

# ELECTRIC TRACTION

Vol. XV

CHICAGO, ILL., JULY, 1919

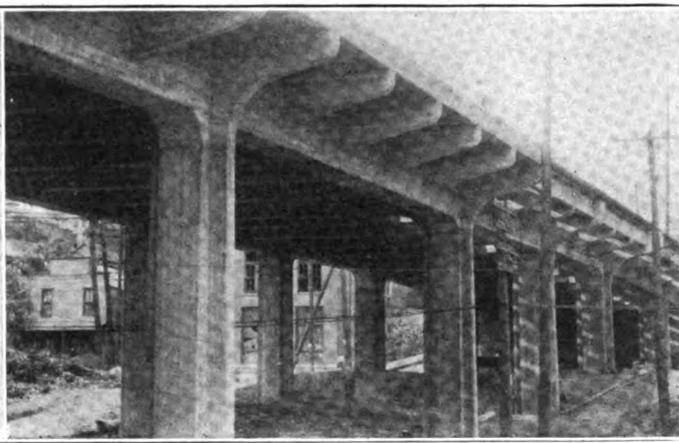
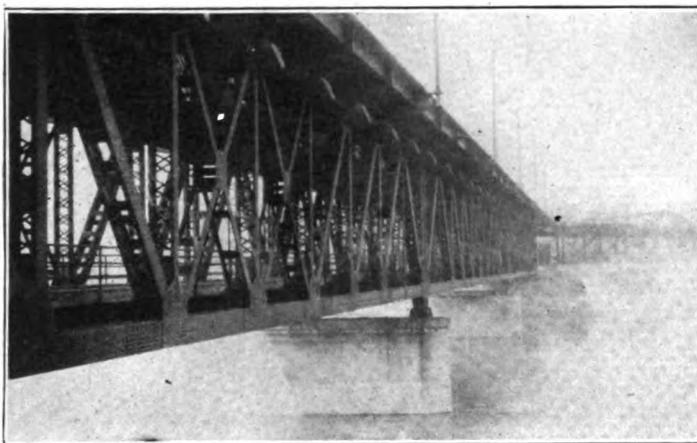
No. 7

## Central Avenue Bridge and Viaduct in Kansas City

**New Structure Will Accommodate Both Street Railway and Roadway Traffic Between Kansas City, Missouri, and Kansas City, Kansas. Open Deck Construction of Reinforced Concrete Portion of the New Structure is a Feature**

In 1903 there was a double deck bridge of three spans of approximately 200 feet each across the Kansas river, between Kansas City, Missouri, and Kansas City, Kansas. This structure was supported by tubular steel pier abutments and masonry river-piers. The flood of the spring of 1903 carried out this structure and took with it what was then the Metropolitan Street Railway Company's elevated structure west of the river and the elevated structure on the east of the river

agitation for a wider river channel at this point and the Kaw Valley Drainage Board finally compelled all parties interested to consider the establishment of a 734 foot channel at Central Avenue. This required the rebuilding of the river bridge resulting in the present structure which is shown in one of the accompanying illustrations. In addition the existing highway viaduct was deemed by the city of Kansas City, Kansas, to be unsuitable and unsafe and the remaining portions



Central Avenue Bridge Over Kansas River and West Approach to Bridge, Kansas City, Missouri

for a distance of about 300 feet. Shortly afterward the river bridge was replaced by a similar structure, using as much of the old material as could be salvaged and reclaimed from the stream. The grade of the bridge was raised at this time about four feet above the grade of the previous structure. The Metropolitan Street Railway Company's elevated structure west of the river was replaced by a modern steel structure early in 1904.

After the flood experience there was considerable

of the street railway trestle were considered unsatisfactory. The city therefore desired that the structures be entirely removed and a single new structure be built to replace the two existing structures so as to make with the new Kansas river bridge at Central avenue a continuous highway structure from near the intersection of Park avenue and Central avenue to and across the Kansas river; the structure to provide facilities for street railway traffic as well as other classes of traffic. Originally, two spans were contemplated, but in ac-

cordance with other structures over the river in the vicinity, three spans were finally decided upon. These spans are 250 feet long and the structure has two decks.

