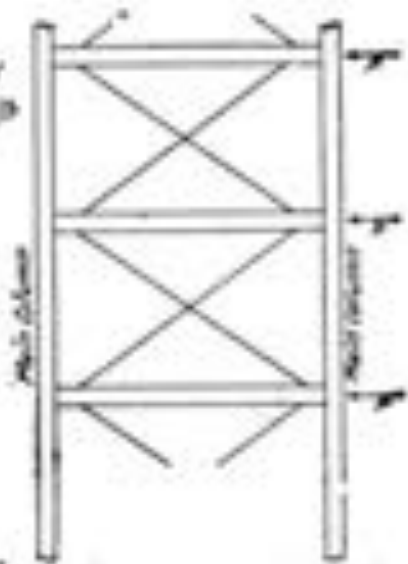


Diagram of one Column Bay Braced by Diagonal Rods to resist Wind Pressure

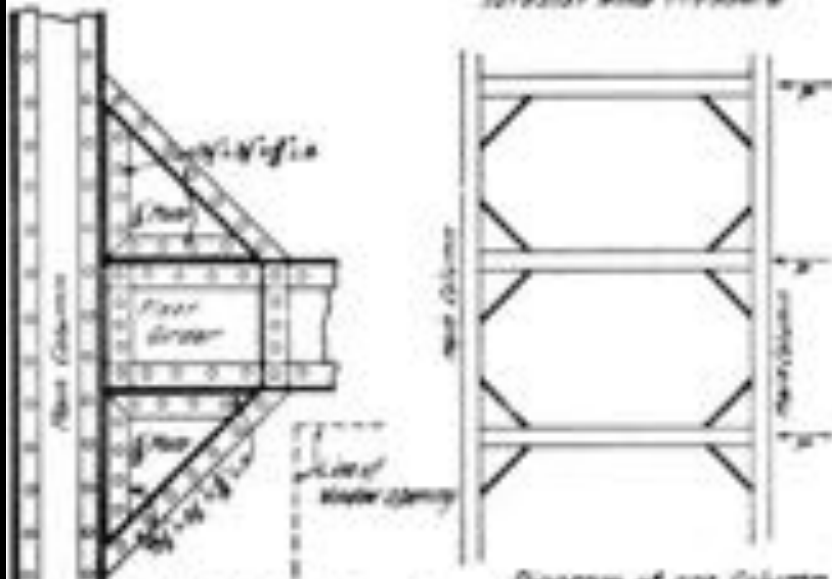


Fig. 162.

