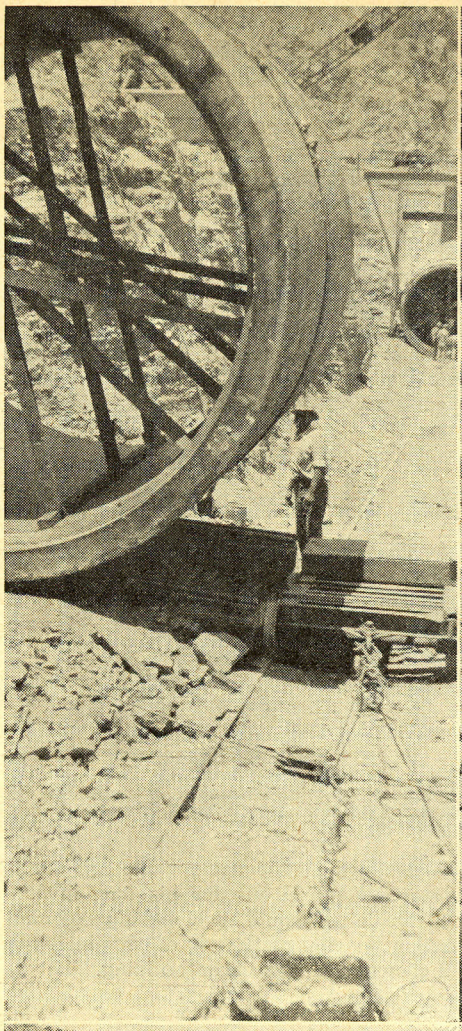
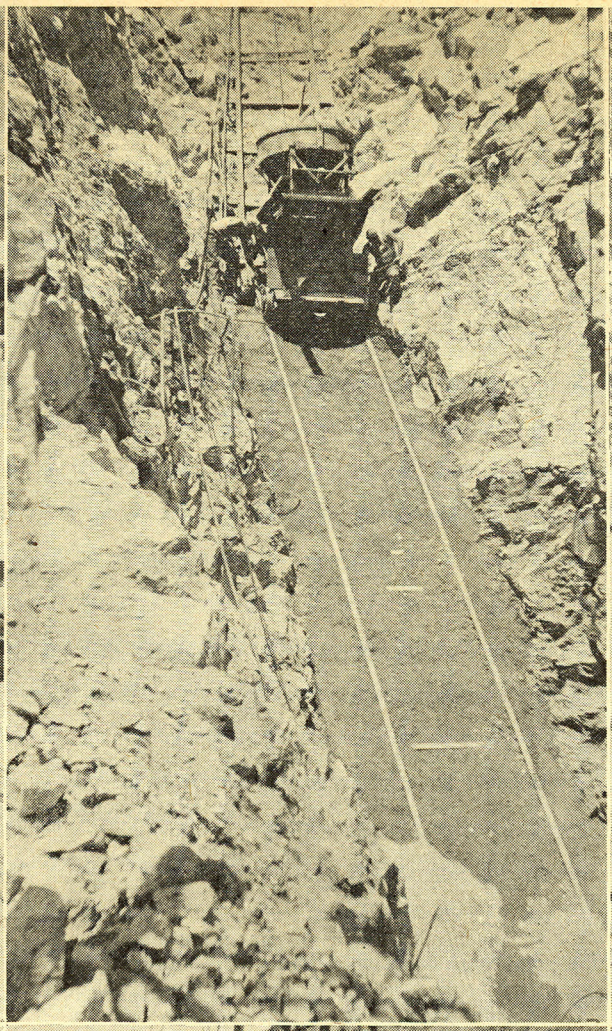
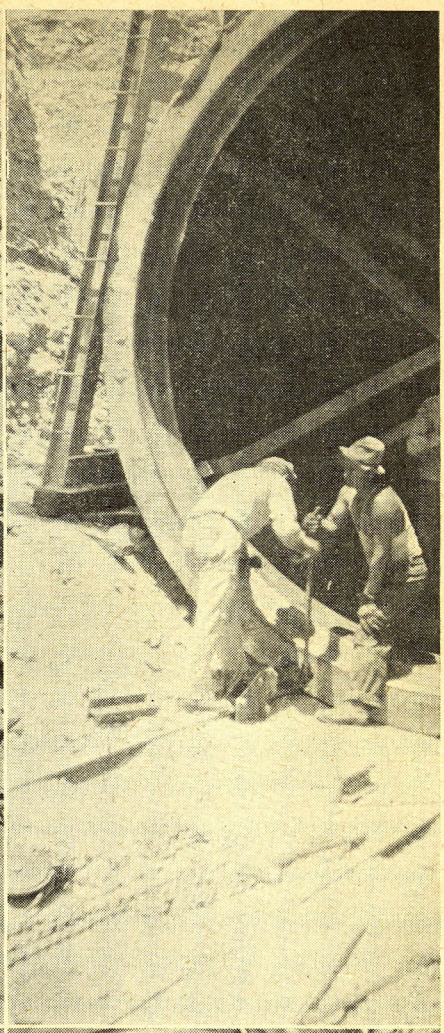