In the construction of the west approach to the Kansas river bridge the Kansas City Railways Company was asked to pay the city of Kansas City, Kansas, on account of column footings consisting of creosoted wood piles and reinforced concrete between the Missouri Pacific right-of-way and the Kansas City Terminal Railway, one-third of the cost or \$811.47, and also one-third of the cost of approaches, ties, rails, wiring, lamp posts, globes and fixtures.

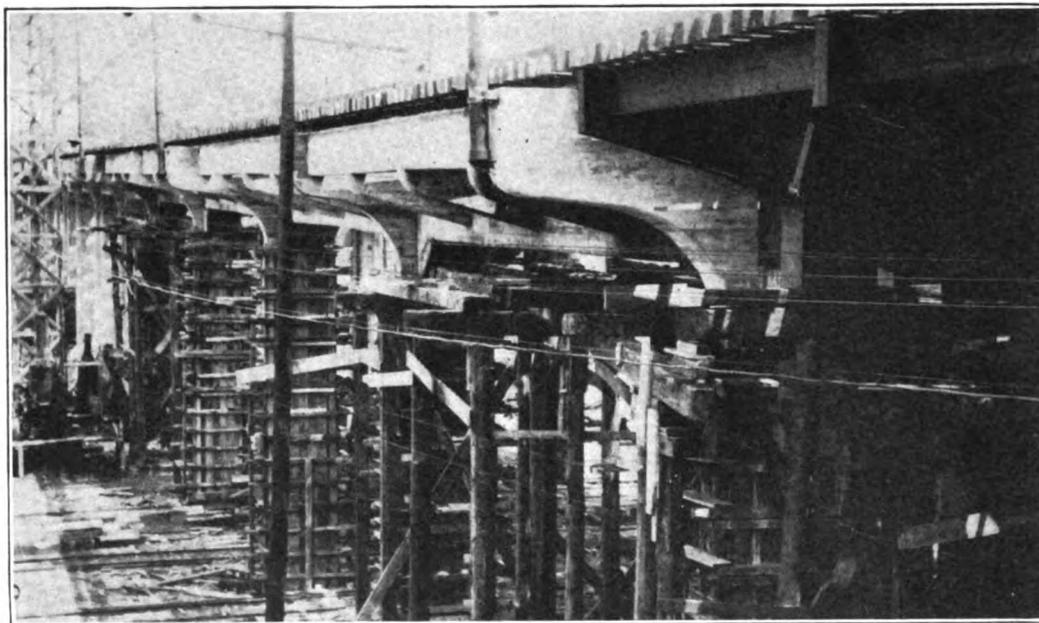
#### Maintenance Agreement

The city of Kansas City, Kansas, is to maintain the viaduct approach and one-third of the cost of such maintenance and repairs is to be paid by the Kansas City Railways Company except maintenance and repairs to the roadway, paving and sidewalk and main-

the line of Central avenue extended from the Wyandotte County approach to the Central avenue bridge westward to Park avenue. The approach begins near 3rd street and joins the main structure at a point about 600 feet west.

The main viaduct consists of reinforced concrete girders and columns supported on piles providing a roadway 30 feet wide, a sidewalk 6 feet wide and a double track street railway. At the west end of the viaduct there is a retaining wall in addition to the abutment. The street car tracks are in general of open deck construction except over the right-of-way of the Union Pacific Railroad Company and the Kansas City Terminal Railway Company where the street car space is paved.

The roadway of the structure is paved with creosoted wood blocks. The secondary approach on the Kansas side terminates at its east end in an embankment supported by retaining walls. It provides a 16 ft. roadway



Construction View on Central Avenue Viaduct, West Approach, Showing Junction of Steel and Reinforced Concrete Structures

tenance of the lighting system. The Kansas City Railways Company was to furnish at its own cost the necessary trolley poles, trolley wires, overhead construction, rails, cross ties and track fastenings. The viaduct is to remain the property of the city of Kansas City, Kansas, except only as to the right of the Kansas City Railways Company to operate thereon as provided. Six thousand dollars is to be paid to the city of Kansas City, Kansas, by the street railway company upon the completion of the viaduct as the agreed salvage value of the old street railway trestle and equipment. It is expected that the structure will be ready for traffic shortly after August 1.

