EXPERIMENT in CONCRETE

A Pioneer Venture in GRAIN STORAGE

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UPON LEAVING Minneapolis via Lake Street and proceeding along Highway No. 7 in the direction of Excelsior, one passes a large white structure on the left just west of the bridge that spans the Belt Line. It is composed of a triple row of monoliths as classically symmetrical in outline as the columns of a Greek temple, although not as decorative. The Minneapolis structure is a terminal elevator designed for the storage of grain, and, like most modern terminal elevators, it is built of concrete. On the east side of the bridge stands a single monolith with the words “Lumber Stores” running the length of the tube. It looks as though it might once have been the chimney of a factory, though it now seems to have no purpose other than to advertise the lumber sold nearby. Certainly no one would associate it with the pretentious structure across the bridge, yet if it had not been for that single tube of concrete, terminal grain elevators might be built in a different, and perhaps less efficient, way today. For apparently this was the first tubular grain elevator of solid concrete in the world. Although it was never put to use, it was built as an experiment to find out if it was practical to store grain in a concrete bin of this shape.

Early in 1899, Frank H. Peavey and Charles F. Haglin talked over the possibility of storing grain in bins constructed of material other than wood. Both men were early residents of Minneapolis; both were outstanding in the fields of activity they pursued. Peavey had built up a grain company that contributed to the prosperity of Minneapolis. Haglin had erected public buildings that were the evidence of that prosperity.

MRS. HEFFELFINGER is the wife of George W. P. Heffelfinger and a daughter-in-law of the late Frank T. Heffelfinger, who died in July, 1959. His recollections of the trip made in 1900 and diary kept while abroad have provided much of the material for this article.
Peavey was born in Eastport, Maine, in 1850. He boarded a Chicago-bound train the very day the Civil War ended, having sold papers for two years to earn his fare. In 1866 he went on to Sioux City, Iowa, arriving with a dollar in his pocket. After selling farm implements for a time, he organized a grain company, and within ten years moved his business to Minneapolis. Haglin, who was of German and Huguenot descent, was born in 1849. Although his parents had settled in Upstate New York, when Charlie reached the age of twenty, he set out for Minnesota. He was trained as an architect, but soon became more interested in construction and the contracting business.

It is not known whether one of these men was the first to conceive the idea of using concrete in a hollow monolithic mass for the storage of grain, or if the idea came from another source. It was, however, the desire of Frank Peavey to build such a structure, and the conviction of Charlie Haglin that such a thing was possible. Up to this time even terminal elevators in the United States were squarish wooden structures similar to the country elevators so familiar today throughout the Middle West. The two men were faced with considerable opposition. Who ever heard of such a thing! Contractors and engineers throughout America argued forcefully that a tank of solid concrete would lack "give" and would therefore explode or, at best, crack wide open when grain was drained off.

In spite of such misgivings, during the summer of 1899, construction was started. Round forms braced with steel hoops were built, and concrete poured into them. As the concrete dried, the forms were pulled up, braced, and another layer poured; it was like building a giant layer cake. The result was a hollow monolith of concrete sixty-eight feet high, with an inside diameter of twenty feet. The walls were twelve inches thick at the base, tapering to eight at the top. By fall the structure was ready. Grain transported in railroad cars was shoveled into a bucket elevator, carried to the top of the concrete tube, and dumped in. There it would remain through the winter, and in spring the condition of the grain would be tested.

WHETHER or not this was a practical design was still in doubt, and since it was rumored that concrete elevators were used in Europe, Peavey gave his son-in-law, Frank T. Heffelfinger, the assignment of traveling overseas with Haglin to find out about them at firsthand. Actually the trip had another purpose: Peavey wanted to ascertain if it would be possible to build and operate a line of elevators in Russia. Accordingly, accompanied by Haglin and the contractor's young son, Eddie, and armed with letters to grain merchants, millers, bankers, and diplomats, Heffelfinger sailed for Europe in January, 1900, on the "New York," a steamship of five thousand tons. Upon arriving in London on February 1, he wrote in his diary: "I was much pleased and found it somewhat different than I had pictured." One busy day was spent in London calling on grain importers, getting available information about Russian grain markets, and securing passports to Russia. Then the travelers went on to Hamburg, Germany.

