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Concrete Bridges with Stone and Brick Facing

BY C. E. DRAYER*

The use of facing on concrete bridges is displayed in interesting contrast by two recently built arch bridges in Fort Wayne, Ind. In both cases the esthetic value of the facing quite evidently justifies its use. To what extent the facing affects repair and maintenance charges will have to be learned from slow experience.

BRICK FACING: TENNESSEE AVE. BRIDGE

Tennessee Ave. crosses the St. Joseph River by two reinforced-concrete arch spans of 105 ft. The view shown in Fig. 1 brings out the successful selection of form and the good appearance of the bridge in adaptation to the surroundings. The bridge has an ornamental facing of dark brick and white stone. The balustrade is wholly built of brick and stone, the panels being of brick, while the coping and posts are of stone. In the facing of the arch itself stone is used only for the quoins and for picking out the panels.

The main surface of the arch is formed of wire-cut brick of deep-red color, with matt surface, and is laid in Flemish bond. There is enough variation of color in the brick itself to make the surface as a whole quite picturesquely variegated (see Fig. 2). The stone trim is No. 1 oölitic Bedford sandstone. The pieces used in the balustrade are of very substantial character, the coping rail being in one piece between posts or 12 ft. 8½ in. long. The intermediate posts are solid single pieces extending through the thickness of the balustrade, and the pier caps are single pieces 3 ft. 5½ in. by 9 ft. 4 in.

The bridge was designed by A. W. Grosvenor, of Fort Wayne, and built under his supervision by the Lafayette Engineering Co., Lafayette, Ind., contractor. Above

*1801 East 93d St., Cleveland, Ohio.

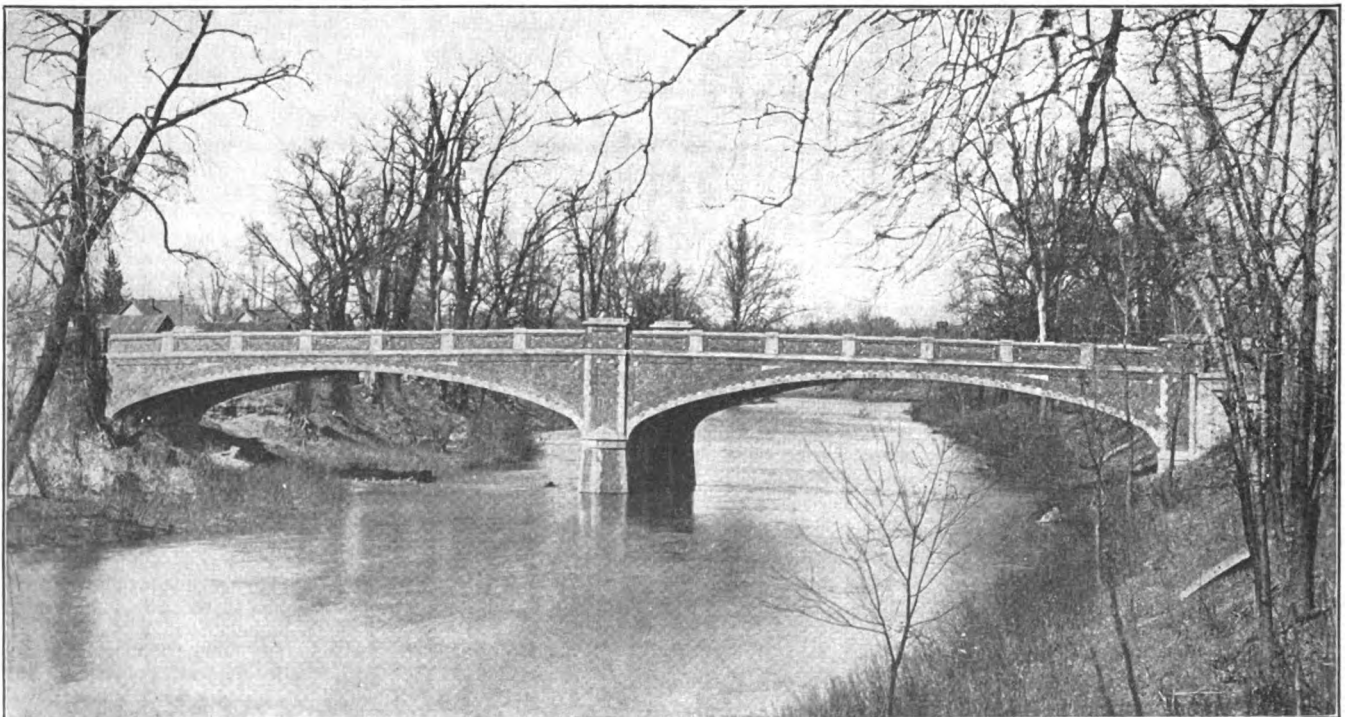


FIG. 1. TENNESSEE AVE. BRIDGE, FT. WAYNE, IND.
(Brick facing with stone trim)

the arch barrel no forms were used. The concrete was placed inside the brick facing, the latter being carried up sufficiently in advance to permit of doing this concreting in 2-ft. layers.

