Early Parabolic Truss Bridges Gradually Disappearing

History and Description of a Type of Truss, Some 300 of Which Were Erected in New England and New York Between 1880 and 1895

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THE PARABOLIC truss bridge deserves a passing notice for its historic interest at least. Prof. G. F. Swain, one of the few who have given it this attention, mentioned in his recent book, "Structural Engineering—Stresses, Graphical Statics and Masonry," a form of truss with both chords curved and supported on verticals at the ends, "largely used a few decades ago for highway bridges by the Berlin Iron Bridge Company." The writer was for a considerable period of time connected with the Berlin company and designed scores of these bridges. By this article it is hoped to place on record something of the history of these interesting structures, which once were quite common in New England and New York but now are rapidly disappearing, and in addition to note a few of the design considerations.

History — A patent dated April 16, 1878, was granted to William O. Douglas, Binghamton, N. Y., for a truss bridge, described in the patent application as "A combination of two or more elliptical trusses connected as herein described with the floor and joists and the necessary flooring to form a through, deck or swing bridge." Two or three of these bridges had been built by the Corrugated Metal Company, a small manufacturing firm at East Berlin, Conn., but they were crude affairs, and not until the company acquired the services of Charles M. Jarvis, of Binghamton, as chief engineer, did the company flourish. The name of the company was changed to the Berlin Iron Bridge Company, and on the death of the president in 1886, Mr. Jarvis became president, retaining that position until 1900, when the company, along with 25 other bridge companies, was merged into the present American Bridge Company.

FIG. 3—DECK PARABOLIC TRUSS AT SUFFIELD, CONN.

Soon after becoming chief engineer Mr. Jarvis changed the shape of the chords so that the pins were placed at points of true parabolas and the name parabolic trusses soon became accepted.

Between the years 1880 and 1895 some 300 or more of these bridges were built, mostly in New England and New York. Many of them still remain and are carrying present-day traffic, although in most cases such bridges have probably been reinforced. The following are some of the larger parabolic bridges of which there is still a record: Lowell, Mass., bridge over the Merrimac River, of five 153-ft. spans with a 32-ft. roadway and two 7-ft. walks; Nashua, N. H., bridge over the Merrimac, of three spans of 150 ft., 160 ft. and 170 ft. respectively; Manchester, N. H., bridge over the Merrimac, of three spans of 140 ft., one of 55 ft. and two of 64 ft.; Shelburne Falls, Mass., a single span of 198 ft.; Waterbury, Conn., a single span of 205 ft.; and Binghamton, N. Y., three spans of 165 ft.