The viaduct includes a main structure about 900 feet long and an approach about 460 feet long. The main structure is of reinforced concrete with one concrete covered steel span. The approach is of steel with concrete floors. The location of the viaduct is along

paved with creosoted wood blocks. The deck is partially carried by the columns of the Wyandotte county approach to the Central avenue bridge.

As a large part of the structure was built over railroad tracks and right-of-way belonging to railroad companies, an agreement was made to allow the contractor to place his equipment to advantage on the property of the railroad companies and at the same time to obstruct the railroad tracks and traffic as little as possible. Agreement was also made for openings and for the necessary shifting of tracks to permit the construction of pier foundations. All poles and wires and other public utilities properties along street were moved by the public utilities owning them to clear the new construction.

#### Replacing Paving

Where existing paving was removed the bricks or stone blocks composing the wearing surface were pre-



served and again used after a new concrete base was provided. The base for the paving is 1-3-5 concrete, 6 inches thick and the bricks or stone blocks were laid



Placing Decking on Street Railway Track, Central Avenue Viaduct, Kansas City

upon a damp coat of mortar an average of  $\frac{3}{4}$ -inch thick and of a one to three mix.

#### Rails and Connections

The rails for the street railway track are A. S. C. E. standard T-rail, 80 pounds per yard weight, connected by angle splice bars provided with proper space for concealed bonds, with alternate round and elliptical holes and having four  $\frac{7}{8}$ -in. bolts in each splice. The rails 33 feet long, are laid with open joints placed opposite. Screw spikes  $5\frac{1}{2}$  in. long and  $\frac{3}{4}$ -in. in diameter were used with tie plates 6 in. x 9 in. x  $\frac{3}{8}$  in.

On the inner rail at each curve there is a guard rail bolted to the main rail; spacer blocks and braces conforming to the standard practice of the Kansas City Railway were used. All track rails, splice bars, bolts, rail clips, connections and appurtenances of every kind are of open hearth process complying with specifications of the American Railway Engineering Association. Sixty-pound steel guard rails fastened by screw spikes were used throughout.

#### Bonding

Rails are bonded by the use of two compressed terminal, double-stranded bonds, 4/0 capacity, similar to bond type F.3-O.B. with  $\frac{7}{8}$ -in. terminals 14 inches long placed under the angle bars. Bonds were compressed into freshly drilled holes in the rail web and ends soldered. Bonds of similar size and capacity were placed across expansion joints. Cross-bonds of 4/0 cable with terminals similarly compressed and soldered were placed at intervals not exceeding 500 feet.

Cross ties and wood guard rails are long leaf yellow pine treated with creosote oil and containing 12 pounds of creosote oil per cubic foot of timber.

All of the steel work in "span 101" below the floor level or the bottom of the ties is covered with cement mortar forming an encasement for the protection of the steel from smoke and other gases. The mortar

was applied by the cement gun except where impractical in which case there was substituted a coating of mortar of one to two mix tempered with lime. Minimum thickness of this protection was  $1\frac{1}{2}$  inches. All concrete unless otherwise specified was of a 1-2-4 mix.

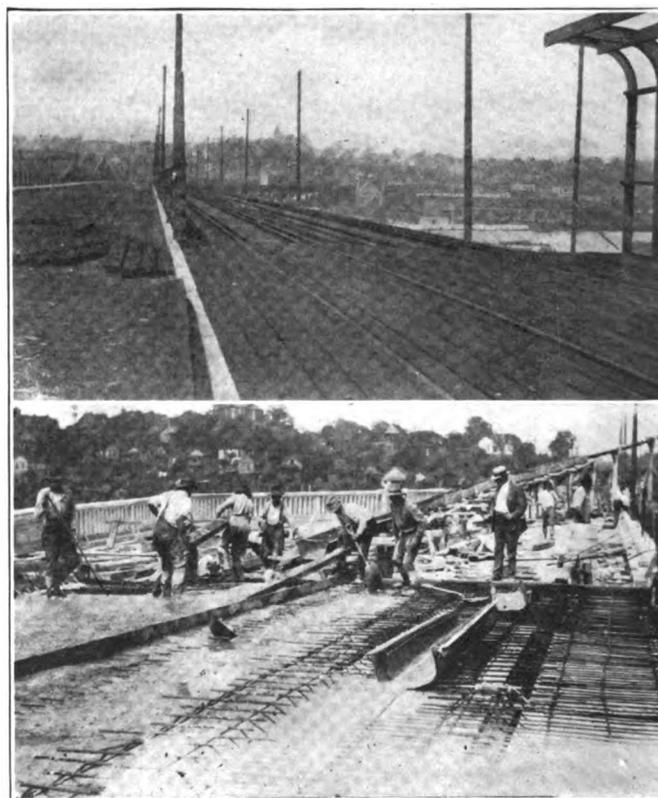
Pier foundations were carried to solid rock a little over 30 feet in depth below the river bed. Caissons were used. Upon the completion of each pier, pedestal, abutment and wall, the surrounding space was back-filled to the original ground surface with earth properly compacted. Where necessary to prevent settlement the earth in back filling was rammed in layers not exceeding 6 inches thick, or water-tamped in layers not exceeding 2 feet.