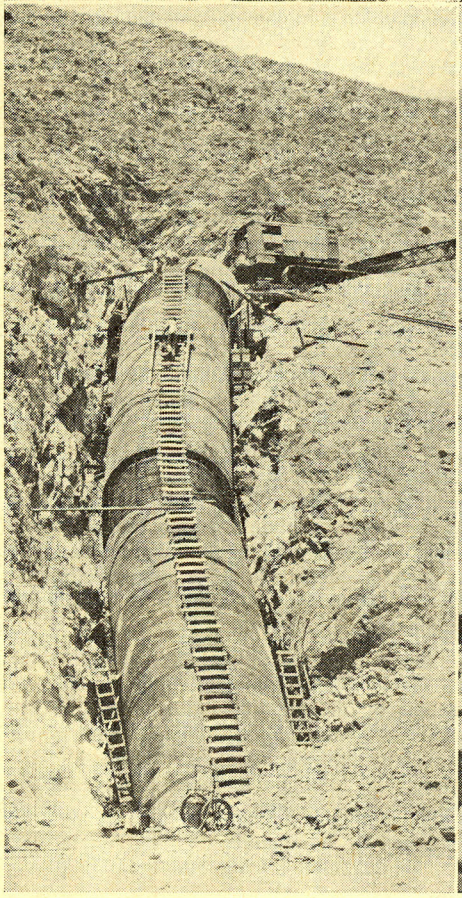
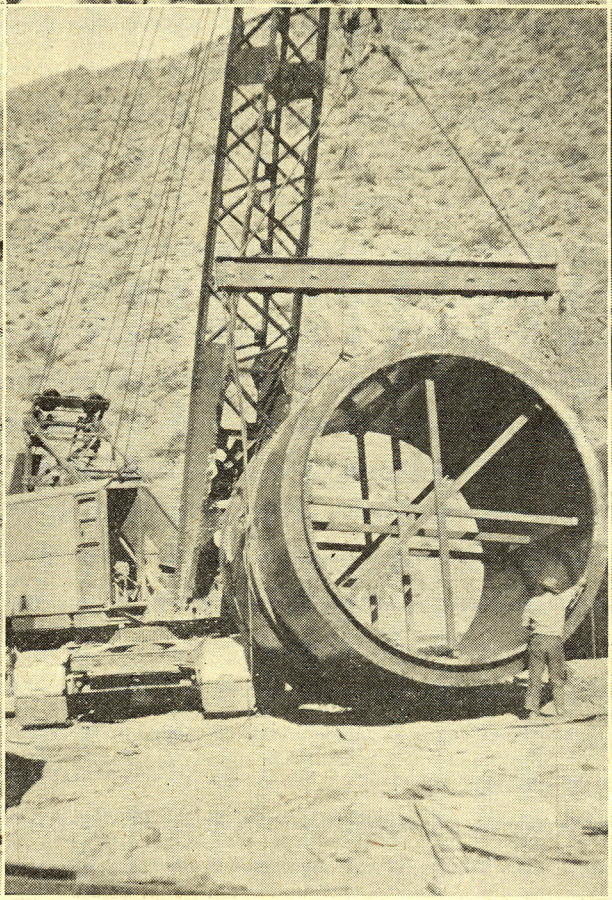
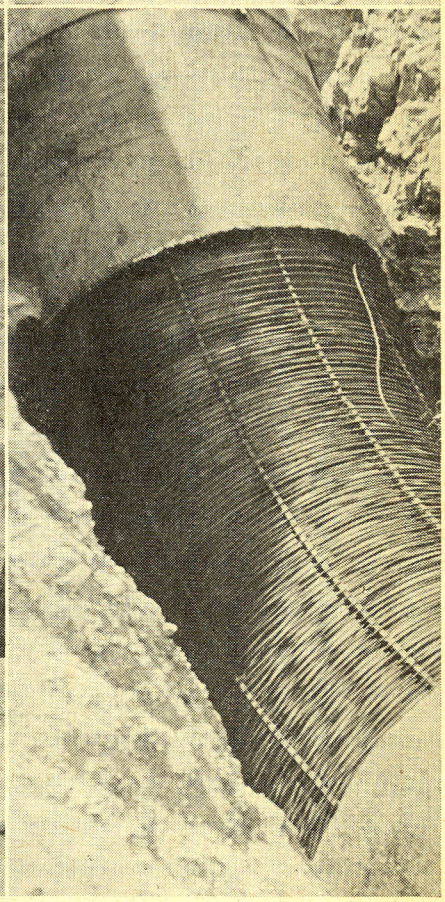