The cost of the bridge was a little over \$39,000, including the pile foundation.

STONE FACING: COOMBS ST. BRIDGE

Fig. 3 shows the stone-faced bridge over the Maumee River on Coombs St., in the suburb of Lakeside. Here

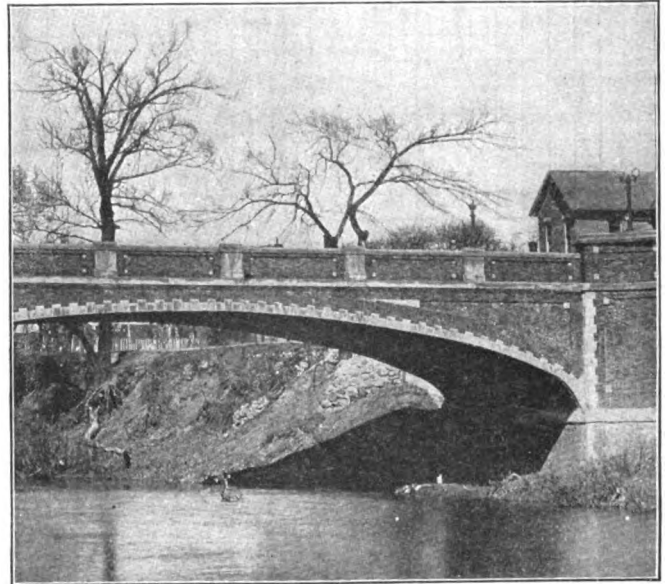


FIG. 2. DETAIL VIEW, TENNESSEE AVE. BRIDGE

the facing used is sandstone. The esthetic effect depends largely on the emphasis of the arch barrel by the quarry-faced ring stones of the facing, although the effect is somewhat reduced by the detail of the railing. The cost of this bridge was about \$65,000.



FIG. 3. COOMBS ST. BRIDGE
(Sandstone facing, concrete balustrade)

The bridge is said to have been built to curves sketched empirically to fit lines traced from drawings of the Tennessee Ave. bridge, under the following curious circumstances:

According to Indiana law, the county must have plans to accompany the advertisement for the letting of a bridge, and any person may submit a plan provided it is filed with the auditor ten days before the bids are opened. When the county commissioners of Allen County were ready to let a contract for the Coombs St. bridge they accepted plans drawn by a man who had been employed as carpenter foreman on the construction

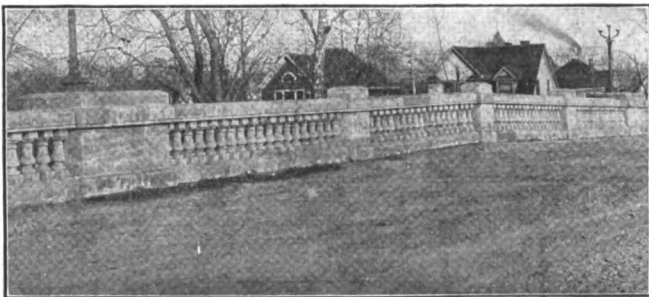


FIG. 4. ROADWAY SUMMIT AND CONCRETE BALUSTRADE, COOMBS ST. BRIDGE

of the Tennessee Ave. bridge. His plans were drawn without any study to determine the necessary size of the various parts of the structure, but from a cardboard templet which he made of the arch curve of the Tennessee Ave. bridge from contract drawings of it on file in the county commissioners' office. The radii of the arch ring of the Tennessee Ave. bridge were changed to make a curve suitable, in his mind, for the new spans.

Construction brought out both the amusing and the serious features of the design. In the Tennessee Ave. bridge the two spans are each 105 ft. long, while in the Coombs St. bridge the channel span is 100 ft. long, flanked on each side by a 90-ft. span. When forms were laid out by the contractor for the Coombs St. bridge, using radii shown on the plans, each span failed by about

2 ft. to connect up with the masonry it was to rest upon. So he and his foreman made full-sized arch-ring templets, pretty much by eye, that would spring over the foundations. Their curves reduced the waterway below what it would have been if proper elliptical curves had been used. The templets were taken to shops in Fort Wayne and Melan-type arch ribs bent to fit them.

Not only was the design of the arch curves defective, but in the plans of the Melan trusses a serious omission occurred, due to ignorance. The ribs were made in three sections, but no top and bottom flange plates were provided at the joints where the angles butt. In other words, at the two points of approximate maximum stress the flange connections containing two-thirds of the rivets at the joints were omitted.

