an increase of conductivity of the scaled tube as compared with the employees, but still 18 to 20 per cent. of the deaths are due to it; conducting the experiments, although they could not be detected prevent the disease. at the time the experiments were made. The apparatus used in 1904 and 1905 was improved in some particulars, the most important change being in the means for the measurement of furnace temperatures, as already mentioned. Such discrepancies disappear in the later series.

When the experiments were planned it was considered probable that the transmission of heat through the scale was principally dependent upon two of its characteristics, namely, its thickness and its mechanical structure, and that probably, for such thicknesses as are usually met with, thickness had greater influence than structure. Thickness was therefore carefully determined and structure approximately designated as hard, soft or medium, no more exact characterization of structure being possible with tubes collected from different sources, as these were. It was hoped that the experiments might develop, if perhaps only approximately, some law of variation of conductivity with thickness. After making allowance for possible errors due to the method of conducting the tests, consideration of Fig. 2 shows perhaps a decrease of conductivity with thickness, but certainly no regularity of variation. In Fig. 3 the loss in heat transmission is again plotted with reference to thickness, and the structure of the scale, in so far as it was determined, is indicated as previously explained. No regularity of variation is observable with respect to hardness or softness.

In considering Figs. 2 and 3 it must be borne in mind that the tubes tested were taken from locomotives which had been in service in different parts of the country and that the scale on each tube was made up of the mineral constituents of many different water What is designated as hard scale in one case may be very different in structure—in porosity, for example—from what is designated as hard scale on another tube. Fig. 3 cannot therefore be considered as providing conclusive evidence concerning variation of conductivity with structure. The results may properly be interpreted as indicating that mechanical structure is at least as important a factor in the change in heat transmission due to scale as is the mere thickness. Such a conclusion is, of course, in accord with the facts concerning other heat insulators.\*

Water and vapors are known to be poor heat conductors. Experiments on the conductivity of metals by Fourier and others, in which the heat transmitted was measured by its absorption in water, proved that unless care was exercised to constantly remove the film of water next the metal, the low conductivity of this water layer so affected the results as to make it difficult to distinguish the effect of differences in thickness and nature of the metals themselves. It seems probable that soft, porous scale would more effectively retain against the tube surface such a layer of water or vapor of low conducting power. Such facts seem to indicate that we should accept with caution the assumption that hard scale will cause a greater loss than soft scale.

Figs. 4 and 5, in which the loss in heat transmission is plotted with reference to the principal chemical constituents of the scale, do not warrant the conclusion that its chemical composition has any direct influence on its conductivity.

From the point of view of the physicist the experiments are open to objection as to method. From the engineer's viewpoint it is believed that the possible errors of the experiments do not by any means account for all the irregularity in the plotted results and, considering the controversy upon the subject and the comparatively meager information available, it is deemed proper to publish at this time the results as they stand in the hope that they contribute additional information which may be of interest in some

## CONCLUSIONS.

In so far as generalization is warranted, we may sum up the results of the tests in the following conclusions:

- 1. Considering scale of ordinary thickness—say of thicknesses varying up to 1/8 in.—the loss in heat transmission due to scale may vary in individual cases from insignificant amounts to as much as 10 or 12 per cent.
- 2. That the loss increases somewhat with the thickness of the scale.
- 3. That the mechanical structure of the scale is of as much or more importance than the thickness in producing this loss.
- 4. That chemical composition, except in so far as it affects the structure of the scale, has no direct influence on its heat transmitting qualities.

The Bavarian authorities announce that since the effort to guard against tuberculosis began in 1878, there has been a great reduction in the number and mortality of the cases among railroad

These were perhaps to be accounted for by errors in and they have issued new regulations, intended to still further

## The Sixth Street Viaduct at Kansas City.

### BY J. A. LAHMER.

Principal Assistant Engineer, Kansas City Southern.
Kansas City has many hills and hollows. The west bottoms on the south side of the Missouri river and on both sides of the Kaw river—are occupied by railroad yards and terminals, stock yards and meat packing plants, and other factories and warehouses. Wagon traffic from the uptown district to the west bottoms and Kansas City, Kan., passes over heavy grades and across many railroad tracks, and, during the busy hours of the day, is very con-

A public viaduct from the west bluffs at Fourth street across the tracks which lead from the north to the Union Depot and adjacent yards, lands at the east edge of the west bottoms. It partly relieved the situation in the early days, but has long been inadequate and in addition is too far north to benefit a considerable portion of the present traffic. The next streets which afford access to the west bottoms are Sixth street and Twelfth street, from which roadways wind to the south and north, respectively, along the west bluffs. These routes are unsatisfactory on account of indirectness, steep grades and numerous railroad crossings.

A municipal viaduct to afford an easy and direct route for wagon and street railway traffic between Kansas City, Mo., and Kansas City, Kan., and the intervening bottoms was advocated in 1902 by William J. Knepp, while he was a member of the City Council of Kansas City, Mo. Approximate estimates of the cost of the structure were prepared and some investigations made as to right-of-way. However, it soon became evident that the two cities had not the necessary funds available, nor were they in a position to issue bonds for the purpose. Mr. Knepp then set about to interest private capital in the enterprise and finally succeeded in obtaining the necessary funds in the East. The Kansas City Viaduct & Terminal Railroad Co. was organized and a toll viaduct built. This structure is known as the Sixth street viaduct, but is also often referred to as the Intercity viaduct. It extends from Sixth and Bluff streets in Kansas City, Mo., to Fourth street and Minnesota avenue in Kansas City, Kan., and for the greater portion of its length is located between the Missouri river and the tracks on the south side of this stream on land which was formed by accre-

The length of the main viaduct is 8.400 ft., including an earth approach 381 ft. long, at the Kansas end. Beginning at the east end, there is a 15/10 per cent. descending grade for 843 ft.; a 5/10 per cent. descending grade for 2,362 ft.; a  $^3/_{10}$  per cent. ascending grade for 2,091 ft.; a  $^{14}/_{100}$  per cent. ascending grade for 45 ft.; a  $^{13}/_{10}$  per cent. ascending grade for 1,415 ft., which ends at the east end of the bridge across the Kaw river; a \*/10 per cent. ascending grade 609 ft. long across the Kaw river bridge and 1,035 ft. of a 15/10 per cent. ascending grade to the west end of the viaduct. The grades which are shown on the general plan, Fig. 1, are incorrect. It was necessary to eliminate the level grade in order to meet the wishes of the company which provided the paving for the roadway. There are three 3-deg. curves in the alinement, which are respectively 683, 653 and 190 ft. long.