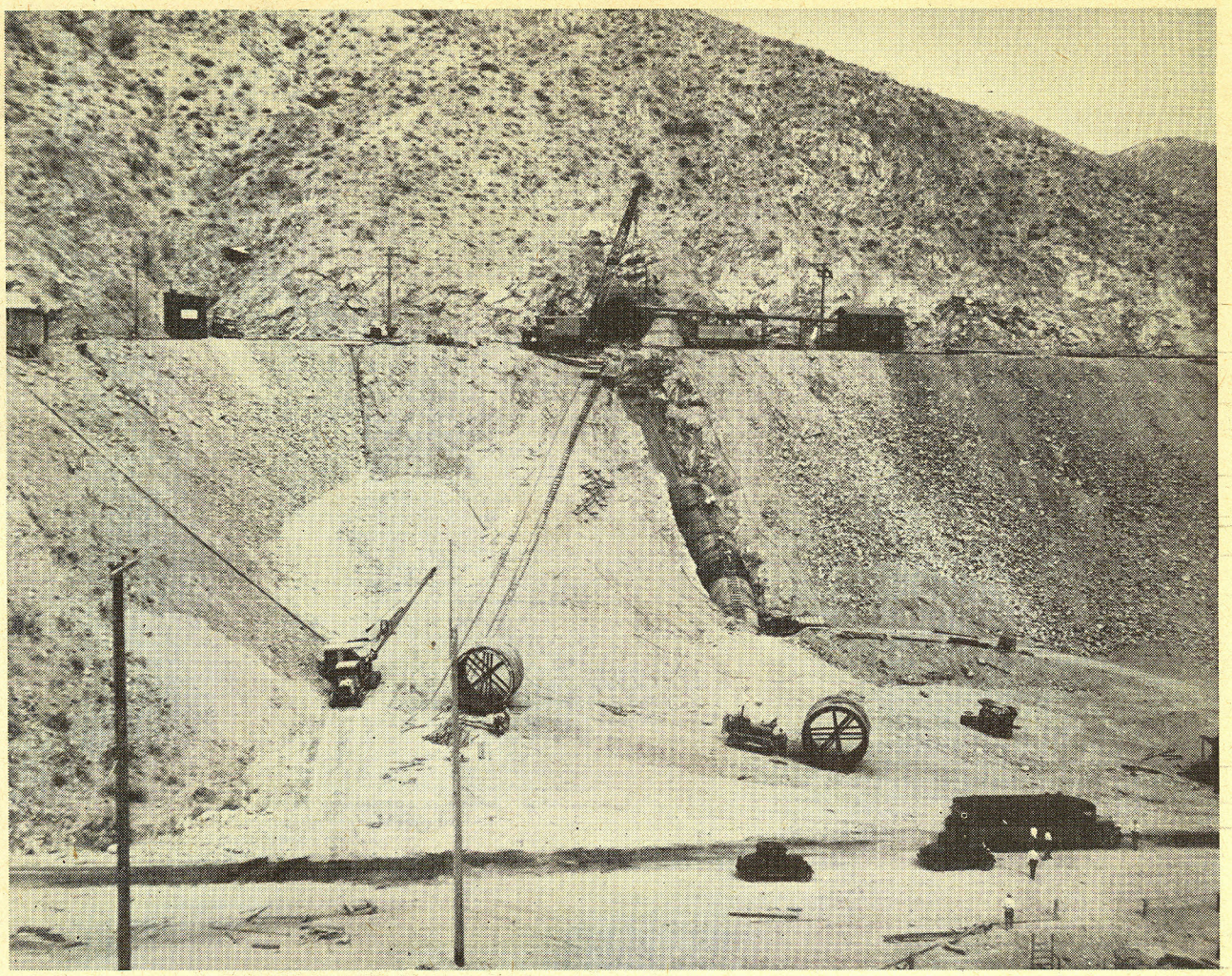






Pictures showing operations in laying 12-ft. diameter precast reinforced concrete pipe for Little Morongo siphon on Colorado River Aqueduct. At the top—Left, rolling big cylinder onto car in trench in bottom of canyon preparatory to moving it into place. Middle, concreting in rails in slope trenches. Pipe was lowered on these rails. set to grade. Concrete hopper was set on platform carried by car controlled on incline by cable. Right, telescoping of pipe at joints accomplished by 25-ton jacks operated against brackets attached to rails.

At the bottom—Left, part of siphon laid in slope trench. Reinforcement shown as set for vertical bends which were cast in place. Middle, belt sling used to tip over big pipe handled by Link-Belt K 55 crane. Right, special bend cast in place showing detail of exterior cages of rod reinforcement.