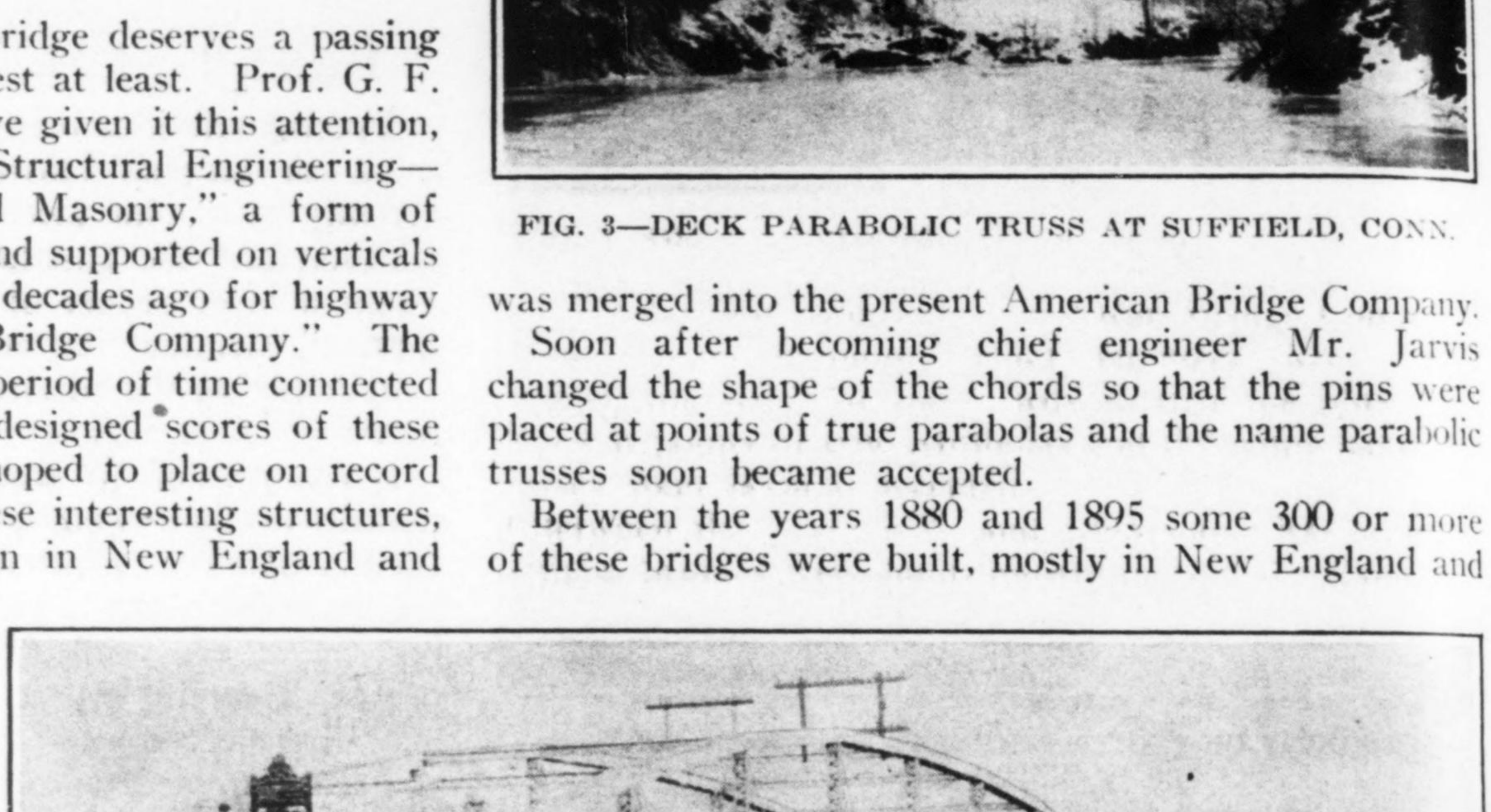

FIG. 1—THROUGH PARABOLIC TRUSS BRIDGE AT BINGHAMTON, N. Y., WITH THREE 65-FT. SPANS

With a single exception, the bridges of the parabolic type were for highways. Few were built after 1895, as the demand for this type of bridge had about disappeared. Another reason for this was that the Berlin Iron Bridge Company during its later years stressed the construction of steel-frame industrial buildings, in which it was one of the pioneers.

Several noted bridges of similar design exist in Europe; there, however, the truss is called the Pauli truss from its inventor. Professor Swain in his book mentions the Rhine bridge at Mainz, built in 1857 and consisting of four 345-ft. spans, as the principal bridge of this type. Another similar bridge is the Royal Albert

FIG. 2—PARABOLIC TRUSS OF SEMI-DECK DESIGN

bridge, which carries the Cornwall Railway across the River Tamar at Saltash, England. This bridge was designed by I. K. Brunel and was opened in 1859. It has a total length of 2,200 ft. and contains two 455-ft. spans over the river and seventeen side spans varying from 70 to 90 ft.

Design—The parabolic bridge presents a pleasing appearance, especially when of three or more spans. It was easily designed, since each chord was of the same cross-section throughout—the top chord being of two channels with plates on top and bottom chord of eyebars. Trusses were invariably pin-connected. The stresses in the web system were small, allowing the diagonals to be round bars with loop eyes and turnbuckle or sleeve-nut adjustment. The posts were four latticed angles, and the floorbeams were hung from pins by inverted U-suspenders of square bar iron, whose lengths could easily be varied to give any desired camber. Few working drawings were needed, and fabrication was simple.