The spans are supported by steel columns which rest on concrete pedestals; the latter in turn rest on piles-12 under each pedestal. The bottoms of the concrete footings under the pedestals are above low water in the Missouri river. It was originally intended to use concrete piling throughout for the purpose of providing satisfactory protection against decay near the surface of the ground The first plan was to drive hollow metallic forms and fill them with cement as the forms were withdrawn, but on account of difficulty experienced by the contractor in doing work in this manner for a warehouse foundation in Kansas City, this method was abandoned. It was found that where these forms were driven through quicksand, a great deal of the concrete was lost by flowing outside the space intended to be occupied by the pile. Concrete piles were then made in forms on the surface of the ground at the site of the work and jetted into position. The cross-section of these piles is approximately an octagon and they are about 14 in. in diameter at the large end and 10 in. at the tip. It was late in August before the moulding of the concrete piling was started. While the weather was warm, the piles would be strong enough to drive within seven days after making and the driving was effected with but little difficulty. As the fall season advanced, the setting of the concrete became so slow that it required 30 days or more for the piles to become hard enough to drive. After driving about 800 concrete piles, yellow pine piling treated with 12 lbs. of creosote per cubic foot was adopted. The concrete piles are from 30 ft. to 35 ft. long and the timber piles from 35 ft. to 50 ft. long.

The concrete piles consist of four %-in. Johnson's corrugated bars wrapped in wire netting and surrounded by a mixture com-

<sup>•</sup>In discussing the effect of structure it seems to be quite generally assumed that hard scale will reduce the conductivity of the tube more than soft scale. This assumption, moreover, is generally made without the reasons or data being adduced. It may eventually prove to be correct, but there are reasons for anticipating that, when the matter is settled experimentally, we may find that soft scale will cause the greater loss.

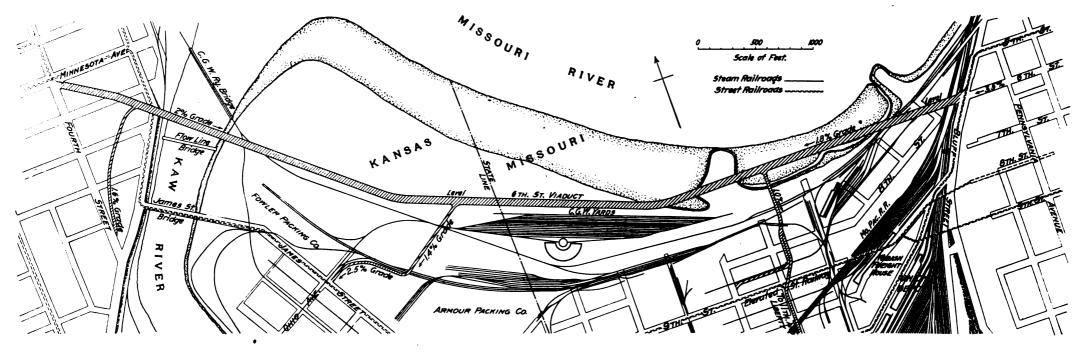


Fig. 1—Map of West Bottoms at Kansas City Showing Location of New Sixth Street Viaduct and Approaches.



Fig. 6—Bird's-eye View of New Sixth Street Viaduct at Kansas City.

posed of one part of Portland cement, three parts of sand and five parts of stone broken to pass through a 1-in. ring. The concrete in pedestals was of the same composition as that in the concrete piling, except that the stone was  $2\frac{1}{12}$  in., or less, in size. The concrete in pedestals deposited in water was mixed in the proportion of one, two and three, broken stone to pass through a 3-in. ring. All ingredients in concrete was determined by volume and each

provided. A double 147 ft. long crosses Southern, and two serected at the crossis for vehicles and foot centers, for motor of the series of th

Fig. 2—Cross Section Through Viaduct Showing Future Widening for Additional Tracks.

mixture contained sufficient water to form what is known as "wet" concrete. The standard footings of pedestals on concrete and timber piles were 9 ft. by 11 ft. 3 in. in plan, with the longer dimension transverse to center line of viaduct and projected  $3\frac{1}{2}$  ft. below and  $1\frac{1}{2}$  ft. above tops of piles. The footings for pedestals through the flat east of Mulberry street were 9 ft. by 12 ft. and extended 10 ft. below tops of piles and 3 ft. above tops of piles. The neat work of pedestals is 12 ft. high, 6 ft. 6 in. by 7 ft. 6 in. at the base

posed of one part of Portland cement, three parts of sand and five and has a batter of 1½ in. to the foot. The corners are rounded parts of stone broken to pass through a 1-in. ring. The concrete to a 3-in. radius.