Detail of Connection of Knee Braces to Columns and Girders

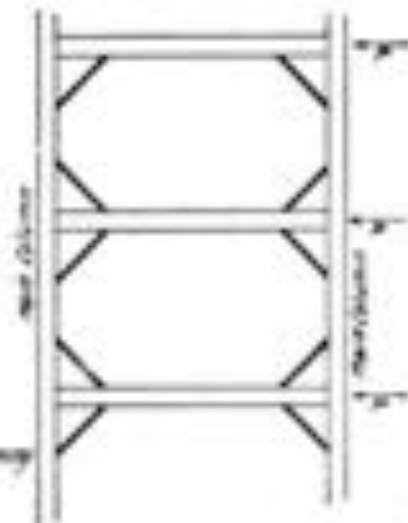


Diagram of one Column Bay Braced by Knee Braces to resist Wind Pressure

Wind Bracing

Masonry walls

Rod bracing

Knee bracing

Portal frame bracing

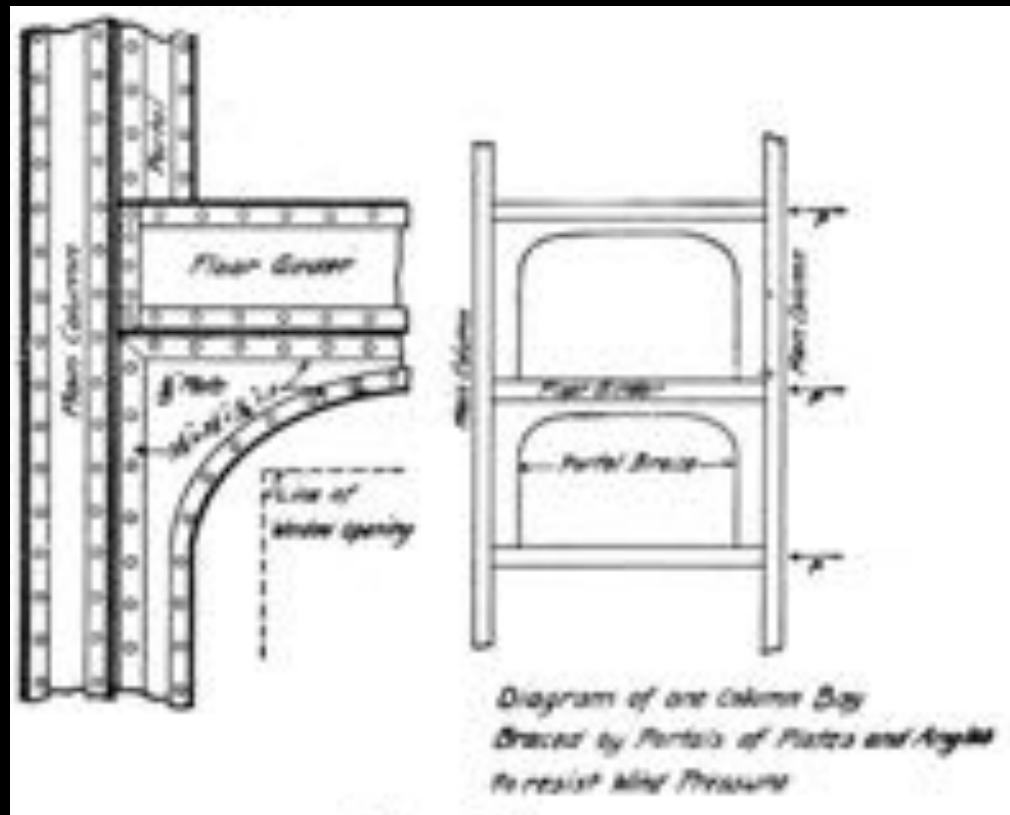
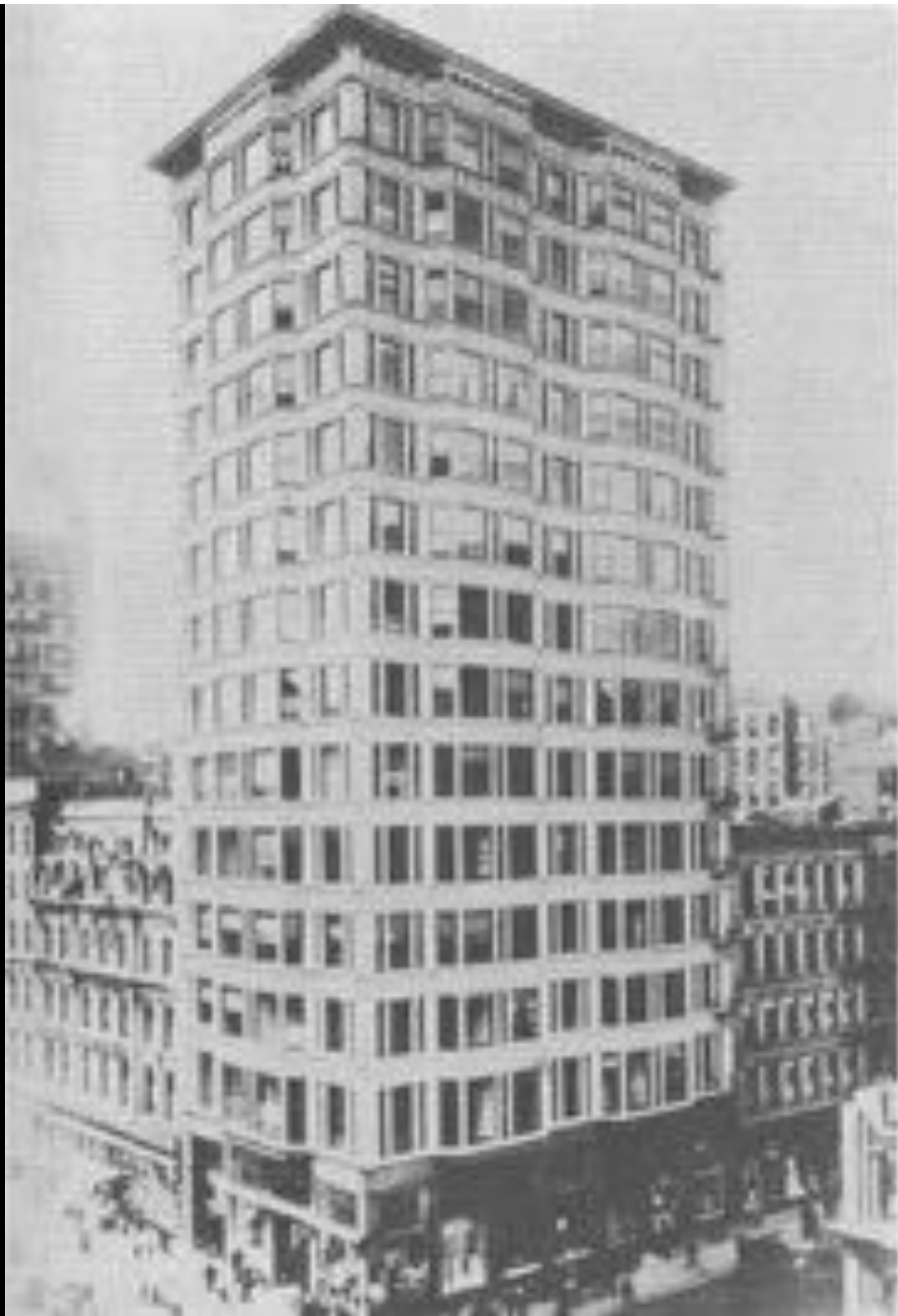