#### Quantities

Approximate quantities and costs were as follows:

Concrete piles, 12,000 lineal feet at \$1.85.....	\$22,200.00
Column pedestals, 50 cu. yds. at \$11.00.....	550.00
Concrete foundations for columns, 450 cu. yds. at \$13.25...	5,962.50
Concrete retaining wall, 175 cu. yds. at \$13.25.....	2,318.75
Other concrete retaining wall, etc., 150 cu. yds. at \$15.00....	2,250.00
Concrete between pedestals and top of slab, 4200 cu. yds. at \$16.00.....	67,200.00
Concrete handrail, 1500 lin. ft. at \$3.10.....	4,650.00
Metal embedded in concrete, 825,000 lbs. at \$0.05 $\frac{1}{2}$ .....	45,375.00
Metal work in span 101 and approach, 220,000 lbs. at \$0.08 3-8	14,425.00
Creosoted wood block paving, 3700 sq. yds. at \$4.15.....	15,355.00
Embankment and fill, 3000 cu. yds. at \$0.60.....	1,800.00
Concrete paving base, 110 cu. yds. at \$9.00.....	990.00
Concrete curbs, 20 cu. yds. at \$20.00.....	400.00
Concrete sidewalk, 500 sq. ft. at \$0.16.....	80.00
Paving, using old blocks, 100 sq. yds. at \$1.00.....	100.00
Mortar encasement (span 101).....	450.00

Figures on labor were estimated as follows: Laborers, 42 $\frac{1}{2}$  cents per hour; carpenters, 56 $\frac{1}{4}$  cents per

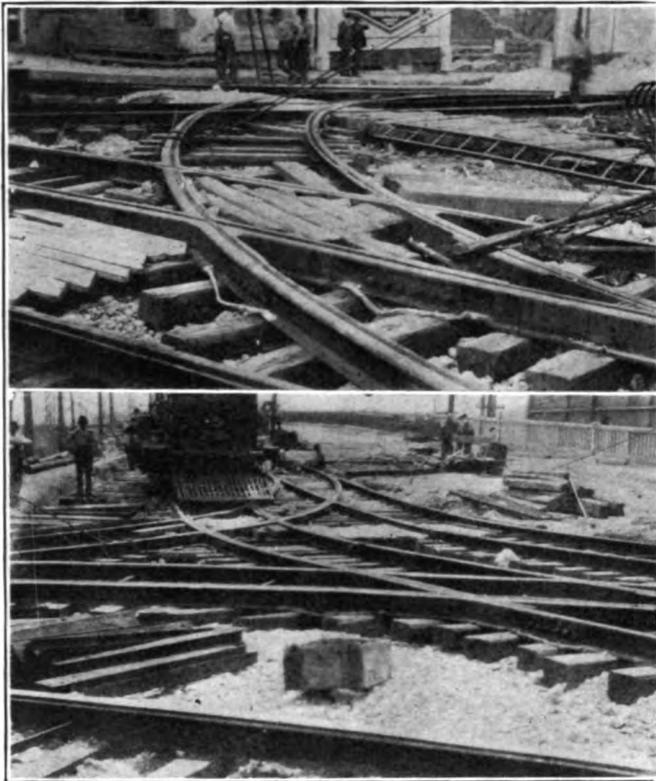


Above: View of Upper Deck, Central Avenue Bridge Over Kansas River, Kansas City. Below: Concreting the Reinforced Concrete Roadway Slab on West Approach

hour; hoisting engineers, 75 cents per hour; iron workers, 75 cents per hour.