In general the superstructure is arranged in bays, separated by expansion joints, each bay consisting of seven 45-ft. spans and one 30-10. tower, thus spacing the expansion joints (shown in Fig. 3), 345 ft. apart. The tower span is well braced longitudinally. All columns are of steel. Where necessary to carry the viaduct over buildings, railroad tracks, streets and alleys, special spans are provided. A double intersection, riveted, Warren deck truss span 147 ft. long crosses a proposed freight yard of the Kansas City Southern, and two spans, each 300 ft. long, of the same type were erected at the crossing of the Kaw river. These carry a roadway for vehicles and foot passengers and two tracks, 12 ft. 6 in. between centers, for motor cars, the center of the inside track being 6 ft.

10½ in. from the hand-rail of the highway. The roadway is 38 ft. wide east of Mulberry street and 30 ft. wide west of Mulberry street. The present structure is built to permit a future addition of a footway 7 ft. 6 in. wide on the south side and another row of columns 31 ft. north of the present north line of columns to support another pair of tracks for motor cars.

A typical section is shown in Fig. 2. The columns of each bent are 33 ft. between centers and vary in height from 27 ft. to 52 ft... to fit the grade, the top of concrete pedestals being level. A column between 27 and 31 ft. high consists of two 15-in. 33-lb. channels, separated by a 1/2-in. x 16-in. plate fastened to the channels by means of four 5-in. x 3-in. x %-in. angles. For higher columns, the weight of the channels was increased, but the diaphragms remained the same. The floor beams are 15 ft. apart and, between main girders, are 52-in. plate girders having a %-in. web and 6-in. x 6-in. x ½-in. angles. Outside the main girders are cantilever girder arms, which are connected to the floor girders by a plate across the top of columns; the thrust at the bottom is transferred by means of a cast iron block

between the outside channels of the columns. At every bent there are angle iron braces across the corners between floor beams and columns. On top of the floor beams there are 12-in., 31½-lb. I-beams, 5 ft. between centers, under the roadway for vehicles, and one 18-in., 55-lb. I-beam under each rail of the tracks for motor cars. Longitudinal bracing is provided in every seventh panel on tangents and every fifth panel on curves, except that in a few instances, on account of undercrossings by streets or tracks,

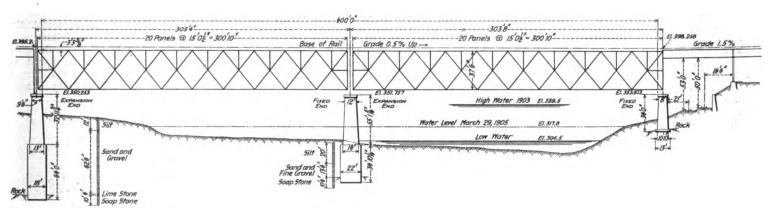


Fig. 4-Elevation of Bridge Over the Kaw River for the Sixth Street Viaduct.

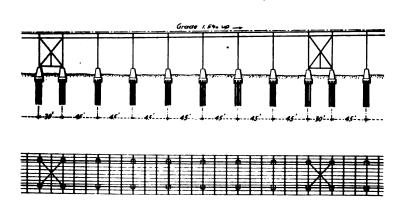


Fig. 5-Part Plan and Side Elevation of Sixth Street Viaduct.

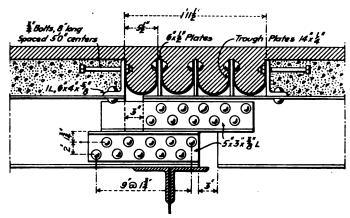


Fig. 3—Detail of Expansion Joint in Floor.

The material for the substructure of main viaduct was delivered on surface tracks under or along viaduct. The first metal was erected by the use of a gin pole and the remainder by means of a double-boom traveling derrick.

The floor of the roadway for vehicles consists of a 6-in. layer of reinforced concrete covered by a finishing coat of 2 in. of asphalt. The highway stringers are encased in concrete, as shown in Fig. 2. The four track stringers of the motor-way floor system are braced by a 10-in. channel over each floor beam with diagonals between. The ties are 6 in. by 8 in. by 9 ft., creosoted yellow pine, laid flat and spaced 14 in., center to center, except that every fourth tie is continuous across both tracks. They are fastened to track stringers

by means of hook bolts. On curves, the ties are laid on edge and dapped to give superelevation. Guard rails are also 6-in. by 8-in. yellow pine, creosoted, and are laid flat and dapped 11/2 in. Trolley poles are set between tracks.

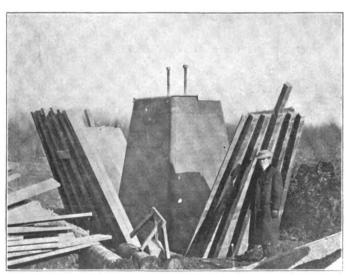
The viaduct is to be used by cars of the Metropolitan Street Railway Co. and also by cars of the Kansas City Western Railway Co., which operates an electric line between Kansas City, Mo., and Leavenworth, Kan.

The general plan and profile of the bridge across the Kaw river is shown in Fig. 4. These spans are designed for a combined live and dead load of 22,000 lbs. per lineal foot and are examples of long, heavy, riveted spans. Each span is 300 ft., 10 in. long, divided into 20 panels and weighs approximately 1,780,000 lbs. The bottom of the trusses is about 15 ft. above the high water mark of the flood of 1903, which caused such enormous damage at Kansas City and throughout the Kaw valley. Foundations for the east and middle piers were built by the pneumatic process, and that for the west pier by open excavation.

A lateral viaduct leaves the main viaduct in the block east of Mulberry street (in Missouri), and extends south across private property and buildings to a point about 100 ft. south of Eighth street. It divides here and one portion runs thence to Ninth and

Mulberry streets, where it will cross above the Ninth street elevated tracks of the Metropolitan Street Railway and will extend on Mulberry street to Eleventh street. The other portion runs westward along the alley and by an incline on a 35/10 per cent. grade reaches the grade of the street surface near Ninth and Mulberry streets. The Eleventh and Mulberry street lateral will be about 2,200 ft. long and the Ninth and Hickory street lateral about 450 ft.