✻

San Francisco Specifications for Concrete Pavements—Some interesting points in the specifications for concrete pavements, written by M. M. O'Shaughnessy, City Engineer of San Francisco, and recently adopted by the Board of Supervisors, follow: The concrete is of 1 : 2 : 3½ mixture. After mixing, the concrete is deposited rapidly in successive batches; the concrete is deposited to the required depth and for the entire width of the pavement in a continuous operation between transverse and longitudinal joints without the use of intermediate forms or bulkheads. In case of a breakdown, concrete must be mixed by hand to complete the section or to an intermediate transverse joint placed at the point of stopping work. Any concrete in excess of that needed to complete a section at the stopping of work is not to be used in the work. Longitudinal joints filled with ¼ in. of prepared felt are constructed between the curb and the pavement on each side of the roadway, and along the center line where the roadway exceeds 25 ft. in width. Transverse expansion joints are constructed in straight lines at right angles to the center line of the roadway for the full width of the pavement and at intervals not exceeding 25 ft. The surface of the pavement is sprayed with water as soon as the concrete is sufficiently hardened to prevent pitting and is kept wet until a sand covering is placed. As soon as this can be done without damaging the concrete, the surface of the pavement is covered with a layer of sand at least 1 in. thick, and covering kept moist for at least 10 days. The pavement is not to be opened for traffic for a period of at least 20 days after being laid. The contractor is required to maintain the sand covering for a period of at least 10 days and must erect and maintain barriers to protect the concrete from traffic, and any part of the pavement damaged by traffic or other causes prior to its official acceptance must be repaired or replaced by the contractor at his own expense in a manner satisfactory to the engineer.



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The Bridges of Fort Wayne, Ind.

The Consolidation of City and County Organizations Helps in Building Bridges
at the Confluence of Three Rivers

By Robert A. Reed

ALMOST in the heart of the city of Fort Wayne, Ind., three rivers meet. Through many sections of the city the St. Joe, Maumee and St. Mary's Rivers wend their way, making necessary the erection of a large number of bridges. It is doubtful if there is another city in the United States of the same size which has the number of bridges that exist in Fort Wayne. Fort Wayne's bridge building has attracted attention from municipalities all over the country. During the last ten years Allen County and the city of Fort Wayne have embarked upon a progressive program of bridge building that has resulted in the erection of some of the finest modern concrete bridges in the Middle West.

The three rivers of the city are spanned by fifteen large, modern bridges, six of which are of concrete construction, and the others of steel. The concrete bridges in the city are the Clinton Street, Tennessee Avenue, Harrison Street, Coombs Street, State Boulevard, and the West Main Street, now in process of construction. The steel bridges in the city are rapidly being replaced by the new and more modern concrete bridges, but the steel bridges are nevertheless a credit to the city. The nine steel bridges are the Walton Avenue, Lakeside, Spy Run, Wells, Van Buren, Taylor, Hale, Broadway and Swinney Park.

The bridge-building program has been accomplished at a cost of nearly a million dollars. This sum represents only the amount expended on city bridges, for the bridges in the county outside the city have cost thousands more. The six concrete bridges in the city represent an outlay of \$474,000, and the steel bridges have been erected at costs varying from \$25,000 to \$60,000 each.

The work of bridge building in both city and county is under the jurisdiction of the county and is in charge of the county surveyor. The present surveyor, Asa W. Grosvenor, has designed all the new concrete bridges except the Coombs Street and the Clinton Street. Allen County is at present

