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The attention of every reader is directed to *The Editors' Page*—page 4 of the advertising section (the second page inside this cover.)

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Three minutes devoted to this page will mean more time saved.

A Concrete Arch Bridge at the San Diego Exposition—Beautiful and Permanent

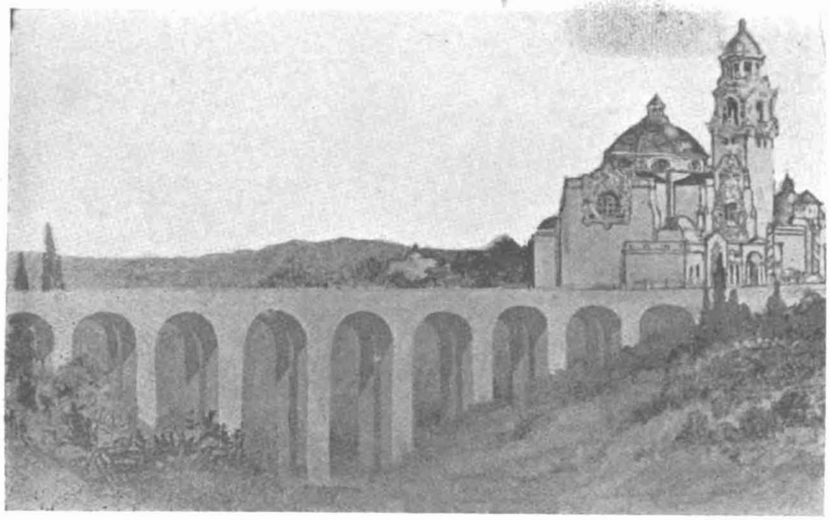


Fig. 1—Architect's Perspective of the Completed Bridge

A combination of beautiful but simple architecture, and a wonderfully instructive revelation of things that man is doing and how he is doing them, how he lives, and how he earns his livelihood, with striking comparisons of the difference between human aspirations and processes used in this and in bygone generations, will make the San Diego exposition in 1915 different, and the visitor will find much of interest, pleasure, instruction and inspiration. The California State building, the Ethnology building, the Puente Espanol, the great bridge over Cabrillo Canon forming the west entrance to the grounds, are of reinforced concrete. Of these structures the most striking is the Puente Cabrillo. It will be a seven-arch bridge with enclosed beam and girder approaches. At either end there is an earth-filled retaining wall. These walls are of the "box" type, the sides being reinforced slabs 12″ thick tied together with steel rods bedded in concrete. The end wall of this section is of the buttress type. The two buttresses serve not only to take the overturning thrust of the earth fill, but also to carry the ends of the concrete girders of the approach spans.

STRUCTURAL FEATURES OF THE BRIDGE

The east approach consists of two roadway girders, 24′ c.-c., each 2′ wide x 4′ deep, and 144′ long, supported by columns 24′ c.-c., and two smaller girders at the edge of the sidewalk, with transverse floor beams 8′ c.-c., carrying the floor slabs. The parapet wall along this section is carried to the ground, completely enclosing the girders and the supporting columns. The west approach is a similar section 72′ long.

The bold and unusual features of this bridge are in the section between the two approaches. To the casual observer, the structure will have seven arches each of 56-ft. span with piers 12′ wide. A closer inspection, however, will reveal expansion joints at the crown of each arch. This design limits the effect of temperature changes to the portions between the crowns of adjacent arches. To do this the bridge was designed not as a series of elastic arches, but as a series of balanced cantilevers resting on the piers.

The roadway slab is carried on transverse floor beams and the sidewalk slab on 6-in. diaphragms which also tie the roadway and the sidewalk cantilevers together.

The roadway cantilevers rest on reinforced columns. The sidewalk cantilevers are carried to the foundations as a reinforced section 15″ wide and 12′ long.

To stiffen the structure and more completely to tie the roadway and the sidewalk cantilevers together, a 6-in. soffit is indicated between the roadway and the sidewalk cantilevers. The pier is 41′ 8″ wide but at this section is divided into two parts, which are connected by a transverse arch. The piers below this section are stiffened by horizontal diaphragms 8″ thick and 15′ c.-c.

The reinforcing of the 6-in. and 8-in. diaphragms consists of a double system of diagonals, usually of ½-in.