The city contemplates the construction of a viaduct west from the bluffs at Twelfth street, which would join the Mulberry street lateral of the Intercity viaduct at Eleventh and Mulberry streets. An effort was made by the city to unite with the Metropolitan Street Railway Co. in the construction of a viaduct from Twelfth and Bluff streets, but no agreement has been reached. From present appearances, the Metropolitan will reconstruct its old Twelfth street viaduct on a steeper grade than that contemplated by the city for its viaduct. The Kansas City Viaduct & Terminal Railroad Co. at



Concrete Foundation Pier with Forms Removed.

every eighth panel on tangents was braced longitudinally. first figured on a landing for its viaduct on the surface of the street a short distance west of Eleventh and Mulberry streets, but was unable to make satisfactory arrangements for right-of-way. The present plan is to provide elevators at the south end of the Mulberry street lateral to handle traffic between the viaduct and the surface of the street, a vertical distance of about 22 ft. The Mulberry street viaduct will have a clear roadway of 24 ft., but no railway tracks.

> The ordinance covering the portion of the Sixth street viaduct which is located in Kansas requires the construction of laterals on Ohio avenue and Ferry street.

> Actual construction of the Sixth street viaduct was begun August 9, 1905. The main viaduct was opened for traffic between

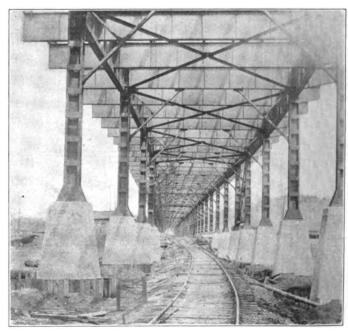


Bridge Over Kaw River for Sixth Street Viaduct.

Kansas City, Mo., and Kansas City, Kan., on January 29, 1907. Work is now in progress on the Eleventh and Mulberry, and Ninth and Hickory street branches.

The total cost of the main viaduct and its laterals is estimated at \$3,000,000.

The general contractor for the substructure was James F. Halpin, of Kansas City, and for the superstructure, the Riter-Conley Manufacturing Company, of Pittsburg, Pa. Thanks for drawings and other information from which this article was prepared are due Mr. Ira G. Hedrick, who on the dissolution of the firm of Waddell & Hedrick, became Consulting Engineer to the Viaduct Company.



View Under Viaduct Before Laying Floor.

# RODUCTS

DEVOTED TO CONCRETE AND MANUFACTURED BUILDING MATERIALS.

Volume VII.

CHICAGO, NOVEMBER 22, 1907.

Number 5.

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Heavy demand for cement has practically closed for this year, and it has been a better average season than some are willing to admit.

Hard wall-plaster has won its leading position in modern specifications upon merits. Our people are always glad to pay for a good thing.

The feature of the sewer pipe industry just now is a general tendency to increase the size of the plant to provide for a bigger output next season. And it is needed.

Sand-lime brick have been produced in larger quantities in 1907, and every one of them marketed. Many times more could have been sold with ease. Greater output is needed.

Architects are taking a deeper interest in the study of concrete. Very few of them now are willing to admit that they ever had any serious doubts about its structural adaptabilities.

Vitrified paving-brick have been very short all the season. Twice as many as were delivered could have been sold. Many miles of street go unpaved all winter because of this deficiency. Wake up. Here's an opportunity for somebody to get busy.

The concrete engineers have made a great record this past season. If there were any doubts about the structural value of concrete they have all been expelled. The monthly record as shown by Rock PRODUCTS covers every possible adaptation.

There are two dates for the cement user to remember:

December 16 to 21—The Cement Show at the Coliseum, Chicago. January 20 to 25—The National Cement Users' Convention at Buffalo.

Big things will be doing.

Road contractors observe the indirect campaign of the automobile in their behalf with gratification. When the men of affairs need roads for a plaything it becomes easy for the farmers to get promptly what they have been waiting for all their lives. The road construction now being decided for next year's work is something stupendous.

The time is not far distant when hydrated lime will be the only form in which that material will be used. Lime putty as commonly used in the past and up to the present time secures to the user a mere approximation of the active element for which the material is purchased, while by hydration all the usefulness in it is brought out. It is the only way for the consumer to get all the value that he pays for.

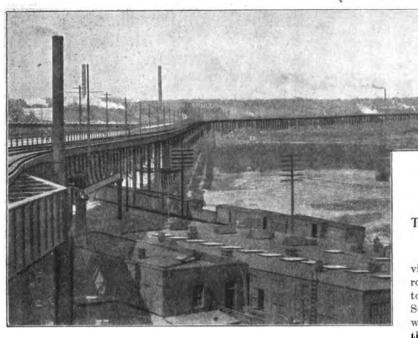
Supply dealers are beginning to take things easy. It has been a prosperous season all the way through, in spite of this after-season talk. Rock Products told you so in January. Before the activities of another season come on it will be better than ever. We must all pitch in and pay court to Miss Prosperity if we would win and keep her constantly by our side. She likes to be appreciated and is easily frightened when knockers are around.

Employing plasterers in New York have had an association for several years which has enabled them to improve the conditions of their business, so much so that the plaster contractors of other cities have expressed a desire to join them, and an international association has been formed as a result. The plaster specification is the last thing undertaken in the construction of a building, and too often is there a tendency to cut it down to the last notch both as to materials and workmanship. There is certainly a big field of usefulness for this association, and every progressive plastering establishment should hurry up and give its help to the movement.