An objection to the parabolic bridge was its lack of stiffness. The entire floor system was suspended from the lower chords by bar hangers, some of which were

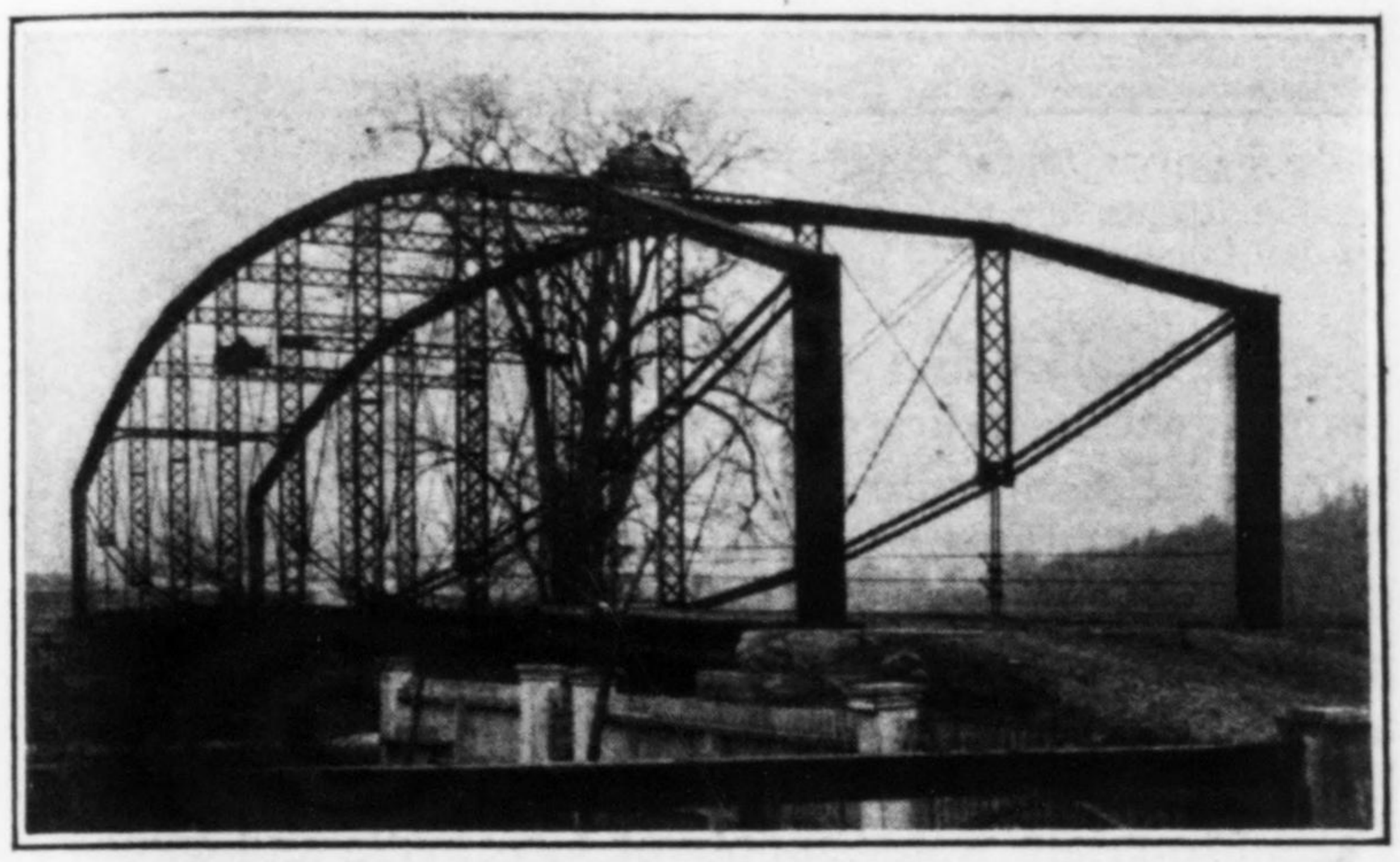

FIG. 4—PARABOLIC TRUSS WITH PORTAL AT FIRST PANEL POINT

It was often necessary to set the portal back from the end posts in order to provide adequate headroom between the bridge floor and the upper lateral system.