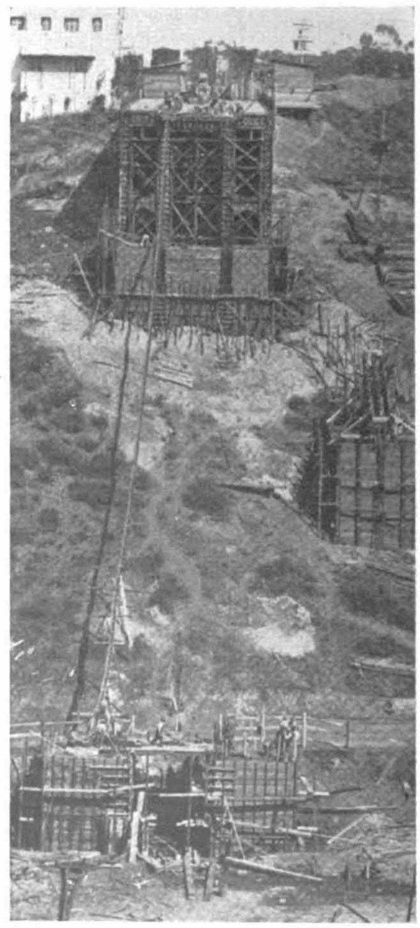


Fig. 2—Preliminary Work at the East Approach of the San Diego Bridge

In the foreground is shown the work in some of the central piers. At this time concrete was being chuted from the mixer at the east approach, shown in the background. This plant is shown in the center of Fig. 6. The bins for holding sand and stone for the main mixing plant are shown at the right. Note the diagonal reinforcing in the face of the pier wall

rods spaced 24″ c.-c. The floor slabs are reinforced with Kahn shear bars, floor beams and girders are reinforced with ¾-in. bars and 1-in. bars. All steel for the bridge is being furnished by the

FIG. 4—GENERAL VIEW OF "PUENTE CABRILLA" UNDER CONSTRUCTION AT THE SAN DIEGO EXPOSITION. AT THE EXTREME LEFT IS SHOWN THE GRAVITY TOWER

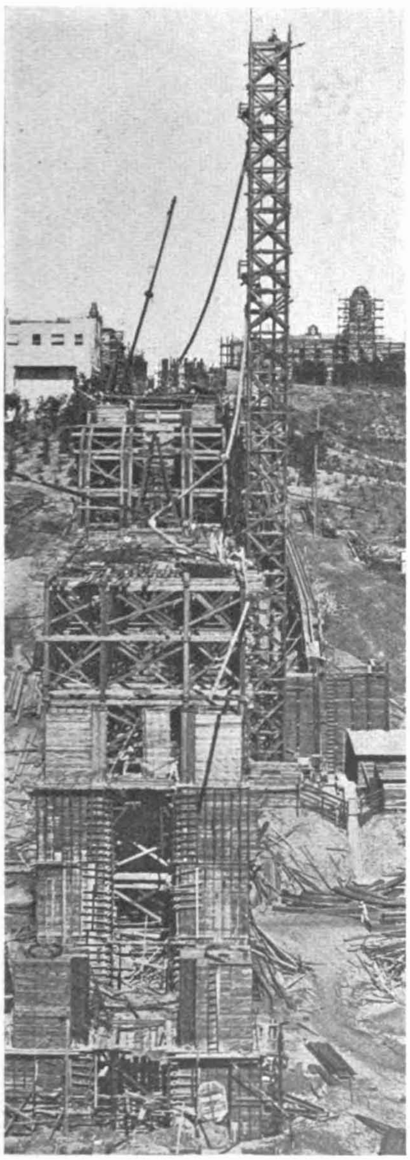


FIG. 3—THIS SHOWS VERY MUCH THE SAME VIEW AS FIG. 2, WITH THE WORK FURTHER ADVANCED

In this view the central tower for handling concrete has been built and is in operation. Work has been begun on the intermediate piers

Trussed Concrete Steel Co., Detroit. There will be used in the construction of this bridge 7,700 cu. yds. of concrete and 450 tons of steel.

CONSTRUCTION METHODS

The necessity for economy in costs necessitated the introduction of automatic methods as far as possible. In handling the materials for the mixture and the concrete after mixing, a system of chutes was devised, supplemented by a hoist at a central point from which to pour the entire structure.