## Idle Money Talk.

There has been more idle talk about currency stringency than there has been any warrant for. People who are accustomed to run to the banker every time they need accommodation, or every time they think they do, are making a roar when the banker in turn has a favor to ask of his customers. Currency has been called for in such prodigious quantities that the cash reserves are insufficient for a time to meet the demand, and the bankers put out accommodation paper of a sound and conservative character to prevent anybody from being inconvenienced. The clearinghouse checks will buy just as much as any other currency, and for a circulating medium meet every requirement for practical purposes. The very people who talk and argue the matter for the most part have no real interest or reason for doing so. It cannot be dignified by the name of currency agitation or criticism of the banking system. There is nothing to be excited about, for our banking system is all right. As soon as some other general topic arises for idle gossip to wag about this subject will pass into oblivion without anyone realizing how it happened, just like every other nine days' wonder gets to be common. If each fellow who wants to drop the matter will just settle promptly all the bills he can with whatever currency the banks offer, a whole lot of people will feel comfortable at once and proceed to do likewise. This holding up of payments is utter folly on the part of business establishments, for everybody is glad to get the kind of money that buys things. We should all be glad to extend the trivial accommodation to our bankers, especially when they shoulder all the trouble and responsibility themselves. Send us as many clearinghouse checks as you please. ROCK PRODUCTS will find no difficulty in putting them to good use.

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## THE KANSAS CITY VIADUCT.

The Largest Structure of Its Kind in the World. A Notable Example of Up=To=Date Concrete Engineering.

ANSAS CITY, MO., October 15.—What is known here as the Sixth Street Viaduct, the Inter-City Viaduct, or, simply, as "The Viaduct," connecting the two Kansas Cities—Kansas City, Missouri,

and Kansas City, Kansas—is the longest street viaduct in the United States, if not in the world. It not only makes a Greater Kansas City possible, but its successful planning and construction constitute one of the notable engineering feats of recent times.

The first spadeful of earth on the new construction was turned August 9, 1905. Work on the substructure, which consisted of three concrete piers in the Kaw River and 322 concrete pedestals averaging 45 feet apart, was rushed with such success that on February 12, 1906, the first steel column of the superstructure was erected in the main viaduct just west of the Kansas City Suburban Belt Railway tracks. The bridge across the Kaw River was erected during the months of March and April, 1906.

The main portion of the Sixth Street viaduct extends from Sixth and Bluff Streets, Kansas City, Mo., to Fourth Street and Minnesota Avenue, Kansas City, Kan., a distance of 8,400 feet. It consists of a double track street railway and an asphalt roadway for vehicles, supported on parallel girders which are spaced 33 feet apart and attached to steel columns resting on cement pedestals. The street railway tracks are laid on creosoted ties, and the asphalt roadway on a 6-inch reinforced concrete base. Steel handrails are pro-

vided on each side of the roadway. From Bluff Street to a point near Mulberry Street the roadway is 38 feet wide, and from this point to the west end it is 30 feet,

with an approach at each end widening out. The total width of the structure is 60 feet 7 inches from the east end of Mulberry Street and 52 feet 7½ inches for the rest of the distance. The height above the established grade, to which the ground beneath the viaduct will be filled, varies from 30 feet 6 inches to 50 feet 6 inches, to the surface of the pavement.

The substructure of the viaduct consists of three large piers at the Kaw River, one abutment and 322 pedestals. Of these pedestals, eight are based on rock, forty-two on clay, and 272 are supported on piles. Both concrete and creosoted piles were used, nearly all of which were driven by the use of water jets, and practically all of them either reached rock or a bed of gravel underlying a portion of the structure. There are 798 concrete piles, totaling 23,950 lineal feet, and 2,573 creosoted piles. The total number of piles is 3,371, being 131,000 lineal feet, or about 25 miles, as delivered at the site, and 117,750 feet, or about 22.3 miles in place. The pedestals vary in height from 17 feet to 24 feet on different parts of the work, and there are 13,922 cubic yards of concrete in all. For fastening down the steel to these pedestals, 36,500 pounds of anchor bolts, 8 feet long and 2 inches in diameter, were used. Nine of these pedestals were built under the building of the Kansas City Hay Press Company, and two under the tracks of the Kansas City Belt Line Railway. Pedestals supporting the girders at the east end are situated about the center of Bluff Street and make the structure entirely independent of the large retaining-wall on the west side of this street. At the west end of the viaduct is a fill 70 feet wide at the top and containing 24,000 cubic yards of material.

The piers of the Kaw River bridge are founded on rock, two of which were sunk by the pneumatic process, and the other built by open excavation. The east

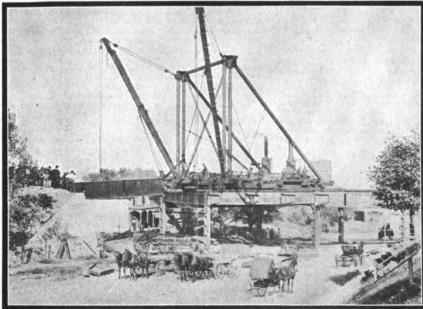
pier is 99 feet from the lowest to highest point. The channel pier is about 92 feet, but very large, the base being 22 feet by 56 feet and the top of the coping 13 feet by 48 feet. This is the largest pier in the Kaw River. These piers were constructed very rapidly, one of the pneumatic caissons being sunk in four weeks and the other in five weeks. In the three piers are 6,415 cubic yards of concrete.