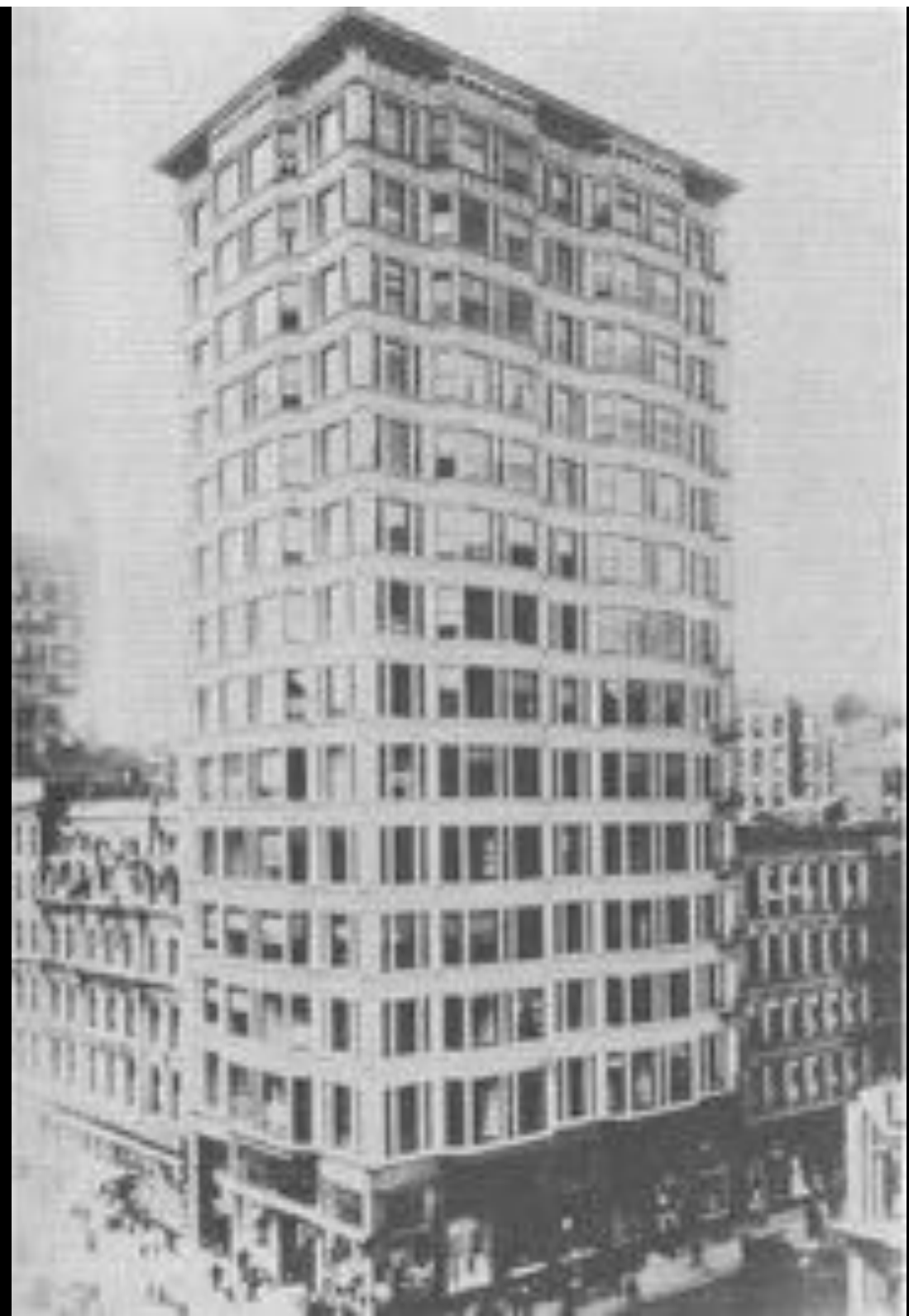
Diagram of one Column Bay Braced by Portals of Plates and Angles to resist Wind Pressure