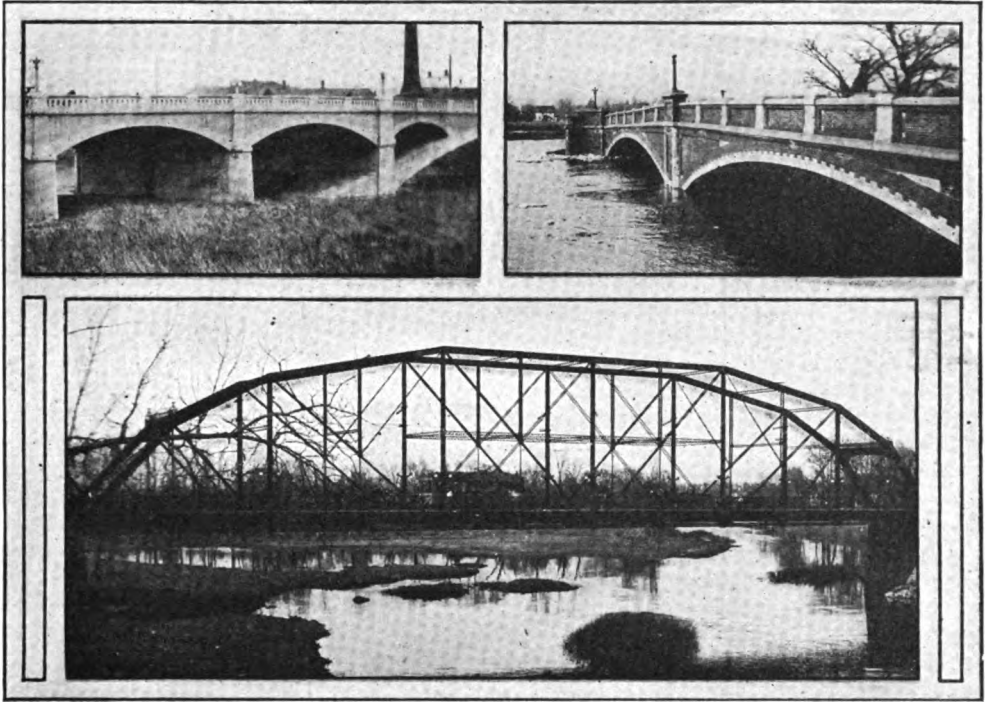
doing more work on bridges and roads than any other county in the state.

Some of the Most Notable of the Fifteen Bridges

The past year marked a great step in bridge building in Fort Wayne, when construction was started on the West Main Street bridge, which is to be the largest and most costly in the entire city. It will be completed during the present year and will represent an expenditure of \$155,000. It will consist of three spans, the center span being 95 feet in length, and the two end spans 90 feet. It will be 40 feet between curbs, with double street car tracks and two 7-foot sidewalks. It will be 80 feet longer than the old steel bridge which it will replace.

The new West Main Street bridge will be an engineering achievement. Every pile in its foundation is being driven with the utmost care, since each will sustain a weight of 22½ tons. The abutments of the old West Main Street bridge, placed in position by the Herman Tapp Construction Company at the time of construction, are to be used in the new bridge, not for the purpose which they formerly served, but as strengthening material. Blocks weighing as much as a ton and a half, after being carefully cleaned, are dropped into the mass of concrete mixture.

Second in cost among the Fort Wayne bridges is that at State Boulevard, completed in 1919 at a cost of \$95,000. This is a three-span bridge, the center being 90 feet, and the two end spans 95 feet. One new feature which was introduced in the building of the State Boulevard bridge was the use of the ornamental lighting poles as supports for the cross-wires which support the trolley wires. This has made unnecessary the use of extra poles on the bridge, which do not usually add to the beauty of such a structure. The old steel bridge which was replaced by this modern concrete structure has been placed in Swinney Park. New



A FEW OF THE FIFTEEN BRIDGES OF FORT WAYNE, IND.

Left—Harrison Street Bridge on the Lincoln Highway. Right—Tennessee Avenue Bridge, considered by many to be the most beautiful in the city. Below—Bridge at the entrance to Lakeside, where the three rivers meet. This steel bridge is soon to be replaced by a more ornamental concrete structure

abutments were built, and with a new floor which has been laid it will give service for many years.

Probably the first in point of beauty of Fort Wayne's bridges is that over the St. Mary's River at Harrison Street. The Harrison Street bridge has attracted favorable comment from hundreds of visitors in the city. It is a modern concrete structure, 136 feet in length, completed in 1914 at a cost of \$80,000.

One of the earliest concrete bridges in the city is that spanning the St. Mary's River at Clinton Street. This bridge was completed in 1907 at a cost of \$29,000. It has two spans, each 105 feet long. The remaining concrete bridges, the Tennessee Avenue and the Coombs Street, were completed in 1911 and 1912, respectively, the former at a cost of \$45,000, and the latter at \$70,000.

Although the six concrete bridges of the city have all been built since 1907, Fort Wayne has always been active in bridge building, partly from necessity, because of its position at the junction of three rivers, and partly through civic pride and progress. Back in 1891, a board of county commis-

sioners went into office which built 103 bridges throughout the county in six years. J. H. Stellhorn, now the only surviving member of these commissioners, tells interesting stories of bridge building in the early days.

The bridges now being built in Fort Wayne are being constructed with many considerations in view, and with the expectation that they will last for many years. The concrete is reinforced by the use of steel girders, and steel lacing bars are run diagonally through it. High waters are also taken into consideration, and in building the new bridges, flood conditions more severe than the city has ever met with are provided for.

Maintenance Provided for

Not only within the city of Fort Wayne has this community been progressive in the matter of bridge building, but throughout the entire county. Allen County leads the state not only in the number and quality of her bridges, but in the provisions that are constantly being made to keep them in the best of condition.