Auto trucks bring the sand, rock and cement to a dump bin on the end of the east abutment. Two chutes carry the sand and broken rock to separate bins in one structure at the base of the center pier. The cement is also stored here. The bins open by a gate at the base operated by a lever that raises the gate to each bin and admits the proper amount of sand, rock and cement to a common hopper which in turn dumps the material into a 30-cu. ft. mixer, the water being supplied from a pipe let into the mixer itself. The mixer dumps with a lever into a hoist or "skip" operated in the 200-ft. scaffold built to carry the hoist with its lead, at the rate of 100′ per sec. The skip dumps automatically into a hopper at the required elevation in the scaffold and the mixture falls into a sheet iron chute suspended on a ½-in. cable, the chute leading to that portion of the structure at which it is desired to dump the mixture.

Two men handle the materials and the mixer at the bottom of the scaffold. One man operates the hoist-

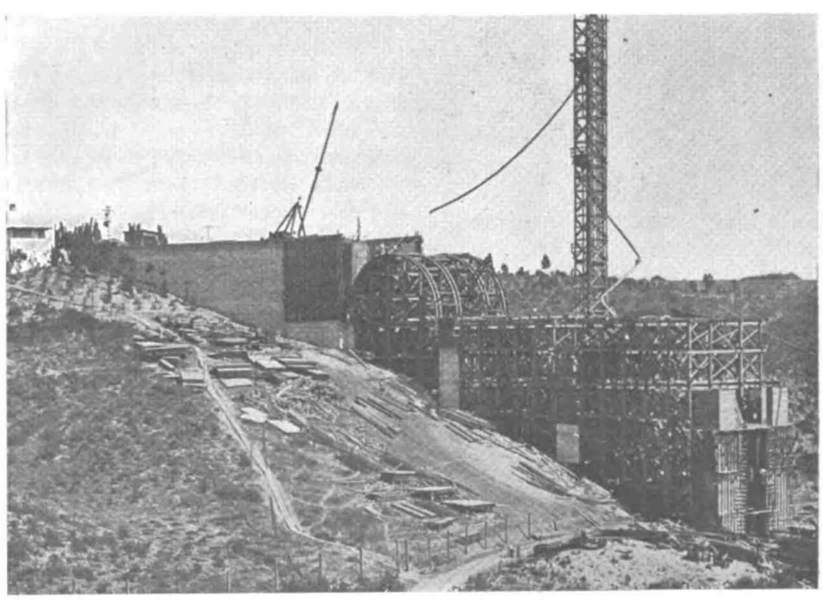


FIG. 5—DETAIL VIEW OF THE EAST APPROACH

This shows in detail the walled-in approach span

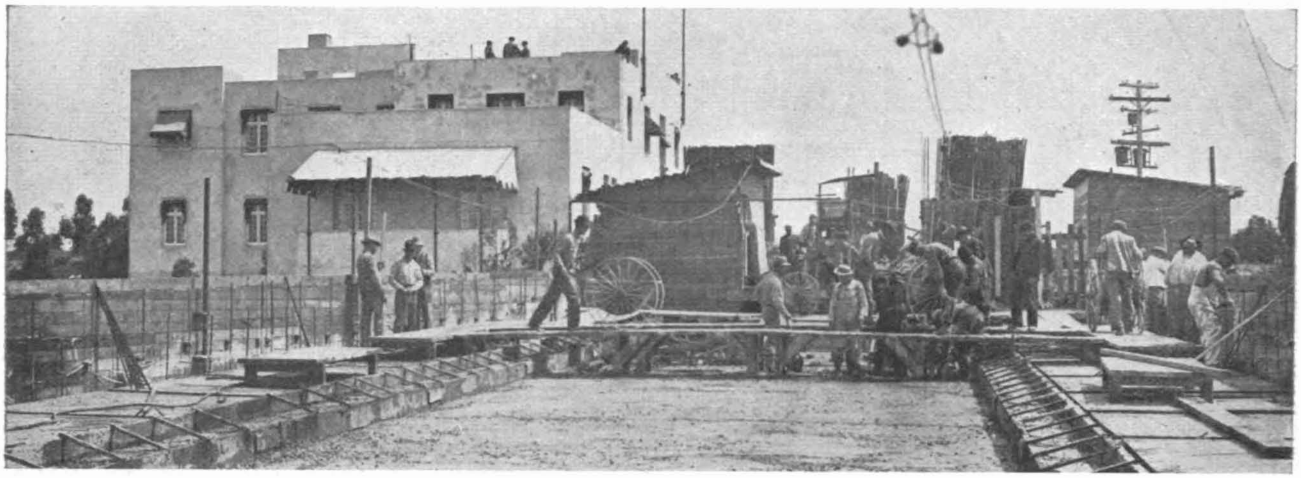


FIG. 6—RUNNING THE BRIDGE FLOOR ON THE SAN DIEGO WORK

This is a detail view of the east approach. Of special interest is the use of sectional platform runways for the concrete buggies

ing machinery. One man attends the hopper at the top of the lift. Tampers attend the outflow.