Montauk Block
Rookery
Monadnock
Rand McNally
Reliance

Denouement



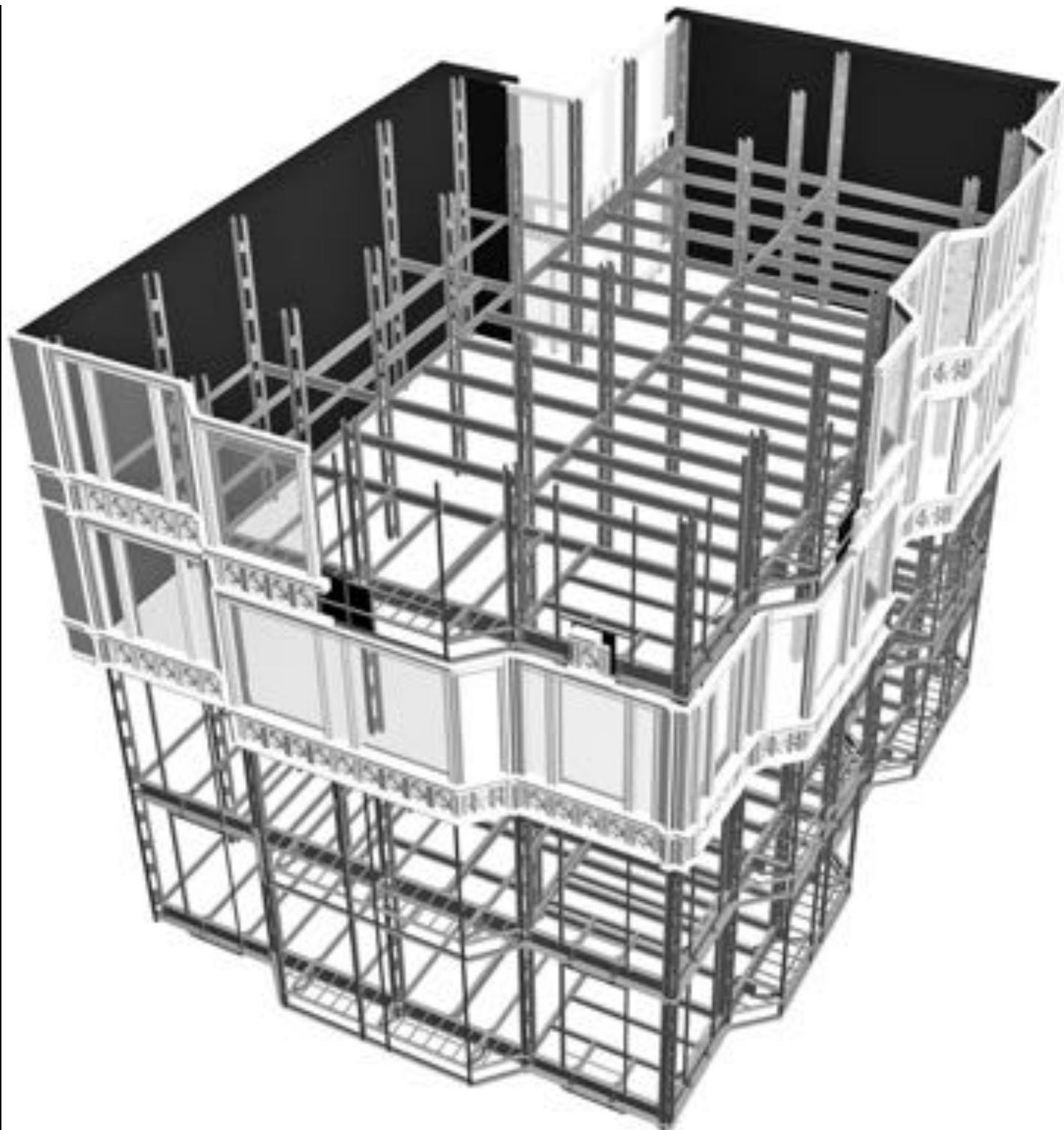
Reliance Building
1895
(Root) & Burnham &
Atwood & Shankland













Root on Structures



Root on Structures

"simplicity, directness, moderation"

"... it is obvious that if a column is primarily a structural feature ... it may be legitimate to use the column in a very small scale as a purely decorative detail, but it is the greatest of architectural crimes to use a great column in a large building for any purpose than primarily to carry weight."



"Generally speaking, however, it will be found that the simplest arrangements ... are best fitted to great buildings."

"Steel columns are rapidly coming into use instead of cast iron ... The steel columns are made of rolled plates of steel which are bent into proper form and riveted together. Thus, they may be perfectly inspected and are absolutely trustworthy."