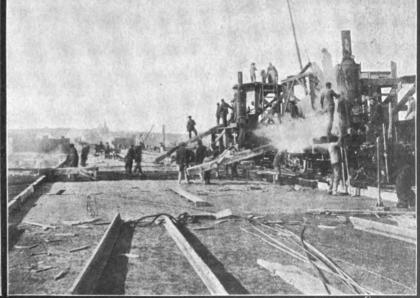
The total length of the steel work is 8,019 lineal feet, and there are 325 girders; the largest is 108 feet long and 10 feet deep. The greatest portion of the structure is built of 45-foot girders with 30-foot tower span at intervals of 345 feet. The first column of the viaduct was put in place February 12, 1906, and the last girder was erected December 18, 1906. The Kaw River bridge consists of two 300-foot riveted pick truss spans, and the two spans weigh 3,580,000 pounds. The main viaduct, exclusive of the Kaw River span, weighs 20,370,000 pounds. The total weight of the whole structure is 23,950,000 pounds, which was erected at the rate of 1,200 tons per month.

The viaduct has an elevator at Ninth and Mulberry Streets to lift wagons. This will raise 12 to 15 tons 40 feet.

Following are the specifications under which the great viaduct was constructed; covering stresses, thrusts, minimum and maximum live load equations. and the details of reinforcement.:

## 

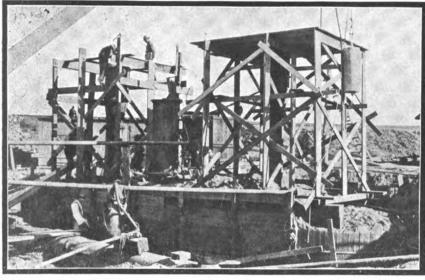


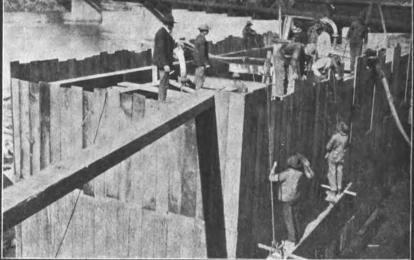


ERECTION AT WEST END, SEPTEMBER 16, 1906.

CONSTRUCTING GREATER KANSAS CITY'S VIADUCT.

Digitized by





Preparing to Seal Caisson No. 1. November 15, 1905.

Building Caisson for Pier No. 1, October 11, 1905.

CONSTRUCTING GREATER KANSAS CITY'S VIADUCT. II.

	•
Shear:	
Pins	5,000
Rivets	0.00
Shear:   Pins.	0,00
Bendina:	
Pins	7,00
Bearing:	
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(d=diam, of roller). lineal i	nch.
On Portland cement concrete,	
Thrust.	
20% of street railway load.	
Impact Loads:	
10,000	
Street Railway: $\frac{10,000}{L+150}$	
40.000	
$Highway: \dots \frac{40.000}{L+500}$	
The mainformed concrete floor on the mandaug	:

The reinforced concrete floor on the roadway shown on the accompanying reproduction of the blue-print plan. The floor was designed to carry Cooper's Class A, highway loading.

The stone used for the concrete in floor and curbing

was principally of Joplin flint or what are known as 'chat." Some local limestone was also used.

The sand for concrete was coarse Kaw River. The

Portland cement used in the construction of the via-duct came from Kansas, the Iola and the new brand of the Kansas City Portland Cement Company being

used.
There are about 40,000 square yards of reinforced concrete floor.

The viaduct was built by the Kansas City Viaduct and Terminal Railway Company at a cost of \$3,000,000. It is a toll bridge, and the company operating it is capitalized at \$3,500,000.

## The Men "Behind the Gun."

W. J. Knepp, who at the time the plan of the viaduct was being agitated, was an alderman of Kansas City, was a leading promoter of the enterprise. The contractors were

Steel work—Riter-Conley Manufacturing Company,

Pittsburg, Pa.; J. P. Wagner engineer.
Substructure—James F. Halpin and H. C. Lindsly

& Sons.

Concrete Roadway Base—Expanded Metal and Corrugated Bar Company, St. Louis; Geo. R. Heckle superintendent.

Asphalt Roadway Surface—The Parker-Washington Paving Company.

Electric Lighting—The Squire Electric Company.
Track Laying—Il. C. Lindsly & Son.
Painting—The Goheen Manufacturing Company;

Mr. Schepler inspector.
Waddell & Hedrick were originally the consulting engineers for the work, but upon the dissolution of that firm the work was turned over to Ira G. Hedrick, consulting engineer, 309 Keith & Perry Building. Kansas City, Mo., who is also now president of the

Viaduct Company.

Many accounts have been published of the construction of this great work, all of them more or less inaccurate. The above is the first authentic summary of the engineering details. It was prepared especially for Rock Products, and all the figures and data have been verified by the consulting engineer.

## Concrete Stone Company Organized.

Superior, Wis., Oct. 14.—T. J. Roth, Henry Husby and W. R. Fanning have just organized a \$40,000 company for the manufacture of concrete stone under the American Hydraulic Company's system. One machine will be installed at present with a capacity of 12,000 stones, 10,000 brick or 500 paving blocks per day, as the case may be. The capacity of the plant will be tripled by the installation of two more machines in the spring.

## EXPOSITION OF CEMENT PRODUCTS.

## The Chicago Coliseum to Be the Scene of the **Greatest Educational Demonstration** in the History of the Industry.

For five days, from December 17 to December 21, 1907, the great Chicago Coliseum will be the scene of the most interesting special-industry demonstration in the history of the West-the Cement Exposition under the auspices of the Cement Products Exhibition Company. This is a permanent organization which has just come into being-the outgrowth indirectly of a spontaneous demand from users of cement and directly of the combined efforts of the great cement companies represented in Chicago, all of whom are backing the enterprise and thus insuring its complete success. The organization committee, consisting of William Dickinson of the Marquette Cement Manufacturing Company, J. U. C. McDaniel of the Chicago Portland Cement Company and B. F. Affleck of the Universal Portland Cement Company, have completed their labors, and officers and directors will be elected at a meeting to be held on the 24th inst., all the stock having been taken up. L. L. Fest, who has had charge of

been taken up. L. L. Fest, who has had charge of most of the great industrial expositions held in the Coliseum, and who has been uniformly successful in his undertakings, will have the general direction of this enterprise and has already commenced work.