Three concrete mixers, two hoisting engines and one pile-driver were used in the construction.

Work on the design of the Kansas river span was started late in 1915 and the contract for the river bridge and the east approach was let in March, 1916. The contract for the west approach was let in December,



Special Track Work at Junction on Kansas Side of Central Avenue Viaduct, Kansas City

1915, and for the viaduct on December 18, 1917. The design of the structure was carried out by Harrington, Howard & Ash, consulting engineers, Kansas City. The contractor for the piers and for the manufacture of steel was the Missouri Bridge & Iron Company. The erection of the steel was carried out by the Kansas City Bridge Company and the approaches and floors were constructed by the Midwest Construction Company.

The structure was designed to carry two 52-foot, coupled cars of 100,000 pounds weight each, the weight being distributed at 25,000 pounds per axle, and impact varying from 30 to 50% was used.

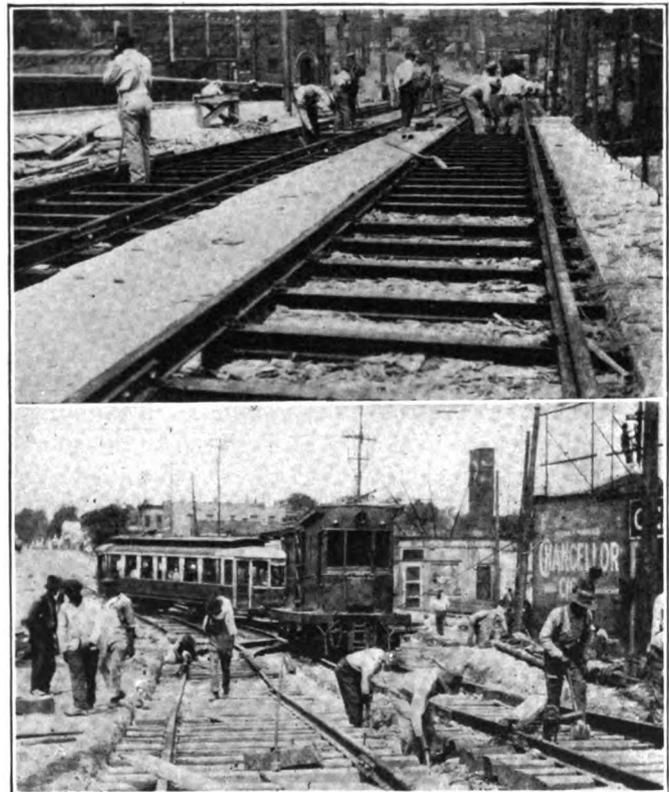
#### Open Deck Construction on Reinforced Concrete Portion

A novel feature of the structure is the open deck construction employed in the reinforced concrete portion of the viaduct for carrying the street railway tracks. The details of this construction are shown in the cross section of the reinforced concrete portion of the viaduct reproduced herewith. The main girder supporting the railway tracks between columns has a depth of 6 ft.  $\frac{3}{4}$  in., while the girders under the outside rails of each track are two feet in depth. Timber stringers 6 in. x 8 in. laid flat are placed directly upon the top of the concrete in  $\frac{1}{2}$  inch of grout and the cross ties, which are 8 in. x 8 in. x 9 ft. and spaced 14 in. centers, are placed on the tim-

ber stringers. This gives an open deck construction in place of the usual slab construction with a ballasted deck. This form of construction has proved very satisfactory as well as economical. Trolley poles are fastened to angles embedded in the cantilever for supporting the trolley poles. Timber guard rails 6 in. x 8 in., dapped 1 inch, are used in the open deck construction and 60-pound steel guard rails, within the main rails, are also used. All timber used in the deck construction is creosoted.