Montauk Block
Rookery
Monadnock
Rand McNally
Reliance



*Aside on
Sullivan*

Denouement

First Chicago School

Burnham & Root

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Jenney

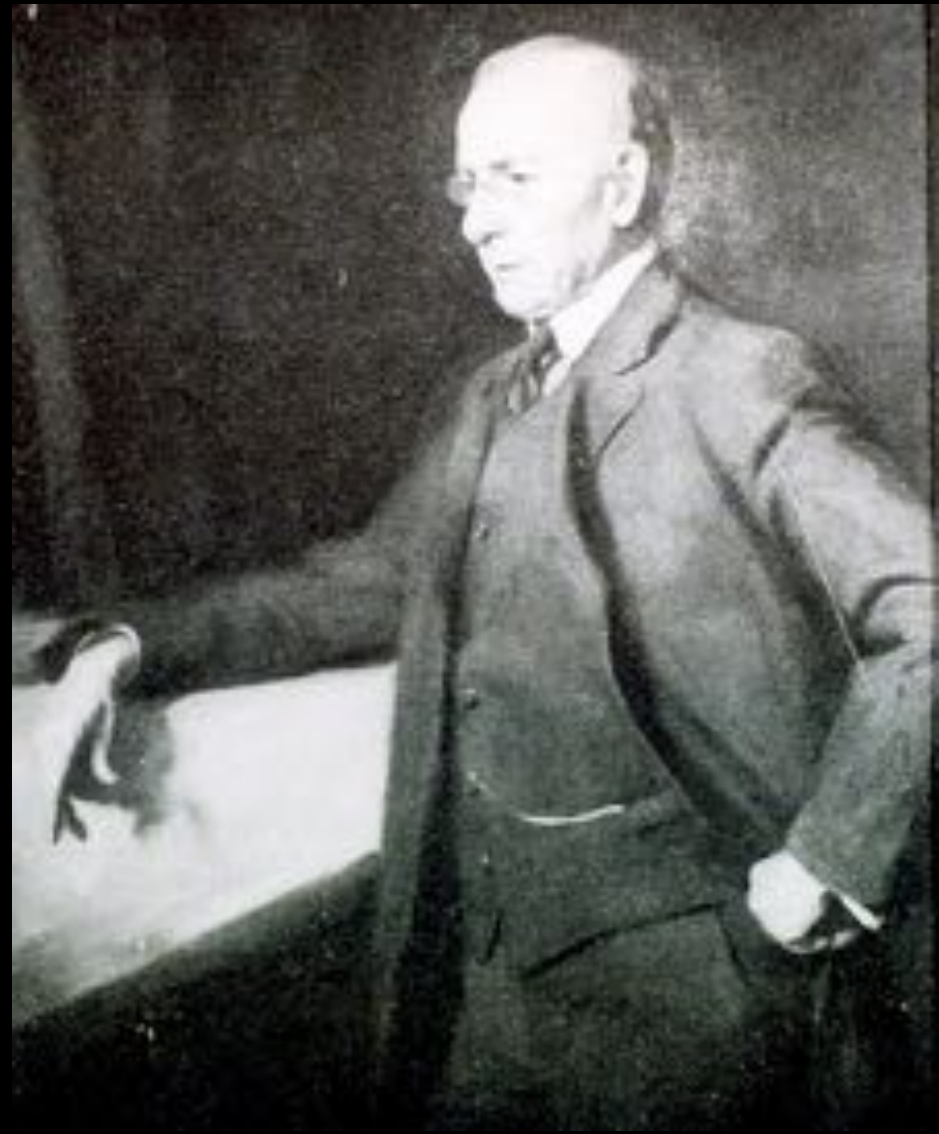


Adler & Sullivan





Sullivan's Wainright in
St. Louis



Sullivan's Wainright in
St. Louis





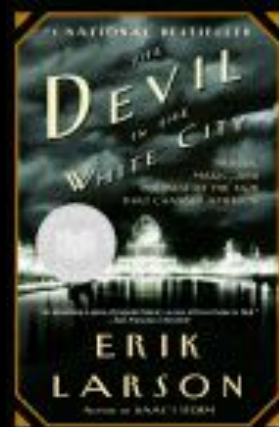
Carson Scott Pirie
Building
1899
Adler and Sullivan





Montauk Block
Rookery
Monadnock
Rand McNally
Reliance

Denouement









extras





Jenney
Sullivan
Burnham
Root

...