"First impressions of Hamburg, good," Heffelfinger reports. And again, "This afternoon I went with Haglin to see the harbour. It is a wonderful place and I was much impressed with the enormous amount of shipping." In Hamburg the travelers learned that Russian methods of handling grain were "crude." They were disappointed to find that "there was no such thing as a concrete

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1 These measurements were supplied by Mr. George Fullerston, who now owns the structure. The height was soon increased to 125 feet. Measurements given in the press vary greatly. See, for example, E. S. Rollins, "Modern Elevator Construction," in the Northwestern Miller (Minneapolis), 50:637 (October 3, 1900); and the Minneapolis Journal, October 3, 1901.

2 Heffelfinger Diary, February 1, 2, 1900. The original journal, kept from February 1 to April 3, 1900, while Heffelfinger was abroad, is owned by the Minnesota Historical Society. It has furnished much of the material for this sketch.
elevator in or near Hamburg,” though they “Had a wire from Antwerp . . . that elevators there are of brick and stand the climate all OK.”

On February 5 the Americans moved on to Brunswick to meet a man named G. Luther, designer of an elevator constructed of Hennebique concrete and steel. This had square bins with walls about eighteen inches thick, supported by horizontal and vertical rods. Elevators of this type, holding fifty thousand tons of grain each, had been built at Braila and Galatz in Romania, and had been in use five or six years. Reportedly they had not cracked, and the grain had kept better than when stored in wood.

Before visiting these cities, Heffelfinger and Haglin decided to travel to Copenhagen to see “bins of Monier” concrete with inside divisions of wood. According to the diary for February 9, they found “a warehouse of brick five or six floors and at first we thought we had been fooled once more, but after some investigation discovered in center of building the grain silos. . . . Haglin is down there this morning to take some measurements and of course will have an accurate sketch. The wall[s] seemed all OK but were cracked slightly, but H. says it is largely on account of the thinness and the improper quantities of cement.”

From Denmark the Americans went to Budapest, arriving on February 16. There, indeed, they were in the “bread basket” of Europe. A letter of introduction put them in touch with a local banker who owned “most of the elevator prop[erty] of Budapest.” Heffelfinger records that “he was a charming man and had visited Mpls and dined with Pillsbury.” The diarist also describes the magnificent quays running the length of the city along both banks of the Danube River, where lighters were unloading grain. The visitors were shown the largest elevator in Budapest, built of brick with steel bins, where the Hungarians sometimes kept grain “for three to four months without danger.”

The travelers next went to Braila, an important Romanian grain-shipping city also located on the Danube. Grain was transported down the river to the Black Sea, then via the Bosporus to the Mediterranean, and on to European markets. After leaving Braila, Heffelfinger recalled that “The RR’s of Romania and Bulgaria all lead to the Danube and the grain from both countries comes down the river. Most large farmers ship it to Braila them­selves. Braila is the principal market of the country. The farmers all live in bands as it were and go out daily to there farms.” He believed that everyone in Braila, which had a population of eighty thousand, was directly dependent on grain for a livelihood.⁵

While in Braila the Americans examined the local Hennebique elevator. The bins were hexagonal with rounded corners, and were fitted together like the cells of a honeycomb. This was “a finer looking building than I expected to see and better constructed and arranged than any we have seen heretofore,” writes Heffelfinger in his entry for February 19. He found “no cracks visible” and was “advised by men that grain keeps all OK. Claim it would keep for a yr if put in in good condition.” The diarist, however, was “fully convinced that our construction is all right and even better than this.” The visitors also “saw them loading a boat with corn. . . . Most of the gr[ain] is loaded and unloaded by hand. Where taken to or from the sheds, it is done by quaint little four wheeled pony carts with one pony owned by the man who drives.”

On February 20, the travelers left Braila for Galatz aboard a “steamer which runs on the Danube between the two places.” The elevator in the latter city and conditions in general were much like those at Braila. The foreman of the Galatz plant reported that “they have had corn in the elevator, without changing it, from Feb. until Sept. and had no trouble. There is not a crack in the elevator that we could see and they told us there never had been.” Upon leaving Galatz for

⁵Heffelfinger Diary, February 20, 1900; Rollo, in Northwestern Miller, 50:637.
Bucharest by train, the Americans "met a grain merchant of Braila named Bach[,] a very pleasant man," though he did "not like the cement elevators" because "when the grain is damp or out of condition it hurts it to lay in the Silos." It seemed that Romanian grain men as a rule did not like the elevator because they claimed the grain was mixed in it.

The travelers stopped at Vienna on February 24 to call on Christian Ulrich, director of the Polytechnic Institute and the architect of the Budapest elevator. "We had hoped to get from him the side pressure of wheat when running out of a bin," notes Heffelfinger, "but he could tell us nothing that Haglin did not know."