The educational advantages of this exposition cannot be overestimated. Every possible use of cement will be illustrated so that it can be studied beneficially by every user of cement. The lively interest already manifested by prospective exhibitors assures a completeness of representation which will make a completeness of representation which will make this exposition a complete education in what is without the shadow of a doubt the most important industry of the twentieth century.

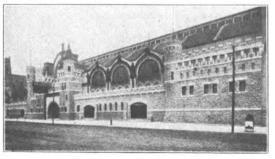
Some idea of the wide scope of the Cement Ex-

position may be had from the following outline showing the departments into which the various various branches of the industry have been arranged:

Concrete Mixers.— This will include exhibits of all e many machines on the market, which will be shown work.

Block Machines.—One of the most interesting departments, as the machines will be in operation, showing the novice as well as the expert what can be done with the many faces.

Brick Machines. -The manufacturers of this class of machinery, which has shown great improvement during the year, will make a great display.



THE COLISEUM, CHICAGO.

Cement Pipe Machines.—A number of companies will provide a creditable display in this department.

Cement Tile Machines.—This exhibit will reveal some of the more artistic forms for which cement is adapted.

Cement Post Machines.—This will include machinery for making fence-posts, hitching-posts, telephone and telegraph poles.

Reinforcing Metal.—In the matter of instruction, this partment will be an education in itself, as the demand or knowledge about the various systems is universal. Is expected that every company will be represented in its cylibria.

Coment Publications.—All the publications devoted to the industry will be invited to take space for booths.

Books.—A department for cement literature will be provided, where the books dealing with the problems of construction will be available.

Schools.—Institutions like Armour Institute the Lewis Institute, the University of Illinois, the one State institution in Illinois of which every citizen may be justly proud, the University of Wisconsin, Purdue, Rose Polyrechule and the University of Chicago have been invited to show exhibits of the work they are doing, and there is every assurance that they will respond promptly and heartly.

Reinforcing Contractors.—Leading contractors in this field, who have been making such wonderful strides in improved methods of construction, will show models, forms, and other features that will be immensely instructive.

Concrete Block Contractors.—The big concerns that make a business of furnishing blocks for construction will have exhibits of their machinery and products.

Architecture.—Here will be one of the valuable features for the home builder, consisting of a display of original designs adapted to block construction and to monolithic work.

Testing Machinery.—The manufacturers of the great machines that scientifically test beams and pillars in the laboratories will show the machines, and tests will probably be made daily.

probably be made daily.

Testing Laboratory.—One of the interesting features will be a laboratory fully equipped and in operation.

Railroad Displays.—The railroads that have been experimenting successfully with cement have been asked to make displays, among them the Alton, which has successfully used the concrete tie; the Pennsylvania, which has experimented with the cement telegraph pole, and the Burlington, which has used concrete beams in its elevated viaducts in Chicago.

Sheet Piling.—The companies making the steel sheet piling will be asked to show their product.

Forms.—This exhibit will be most interesting and of special educational value to all who visit the show. Forms will be set up ready for the placing of concrete and fully explained by experts.

Aggregates.—This department will include limestone screenings, crushed stone and gravel.

Nand.—Here will be shown the various kinds of sand, and their adaptability to various kinds of work will be explained.

A diagram of the floor space will be ready when this number of Rock Products goes to press and will be sent to intending exhibitors on request. The headquarters of the Cement Products Exhibition Company are the New Southern Hotel, Michigan Boulevard and Thirteenth Street, and all inquiries directed there will be promptly answered.

The time chosen for the exposition is particularly felicitous. With the Buffalo event coming the next month it will mean for 1908 the best send-off the industry has ever had. The Chicago event, coming just before the holidays, will also afford visitors an unexcelled opportunity for Christmas shopping. The general arrangements leave nothing to be desired. The mammoth Coliseum will be beautifully decorated for the occasion, and the music provided will be the Readers of Rock Products are urged to make their arrangements early so that nothing may inter-fere with this grand opportunity to study the cement and concrete industries in all their branches and at the same-time visit Chicago in all its winter glory.

## BROWN'S DIRECTORY

## OF AMERICAN GAS COMPANIES

AND

## GAS ENGINEERING AND APPLIANCE CATALOGUE

Statistics of Gas Companies in the United States, Canada and the more important companies of Mexico and South America

Also

Collected, Consolidated and Standardized Catalogued Data of Gas Equipment, Appliances and Supplies

with

Indexes of Both Firms and Products

1922 Edition

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## RITER-CONLEY COMPANY

## STEEL PLATE CONSTRUCTION

Designers, Manufacturers, Erectors of

Coal & Coke Storage Bins Condensers Coal Crushers Galvanized Steel Products Steel Barges

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## **FACILITIES**

During a period of nearly fifty years, the Riter-Conley Company has demonstrated its ability to render satisfactory service in the design, manufacture and erection of steel plate products of all kinds. That this company is so successful is best shown, perhaps, by the oft-repeated patronage it is accorded and by the large number of clients it has the pleasure of serving. The Riter-Conley Company calls your attention to the continued patronage of some of the largest gas companies in the country.

The shops of this Company are equipped with the most modern machinery for the economical and efficient fabricating and handling of steel plate work of all kinds. Goworking conditions assure a high standard of quality and workmanship. Having the largest plate shops in the world

working conditions assure a fight standard of quality and workmanship. Having the largest plate shops in the world and controlling every feature from the receipt of the plain material in its yards to the delivery and erection of the finished product, the Riter-Conley Company is able to turn

nnished product, the Riter-Conley Company is able to turn out the most satisfactory work at a minimum price.