often several feet long. As the height of the end posts was about one-half the center depth of truss, an upper lateral system of bracing could be carried only to the tops of the end posts. It was therefore often necessary, in spans of about 100 ft., to end the upper lateral system at a portal moved far enough back from the end posts to allow sufficient headroom. To carry the lateral force to the abutments, dependence was placed on the rigidity of the chords and end posts.

Highest Tides in the World Found Along the Atlantic Coast

The highest and most variable tides in the world are found along the Atlantic coast. According to Atlantic Coast Tide Tables for 1929, latest compilation of tides for that region made by the Coast and Geodetic Survey, they range from 50 ft. in the Bay of Fundy in Canada to only 1 ft. at Nantucket Island off Rhode Island. Utmost variation in tides is found along the east coast. New York harbor, for instance, has a tidal range of about 4½ ft., whereas Eastport, Me., a few hundred miles away, has a range of 20 ft. Boston's tide rises 10 ft., while at Key West, Fla., the ocean has a tidal range of 1½ ft.

New Code Lessens Traffic Hazards in San Francisco

Lower Accident Toll Results From Pedestrian Control, Traffic Fines Bureau and Other Features of Ordinance

AFTER several months' experience with a new traffic code in San Francisco, figures showing a notable reduction in the number of personal injuries and in the amount of property damage are announced by the traffic survey committee. "A saving of $2,000,000 a year in the cost of automobile accidents is being made for vehicle owners of San Francisco by reason of the new traffic regulations," the committee said. Reductions in accident frequency since the code went into effect range from 30 to 40 per cent in the records of three companies operating 50, 100 and 400 motor vehicles, respectively. The Market Street Railway Company reports a reduction of 24.7 per cent in pedestrian accidents and coroner's records show no fatal accidents in the central traffic district since the ordinance went into effect.

The street traffic control problem of San Francisco was the subject of a report compiled last August by the San Francisco traffic survey committee, which is an organization supported by contributions from civic bodies. This report was based on an engineering survey by Miller McClintock, a traffic expert, retained to make a study of traffic flow, volume, speed, concentration and accidents, together with an analysis of the data collected with respect to accident hazards.

As the result of this report, a new traffic ordinance was formulated and there was created a traffic fines bureau and a division of street traffic engineering for which George D. Burr was appointed city traffic engineer. A traffic law enforcement board was organized in which are representatives of the California State Automobile Association, the San Francisco traffic survey committee, the managing editors of five daily newspapers, four police court judges, the board of supervisors, coroner, district attorney, chief of police and the city traffic engineer.

The new traffic code went into effect Nov. 1 last and the traffic fines bureau began to impose penalties about Dec. 1. Included in the new ordinance are provisions for: (1) The segregation of pedestrian and vehicular traffic; (2) educational campaigns in the newspapers and other mediums to acquaint the public with the new regulations and the mutual responsibilities of the various elements that constitute the traffic; (3) the traffic fines bureau, which assures swift and just punishment for traffic violations, and (4) the study and remedy of the conditions at particularly hazardous locations where accidents are been frequent.

Although speed limits have not been raised, the new ordinance has materially increased the average traffic speed by eliminating unnecessary delays at clearance zones near intersections and by providing loading zones to eliminate double parking. The control of stop and go signals has been co-ordinated so that where possible traffic is allowed to move uninterruptedly through several intersections.

Further proposed improvements in the traffic control system include a separate signal system for the control of pedestrian traffic on Market St. and a new scheme for reporting and analyzing traffic accidents.