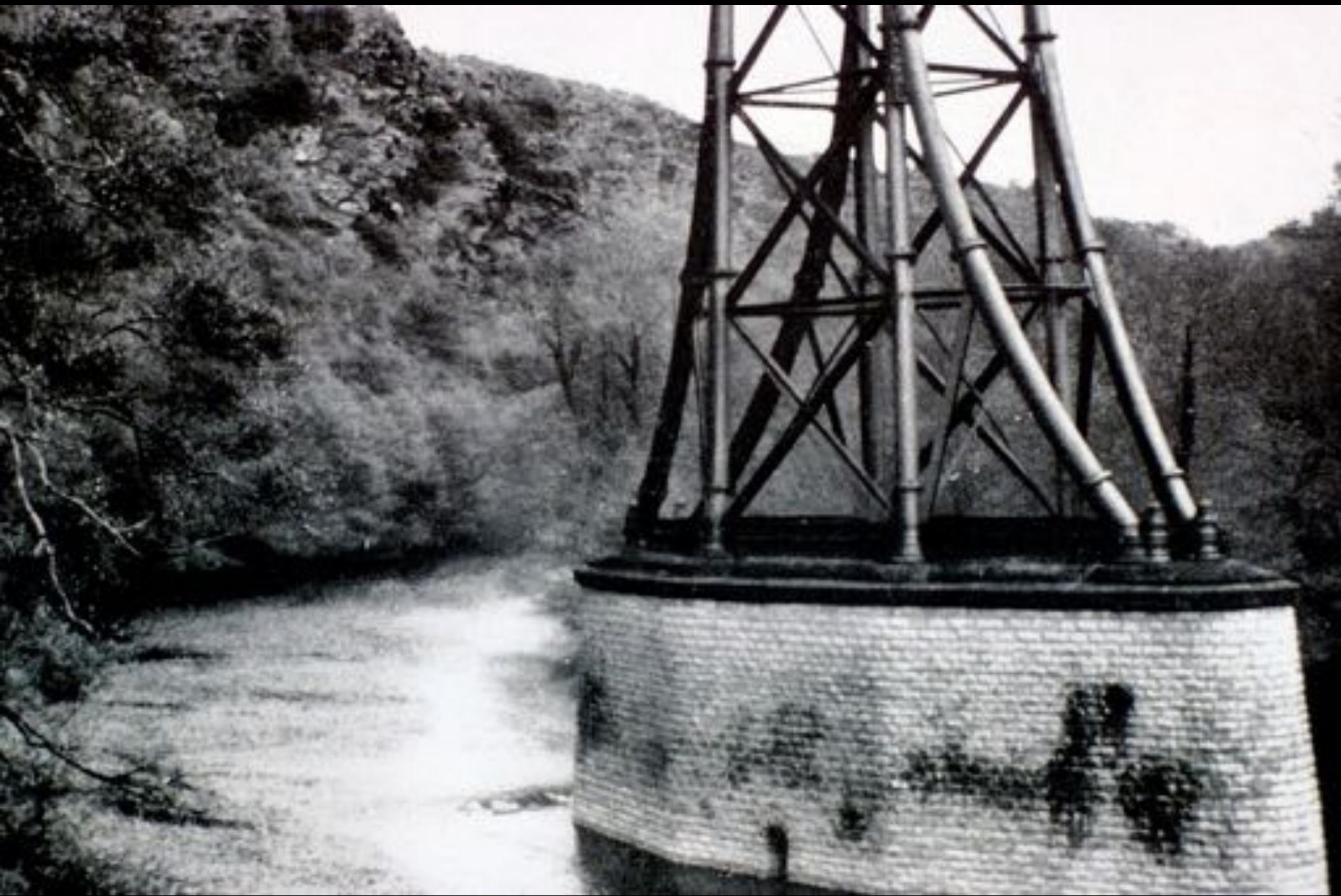
The (First) Chicago School



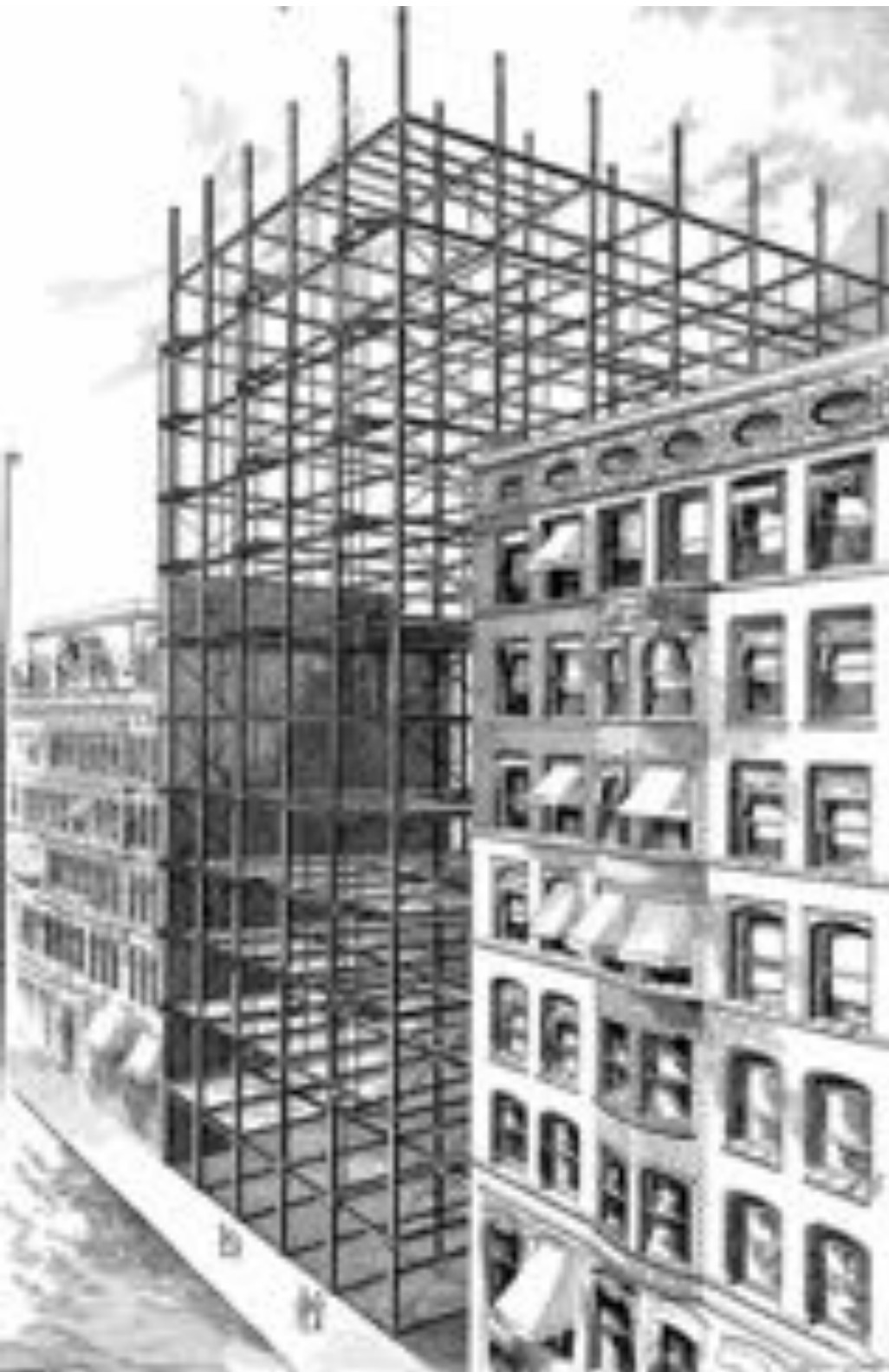












Shows skeletal construction of the time. Architect is Warren, not part of the story line for Chicago talk..

Unity Building
1892
(demolished 1989)



Jenney
1879
Leiter Bldg.

Reliance Building