#### Features of the Design

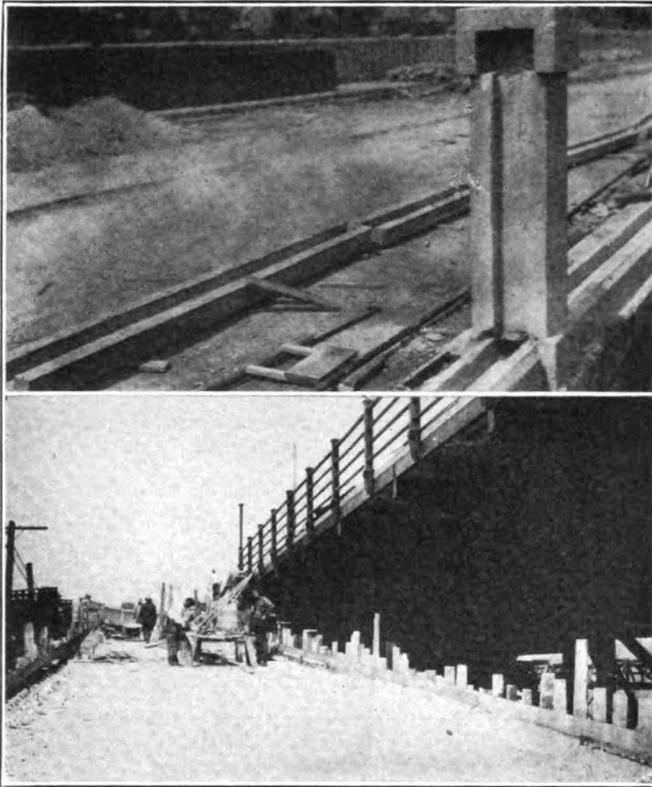
The design is an attempt to produce in a modest way a structure pleasing in appearance and obviously suited in design for the material of which it is constructed, without imitating architectural forms primarily designed for other material. In the execution of the design, the engineers tried to work out a viaduct which would be especially a concrete structure, simple of design and not an imitation of stone or brick structure. There were no funds for adornment and the section of the city in which the viaduct is located would not warrant such ornamentation. The structure is intended to look as if it were built of a once plastic material, monolithic and continuous and not made up of separate units or blocks or stone. The lines of the longitudinal girders and cross girders are carried down to the column so that the columns might appear to be actual parts or continuations of the girders and



Surfacing Track on Kansas Side of Central Avenue Viaduct and Approach, Kansas City Railways

beams, as actually they are. There is no horizontal line breaking the columns from its base at the ground surface clear up to the top. All projecting corners are rounded.

In spite of the unsymmetrical loading on the west approach occasioned by carrying the street railway track on a cantilever on one side of the structure and a sidewalk on the cantilever on the other side of the structure the symmetry of the external appearance has been successfully maintained.



Above: Details of Sections of Cast, Reinforced Concrete Railing, Central Avenue Viaduct. Below: Secondary Approach to Viaduct on Kansas Side

The spans of the reinforced concrete structure range from 30 to 50 feet and the columns range in size from 30 in. x 36 in. to 36 in. x 36 in. top measurement. Expansion joints in the longitudinal girders occurring three to four spans apart have upper and lower steel sliding plates each anchored into the concrete with a sheet of lead between. The lead is intended as a means of adjustment when the girders deflect and also as a means of preventing rusting on settling of the joints.

Reinforcement for deep girders were assembled complete and securely fastened together and then lowered into the forms and adjusted to the proper position before concrete was poured.

The total cost of the structure has been estimated at about \$850,000.00, including the following: River bridge, \$320,000.00; east approach, \$158,000.00; steel portion of west approach, \$112,000.00; reinforced concrete portion of west approach, \$250,000.00.

Carter Glass, secretary of the treasury, recently made the following statement:

"The United States appreciates your unselfish patriotism in lending the money which helped win the war. Upwards of 20,000,000 Americans shared this honor, and are receiving during 1919 more than \$700,000,000 interest."

### COMMITTEE OF ONE HUNDRED PREPARING REPORT FOR PRESENTATION TO FEDERAL COMMISSION

Under the direction of the Committee of One Hundred, of which Mr. Guy E. Tripp is chairman, the American Electric Railway Association is preparing the case of the electric railways, to be presented to the Federal Commission appointed by the President, to investigate the electric railway situation.

The committee on presentation, under the chairmanship of Mr. J. K. Choate, and the committee on recommendations under the chairmanship of Mr. O. D. Young, will meet to give formal approval to the tentative program which is already prepared. If this program is accepted, the case will be presented under three headings: 1. Present conditions of the industry. 2. The causes which have led to these conditions. 3. Suggested avenues of escape.