With this device a batch is placed every 2 min. The segments of the cantilevers require 30 hrs. of continuous pouring. All of the work of designing and constructing the exposition's many structures is being done by the Division of Works,—Frank P. Allen, Jr., Dir. All construction work is being carried on by force accounts.

OTHER CONCRETE STRUCTURES

Many other permanent structures planned by the exposition will be built of concrete. The California building at the east end of the bridge, with its tower rising 180′ above the level of the bridge floor, will be built of reinforced concrete.

Concrete is being used in the construction of the sanitary and the storm water sewer systems as being the most economical material for this purpose.

An Interesting Water Tower Near York, England

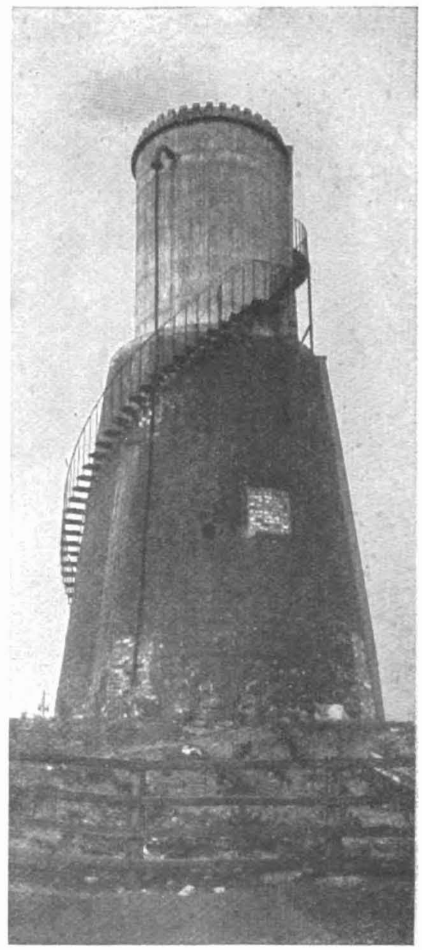
The accompanying illustration shows an unusual type of water reservoir constructed by the Yorkshire Hennebique Contracting Co., Ltd., Leeds, Eng., near York, from the designs of L. G. Mouchel & Partners.

The object of the structure is to provide for the storage of some 25,000 gals. of water to be used as domestic supplies and for farm and stable purposes. The main portion of the tower was formerly part of a windmill, but is now lined with reinforced concrete so as to form a perfectly water-tight chamber. The upper portion is a cylindrical chamber built entirely of reinforced concrete, the upper and the lower reservoir being separated by a floor of the same material.

Water is delivered by pumps into the upper or high pressure reservoir, the capacity of which is 9,000 gals., and the lower reservoir, capable of containing 16,000 gals., is served by an overflow pipe fitted in the center of the chamber above. Each compartment is provided with a 4-in. delivery pipe and valve so that supplies can be drawn off as required. The top of the upper reservoir is covered by a reinforced concrete flat roof, to which access is gained by means of the spiral stairway shown in the illustration.

Standing on high ground and rising to the height of 30′, the tower of the old windmill appeared to offer an excellent and ready-made support for water storage tanks. The original intention probably was simply to install cast iron tanks on the top of the tower after removal of the mill fittings, and that the proprietor afterwards decided upon the adoption of reinforced concrete as a more economical material, of greater durability than metal, and offering the further advantage that being quite unaffected by corrosion it would require no painting or maintenance charges of any kind.

The design prepared by Mouchel & Partners exhibits features of decided originality, for instead of merely utilizing the old masonry tower as a support it provided, as already stated, for converting the interior into a low-pressure reservoir, thereby effecting a very considerable reduction in the cost of the works.



AN OLD WINDMILL NEAR YORK, ENG., CONVERTED INTO A MODERN REINFORCED CONCRETE WATER TOWER

A reinforced concrete floor at ground level forms the basis for a thin monolithic casing of reinforced concrete carried around the interior walls and covered by a circular floor, upon which is built the high-pressure cylindrical reservoir with walls 6″ thick, rising to the further height of 18′, and finished by a castellated parapet 3′ above the flat roof.