At this point the travelers separated, Haglin leaving for Paris. There he called on the director of a well-known mill at Corbeil, who, by a "singular coincidence . . . was just looking over a copy of the Northwestern Miller as the Minneapolis gentleman was ushered in to him." To see his company's elevator in that French milling center, which is not far from Paris, Haglin went out to Corbeil. He found a structure with bins made of stone and cemented smooth on the inside, and the machinery in a separate tower topped by a concrete water tank for fire control. Architecturally, he considered it the most attractive elevator in Europe. With his young son, Haglin then went to London, sailing from England for America on March 7.¹

Heffelfinger, however, went on to Russia, seeking a government contract for handling grain. Fortified with letters to key people, including Charlemagne Tower, then United States ambassador, he arrived in St. Petersburg on February 27. There he found it necessary to have preliminary interviews with the ministers of railroads and agriculture before seeing the minister of finance, whose power was such that everything had to go to the emperor through him. There was much to see in St. Petersburg while waiting for these appointments: the imperial ballet, "which has a reputation for being the best

¹ Kingsland Smith, "European Elevators as Seen by an American," in Northwestern Miller, 49:565 (March 21, 1900).
and is supported largely by the Government, the opera, and magnificent buildings, including a church decorated with paintings and precious stones. In front of the Winter Palace Heffelfinger saw the largest ornamental monolith in Europe, but nowhere in Russia did he find a monolith for grain storage. Before leaving Russia, the visitor from Minneapolis dined with Tower and his wife, "charming hosts and good plain simple Americans" who entertained lavishly in the "grand establishment which they have fitted up themselves."

When finally Heffelfinger was admitted to the presence of the finance minister early in March, Tower allowed his own secretary to serve as interpreter. Heffelfinger found it a "great disadvantage to be unable to speak yourself to a man." In the interview he learned that although the Russians welcomed Americans and would allow them to build grain elevators, they would not permit Americans to run them. Heffelfinger concluded that it would not be profitable to build elevators in Russia.

Since he had been charged with surveying international grain markets as well as investigating elevator construction, Heffelfinger visited Amsterdam, Rotterdam, Antwerp, and Paris before sailing for home from Liverpool on April 2. He had seen square and hexagonal bins, but no tubular concrete bins in European elevators.

BACK IN Minneapolis the following spring the time to draw off the grain from the experimental elevator arrived. At the appointed hour a group of interested people gathered, attracting a small crowd of passers-by. The onlookers drew back, however, putting a good block between themselves and the elevator, for whether or not it would explode was still uncertain. Charlie Haglin, with perfect faith in his calculations, stood firmly at the foot of the elevator as the lever was pulled and the grain began to flow smoothly through the ramp at the base of the tank into a cement pit eight feet below the ground. Not only did the monolith remain intact, but the grain was in perfect condition. For further experiments, the elevator was increased in height to 125 feet. It was never used commercially, however, after serving experimentally in proving Haglin's theory.

The success of this experiment and the favorable impressions of European concrete elevators reported by Heffelfinger and Haglin influenced Peavey's company to undertake the building of a large concrete and steel mesh elevator at Duluth. Haglin designed the structure and received the contract for its construction, making use of "some inventions of his own, on which he has patents and which have never before been applied to elevator-building." Work on the Duluth project began in the spring of 1900. The Peavey firm regarded it "as the most substantial grain-storage house in the world, representing the most advanced ideas of elevator construction." Unfortunately, Frank Peavey did not live to see its completion; he died on December 30, 1901, about a year before the structure was ready for use.

Charlie Haglin died in 1921. Some of the large private dwellings he constructed have been torn down, but the Grain Exchange, the Pillsbury Building, the Radisson Hotel, and the terminal elevator at Duluth are still standing and in use. His slender experimental silo also remains intact, having long survived its designers and builders. Standing on the property of the Fullerton Lumber Company, it is worthy of a passing salute from the people of Minneapolis, for it can be considered a monument to grain, a commodity that has long been an important factor in the prosperity of their city, their state, and their nation.

*This account is based largely on the recollections of the late Frank Heffelfinger, who died in July, 1959.

1 Rollins, in Northwestern Miller, 50:657. Although this writer predicted that the elevator would be completed by November 1, 1900, it was not actually ready until January, 1902, according to officials of F. H. Peavey and Company of Minneapolis.