The Association is endeavoring to present to the Commission an array of witnesses who are thoroughly familiar with the various phases of electric railway operation, finance and economic theories which govern public utilities. The list includes some of the best known men in America—financiers, economists and men thoroughly familiar with public life. It is commandeering the services of witnesses wherever the best men can be obtained. Chairman Tripp believes that the situation is one in which it is the duty of every man interested to render what service he can.

An opportunity is offered for presenting the case of the railways in such a way as to impress upon the people of the United States the desperate straits in which the industry at present is, and the necessity for immediate action, in the interest both of the public, the employees and of the owners of these properties.

Presentation of the case, under Chairman Choate, will be in direct charge of a railway attorney of national reputation, who has participated in a number of investigations along similar lines and who is thoroughly familiar with the subject. As far as possible the evidence will be brought before the Commission in a sequence which will develop the case from the start to the conclusion.

Among the important evidences to be presented is that dealing with the present price level and its probable maintenance for an indefinite period. It is the intention of the Committee to show that what was at first considered a matter of short duration is in reality a condition that is likely to maintain for a long period of time.

All of the various phases of the situation, the causes which have led up to them, the various remedies that have either been suggested or applied in particular situations are to be brought out. Included is a very complete and thorough analysis of the statistics of electric railways as developed by United States census as well as later statistics which have been compiled by the Association for that purpose.

With regard to the publicity work, Mr. Barron G. Collier of Barron G. Collier, Inc., has turned over for

# The Bridgemen's Magazine

PUBLISHED MONTHLY

VOL. XVII. No. 6



JUNE, 1917



THE OFFICIAL  
MONTHLY JOURNAL  
PUBLISHED BY  
AND DEVOTED TO  
THE INTERESTS OF



THE INTERNATIONAL  
ASSOCIATION OF  
BRIDGE, STRUCTURAL  
AND ORNAMENTAL  
IRON WORKERS

HARRY JONES, Editor and Manager  
American Central Life Building, Indianapolis, Indiana  
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*Subscription Rates One Dollar Per Year in Advance  
Single Copy 10 cents  
Advertising Rates on Application.*

Send all moneys for subscriptions, etc., by Money Order or Registered Letter, and make same payable to Editor and Manager.

Communications for the BRIDGEMEN'S MAGAZINE must be received BEFORE the 25th of the month to insure publication. News notes, articles on technical trade topics, and such matter as will be of general interest to the craft are invited. All communications must be accompanied by the name of the sender.

*The Bridgemen's Magazine has a subscriber in every member of the International Association of Bridge, Structural and Ornamental Iron Workers, thus guaranteeing a circulation to every job of importance in the United States and Canada. It has no real competitor as an advertising medium, as it goes directly to Superintendents, Foremen and others with power to approve or purchase.*

The Publisher reserves the right to revoke advertising contracts at any time.

The International Association of Bridge, Structural and Ornamental Iron Workers is not interested in any souvenir publication of any kind.



## Editorial

Before this issue of the Journal reaches our membership, we will have restored to liberty four more of our members who were unfortunate enough to have been confined in the Federal Penitentiary at Leavenworth.

Kansas. Brothers Frank C. Webb, J. E. Munsey and Phil Cooley will be released by expiration of sentence on June 3d, and Bro. J. H. Barry will be released on June 14th. This will leave Brothers F. M. Ryan and M. J. Young confined at Leavenworth, and Brothers E. A. Clancy and J. J. McNamara confined at San Quentin, Cal. We hope that in the near future we will be able to report that these have also been restored to the liberty they justly deserve.

## Liberty Loan Bonds.

Besides being a safe investment, it is a patriotic duty of every citizen who is financially able to subscribe for some of these bonds to do so. As it is the government's desire that this be a popular loan, a loan by and from the people at large of the United States and not wholly from banks, trust companies, financiers and corporations, as heretofore customary, the plain people have an opportunity to share in this patriotic undertaking and at a profit instead of a loss. The faith and honor of the United States, backed by all the resources of the nation and the American people, are behind these bonds. We urge upon our members who may have some surplus cash on hand to buy a Liberty Loan Bond, either large or small, as your means may permit.

The following facts on same will furnish the necessary information:

Liberty Bonds are issued in denominations of \$50, \$100, \$500 and \$1,000. Bonds of these denominations are payable to bearer and have interest coupons attached.