Back of these facilities is a highly efficient engineering department, comprised of men especially trained in each of the departments. These men are fully capable of studying your needs and designing the most economical and efficient steel plate equipment for your use. No matter how complicated the design or how intricate your problem, the Riter-Conley organization is equipped to do the work right.

right.

Whether your requirements are large or small, the Riter-Conley Company is always pleased to quote on them; attention and despatch being given small orders as well as large ones.

## **SPECIFICATIONS**

The designing of the equipment will be made to meet the customer's requirements in accordance with the best practice, or estimates will be furnished from the purchaser's drawings.

To insure satisfactory workmanship, the customer need only specify that the workmanship shall be equal to the best practice in modern plate construction work. By so doing the customer is assured better work in quicker time and at lower prices, because sometimes non-standard requirements cause considerable difficulty in manufacturing and in the end add no particular value to the finished work. However, if special design is called for you can be sure that Riter-Conley will do the work right.

In a great many cases, if the customer can use standard capacities and design, a really appreciable saving in time and cost may be made. Write for Riter-Conley standard capacities and designs for the particular line of equipment which you are interested.

## **GAS HOLDERS**

Riter-Conley design, manufacture and erect gas holders and complete gas plants. Their capability is proved by the oft-repeated patronage this Company is accorded by its large number of clients. The largest gas companies in the country are among them.

The knowledge of Riter-Conley engineers, augmented by the province in designing and executing gas hold.

The knowledge of Riter-Conley engineers, augmented by years of experience in designing and erecting gas holders, makes it possible for Riter-Conley to offer a complete line of standard sized gas holders. Their use assures the customer safe design, quick delivery and low cost. In this connection Riter-Conley calls your especial attention to its erection department. Keeping to schedule in the arcation of large gas holders is a Riter-Conley. in the erection of large gas holders is a Riter-Conley feature.

## **PURIFIERS**

Circular or compartment Purifiers will be designed according to standard practice or the customer's individual specifications. Past performances along this line are a good criterion of future capabilities. Riter-Conley has designed and built many large purifiers.



VIEW OF THE RITER-CONLEY PLANT, LOCATED AT LEETSDALE, PENNSYLVANIA, IN THE AEROPLANE PITTSBURGH DISTRICT. THE LARGEST STEEL PLATE SHOPS IN THE WORLD

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Riter-Conley Co. Steel Construction 139

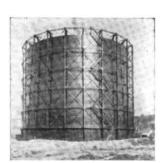


LOWERING BOTTOM OF STEEL WATER TANK ON 10,000,000 Cu. Ft. Gas Holder at East Chicago, Ind. Diam. of Tank, 274' 4"

The Company is also in excellent position to do miscellaneous steel plate work of every description, no matter how complicated the design.

## **TANKS**

Many of the most representative concerns in the oil refining and by-product industries are users of Riter-Conley tanks. Riter-Conley tanks can be found in most oil fields throughout the world. Furnished in standard or special sizes from 500 to 80,000-bar-



sizes from 500 to 80,000-parrel capacity, these tanks represent the most modern design and the highest quality of workmanship. Order standard sizes. They cost less and can be shipped promptly.

promptly.

The Riter-Conley Company is also prepared to design, manufacture and erect steel tanks of special construction and for special purposes, such as storing all kinds of liquids, including chemicals.

## TRANSMISSION TOWERS

This Company also designs, manufactures and erects steel transmission towers of all types and sizes. In connection with this work, a hot galvanizing shop, which is one of the most modern in the country, is maintained. In a recent dip test made in the standard copper sulphate solution, Riter-Conley hot galvanized samples stood ten dips of one minute each—two and one-half times more than required by the standard specifications.

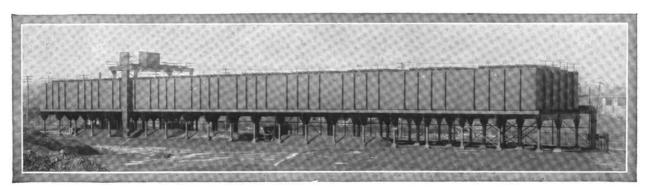
The Riter-Conley Company would be pleased to quote on your next requirements for any of the above equipment; or to supply further information on products in which you are interested.

Send for free descriptive booklet illustrating other steel plate products which can be furnished. Ask for booklet No. P-307.



## STANDARD SIZES—OIL STORAGE TANKS

Capacity	Diameter	Height
80,000 Bbl.	140′ 0″	30′ 0″
80,000 "	120′ 0″	40′ 0″
73,000 "	114′ 7″	40′ 4″
64,000 "	114′ 7″	35′ 4″
55,000 "	$\bar{1}\bar{1}\bar{4}'\bar{7}''$	30′ 4″
37,500 "	94' 6"	30' 6"
35,000 "	95′ 51⁄2″	28′ 71/2″
30,000 "	85′ 0″	30′ 3½″
25,000 "	85′ 0″	25′ 6″
20,000 "	77′ 0″	25′ 0″
15,000 "	66′ Ŏ″	25′ 0″
10,000 "	55′ 0″	25′ 3 <b>%</b> ″
5,000 "	40′ 0″	22' 6"
4,000 "	35′ 0″	24' 0"
3,000 "	30′ 0″	24' 0"
2,500 "	30′ 0″	20′ 0″
2,000	30 0 30′ 0″	
<b>2,000</b>		16′ 0″
1,000	25′ 0″	17′ 2″
1,000	22′ 0″	15′ 0″
500 "	20′ 0″	10′ 0″



10 COMPARTMENT GAS PURIFIER, BUILT FOR DETROIT CITY GAS Co., DETROIT, MICH.