Early Experiments in Concrete Grain Elevators

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Hermann Schlawe, chief engineer of the Roumanian Public Works Service, showed Heidenreich the plans of Luther’s hexagonal plate system using Monier cement cells for grain storage at Galatz along the Danube.
Peavey writes to his chief engineer, John Massie, about plans to erect the first concrete grain elevator in America at Rice Point, Duluth, on Lake Superior. Meanwhile he’s looking to the projects going on in Europe for confirmation.
The original concrete silo engineered by Charles F. Haglin known as “Peavey’s Folly,” on the grounds of Peavey’s Interior Grain Elevator along the SOO rail line in Minneapolis.

Haglin’s experimental concrete bin at St. Louis Park, Minneapolis, after demolition of part of Peavey’s Interior Elevator (Courtesy: Minnesota State Historic Preservation Office, Minneapolis)
“Peavey’s Folley” today – the sole remnant of the Interior Elevator complex (later occupied by a lumber company).
St. Louis Park, Minneapolis
Manchester Ship Canal, Elevator No. 1
Trafford Wharf, 268 bins, opened on July 4, 1898
John Metcalf & Co., Chicago
The first grain elevator using the American System to be constructed in Europe. The Commission was criticized for outmoded wood-crib construction – “a splendid fire pile.”
“Manchester wisely went to America for her elevator, quite as she might go to Paris for a picture, or to South Africa for a diamond, because she could not get an American elevator, or a French picture, or a South African diamond elsewhere. Manchester did not want a silo; she wanted an elevator. She did not want an English engineer’s version of an American elevator; she wanted the genuine thing. Hence, wisely enough, she went to America for it.”

Northwestern Miller, 1898
Frank Heffelfinger
Business associate and husband to
Frank Peavey’s daughter

Minnesota Historical Archives (right)
“there was no such thing as a concrete elevator in or near Hamburg. Imagine our disappointment. Haglin has very evidently been misinformed. We will however stay here for further investigation and present our letters particularly to Luther at Brunswick.”

Frank Heffelfinger, Diary, March 1890
Largest of the grain elevators, Budapest, Hungary

“... it shows the typical difference between the architectural development of Europe and America.”

*American Elevator and Grain Trade* (1914)

Haglin’s photograph of largest grain elevator in Budapest on the banks of the Danube (Courtesy of Minnesota Historical Archive)
Haglin’s sectional diagram of the largest grain elevator in Budapest. The bins are constructed of stainless steel and square. All the working elements, except for the external legs, were hidden behind a traditional brick fabric (later demolished).
Grain Elevator of the Free Harbor in Copenhagen, Denmark (Kjoebenhavns Frihavs Aktieselskabin)
Completed 1894

Sectional view of grain elevator in Copenhagen’s Free Harbor
(Kjoebenhavns Frihavs Aktieselskab)
Heffelfinger’s sketch of floor plan for the Elevator of the Free Harbor in Copenhagen (Courtesy Minnesota Historical Archive). There are actually three arrays of bins with Monier-system concrete outer walls.
“It is a finer looking building than I expected to see and better constructed and arranged than any we have seen here to fore. No cracks visible... Am fully convinced that our construction is all right and even better than this.”

Right: Haglin’s photograph of Braila grain elevator (1900)
Configuration of bins for Haglin’s elevator at Rice Point, Duluth, showing interstitial walls between bins for filling with grain – the so-called “Spread System”

Lateral pressures on inside and outside of bins had too high a differential, causing two structural failures

Collapse of bin wall on December 12, 1900.
Numerous causes were put forth ranging from faulty iron-rebar to poor bonding of cement

*Engineering News*
1901

Haglin first built 15 grain bins at 104 feet high and 33 feet diameter, then added another 3 rows of 5 bins each. At left is Barnett & Record Company’s terracotta tile elevator of 1907, for which only the foundation and first floor were in concrete.
Second failure of one of Haglin’s bins for the Duluth Peavey Grain Company Elevator at Rice Point.
1903

Still in operation around 1940
Weaver’s Granary and Flour Mill at Swansea, Wales (1898)
The first application of the Hennébique system of ferro-concrete by Gustave Louis Mouchel in Great Britain (demolished). This convinced Metcalf of the structural integrity of concrete for the design of grain elevators.
Four concrete bins 47 feet high, 26 in diameter, with storage of 86,000 bushels. Walls were 8 inches thick with steel hoops for reinforcing. The contract obliged Metcalf to insure the structure for 8 years in the event of structural failure.
MacDonald Engineering Company
American Hominy Company
Indianapolis, IN (1909)

MacDonald Engineering Company
New Grain Elevator of Evans Milling Company
Indianapolis, IN (1913)
Successful application of “pocket bins”
Frank Hutchison Peavey
died in Chicago on December 30, 1901
The Globe Elevator (the “Peavey”), Rice Point, Duluth (1901), designed by Barnett & Record Company in the conventional materials of wood-crib construction and iron-clad exterior. Haglin’s concrete silos from 1900 are located behind the working house.
When the Globe Elevator (Peavey) burnt down in 1906, after only five years in operation, the same firm of Barnett & Record replaced it with a fire-proof structure with a foundation and first floor of reinforced concrete and 122 bins of hollow terracotta tiles (Demolished 1998).
Harbour Commissioners’ Elevator (No. 1), across from Place Royale, Montreal, designed by the Steel Storage and Elevator Construction Company of Buffalo, construction by the John S. Metcalf Co., 1902–1904. Stainless steel lined the interior of the bins, while the exterior was completely sealed in bush-hammered concrete panels for stability and insulation.

Left: construction of the concrete cupola during winter.

This all-concrete mammoth, 454 feet long and 200 feet high, blocked a view of the water from the Old City. Le Corbusier infamously retouched this image in *Vers une architecture*.

This was the first structure in which the workhouse was constructed in concrete. Here concrete is being poured in mid-winter for the cupola.
Atchison, Topeka & Santa Fe Railroad
Damen Avenue Grain Silos, Chicago.

Timber construction for working house, reinforced concrete for 35 grain silos. The site was along the north branch of the Chicago River, which fed into the Calumet.

Photograph: current condition facing demolition