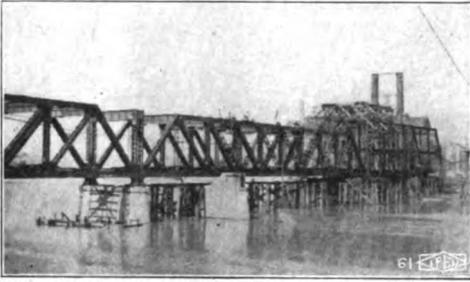
Registered bonds may be had in denominations of \$100, \$500, \$1,000, \$5,000, \$10,000, \$50,000 and \$100,000. These are in the name of the purchaser and are registered with the government.

Liberty bonds bear 3½ per cent. interest.

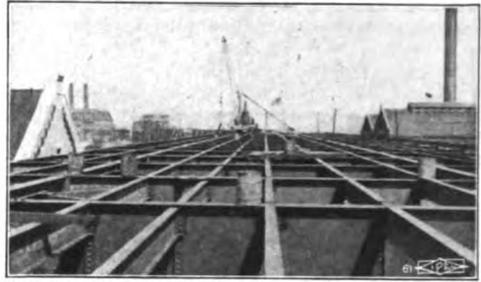
They are exempt from taxes except estate and inheritance taxes.

They can be exchanged for full value for any other bonds that may be issued during the war at a higher interest rate.

They run for thirty years, but the government may redeem them in fifteen years if it chooses.



*Central Avenue Bridge, Kansas City, Mo., erected by members of Local No. 10.*



*Top of approach, Central Avenue Bridge, Kansas City, Mo.*

be able to tend to it and brothers that will drop around this way after that date will be sure of work and a hearty welcome. I shall gladly communicate with brothers desiring information about conditions.

I also enclose a few pictures of what is left of the original union crew, and I wish to note before closing that if I mentioned the negro at the beginning of this letter, at the present writing all members of this local are white so far and wish to remain that shade.

Fraternally yours,

FRANK KING.

**Local Union No. 204.**

BALTIMORE, Md., May 21, 1917.

*Editor Bridgemen's Magazine:*

Make a little room for us to thank General Organizer P. J. Morrin for the hard work and long hours spent on our local this past February, March and April while he was here looking after the pile driver and other affairs.

Forty members and all working, most of them overtime, is not so bad for a local organized February 14, 1917. And if we had a few more good, capable men to take charge of work I have no doubt that we could soon control all the work here. Our scale is low and we have no trouble at all in getting it—\$3.00 for the men, \$4.00 for the foremen, for eight hours, and several are get-



*Central Avenue Bridge across Kaw River, Kansas City, Mo., erected by members of Local No. 10, Kansas City, Mo. Kansas City Steel Company, contractors.*

ting above the scale, so I have no doubt that we shall have no trouble raising the scale when we see fit.

The time has not been so long past when the rodmen's wages here were \$2.00 and \$2.50 for ten hours. In fact, I had a foreman assure me almost with tears in his eyes that our class of work would never pay the worker better than \$2.00 for the ten hours; and, by the way, I shall send this party a copy of this.

Anyway, to cut this short, any credit for our success is due Brother Morrin and our business agent, P. E. Ryan, who is also the business agent for Locals Nos. 16 and 188.

Fraternally yours,

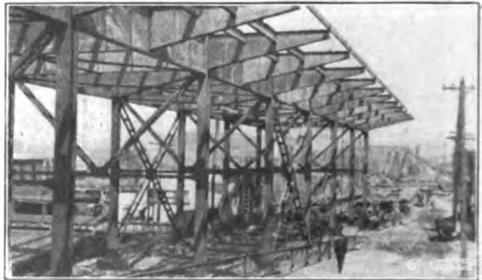
R. E. THORNTON, F. S.

What has become of the old-fashioned girl who used to clean her teeth with the cigar ashes her fellow saved for her?

You may have noticed that a bow-legged girl never selects a dachshund when she wants a pet dog.

Mother's aprons are always worn out in front. Daughter's house dresses are always worn out in the rear.

How can a married man say that he has no peace of mind when his wife is always handing him a piece of hers?



*West approach of Central Avenue Bridge, Kansas City, Mo.*