● *General view of the Little Morongo siphon on Colorado River Aqueduct under construction. Portal of tunnel is seen at top of siphon. Tractor with cable rolled 40-ton sections of pipe 12 ft. diameter to track on left where Universal crane rolled it onto car. Pipe was pulled up this track with special sling attached to cable run through sheaves fastened to deadman at top of siphon and operated by steam hoist in bottom of canyon at right. Link-Belt K 55 crane at top of track swings pipe off car onto rails in trench on which it is lowered into place. Tracks for the tunnel cars are laid in the roadway cut into the side of the mountain on either side at the tunnel portal.*

Siphon of Largest Concrete Pipe Ever Made Laid On Aqueduct

Novel Methods Used in Handling Huge Cylinders Accuracy in Manufacture Aids Laying of Pipe

Laying the 12-ft. diameter precast reinforced concrete Lock Joint pipe for the Little Morongo siphon on the Colorado River Aqueduct has been completed and it now awaits the final tests of its hydraulic properties by the engineers of the Metropolitan Water District of Southern California. A full description of the manufacture of the steel cages for reinforcement of the pipe was published in Southwest Builder and Contractor, issue of March 16, 1934. At that time the steel cages were being delivered at the site 7 miles north of Garnet, Riverside county, preparatory to casting the pipe. The siphon is 720 ft. in length and will operate under a head of 115 ft. For its construction 60 sections of precast pipe, each 12 ft. in length with a shell 12 in. thick, were required, exclusive of the vertical bends which were cast in place.

This is the largest precast pipe ever made and as each section weighed 40 tons the handling and laying of the pipe, particularly on the steep slopes of the canyon with a maximum of 45 per cent on the west end and 37½ per cent on the east end, presented unusual problems which were carefully studied for a practical and economical solution. The work was carried out as originally planned with some minor changes which were found to be advisable as work progressed. In spite of the unusual difficulties the laying of the siphon was completed without injury to either workmen or pipe. All the huge pipe sections fit together perfectly and the lead caulked joints provide what is equivalent to an expansion joint every 12 feet assuring constant adjustment to the extreme temperature changes in the desert region traversed by the aqueduct.

All pipe was cast on the floor of the canyon adjacent to the line of the siphon with forms especially designed for the job. Cement was furnished by the District and a very good quality of aggregates was obtained at the site. The contractors had only to screen the material, which was very clean and did not require washing, to provide the necessary grades of rock and sand. Only two grades of rock were used, one with a maximum of ¾ in. and the other with a maximum of 1½ in. Concrete was designed for 3500 lbs. compressive strength at 28 days and the test specimens indicated an average strength of about 3750 lbs. Curing was started with a water spray but later on account of the limited available water supply the pipe was sprayed first on the outside and then on the inside with a coal tar solution which produced a splendid seal coat allowing the concrete to retain the necessary moisture for curing.

The contractors' aggregate and mixing plant consisted of a Symons screen, a Butler steel bin and weighing hopper and a Koehring paver. Pipe tremies were used in placing concrete in the forms. The test for workability was a 2-in. slump for cylinders and 1½ in. to 1¼ in. on the flow table. Pipe sections were allowed to stand on the base rings for three days after which they were lifted off with a band sling by a Link-Belt K-55 crane and set in a sand bed. All of the pipe had cured 30 days or more before it was laid.

Across the floor of the canyon the pipe was placed in a trench excavated to a depth of 24 ft. by the Link-Belt K-55 equipped with a dragline. Ramps were cut in the sides of the trench and the pipe sections were rolled down these onto cars which ran on 60-lb. steel rails laid with a 4½-ft. gauge. These rails were supported by steel ties and were concreted in place, being set to the exact grade of the siphon as a guide for placing the pipe in position.

For lifting the pipe off the car and lowering it into place a steel framed gantry was designed. This was equipped with a multiple-line lifting beam which was operated by the Link Belt K-55 alongside the trench. It was originally planned to construct a concrete ribbon along each side of the track

to carry the gantry but this was found to be unnecessary, and the gantry was set directly on the ground, being lifted and moved into place as needed by the Link-Belt crane.

A cable sling attached to the multiple line lifting beam on the gantry was used to lift the pipe off the car. Prior to placing the pipe notches were burned out of the rails at the proper locations to take the sling and allow it to be removed after the pipe rested on the steel rails. Telescoping of the bell and spigot ends of the pipe was accomplished by two 25-ton jacks operated against brackets attached to the rails. In spite of the fact there was only 3/32 in. in diameter difference between the inside of the bells and the outside of the spigots, there was no difficulty in fitting the sections together, because of the accuracy with which the steel joint rings had been made and the perfect grade of the rails on which they were laid.

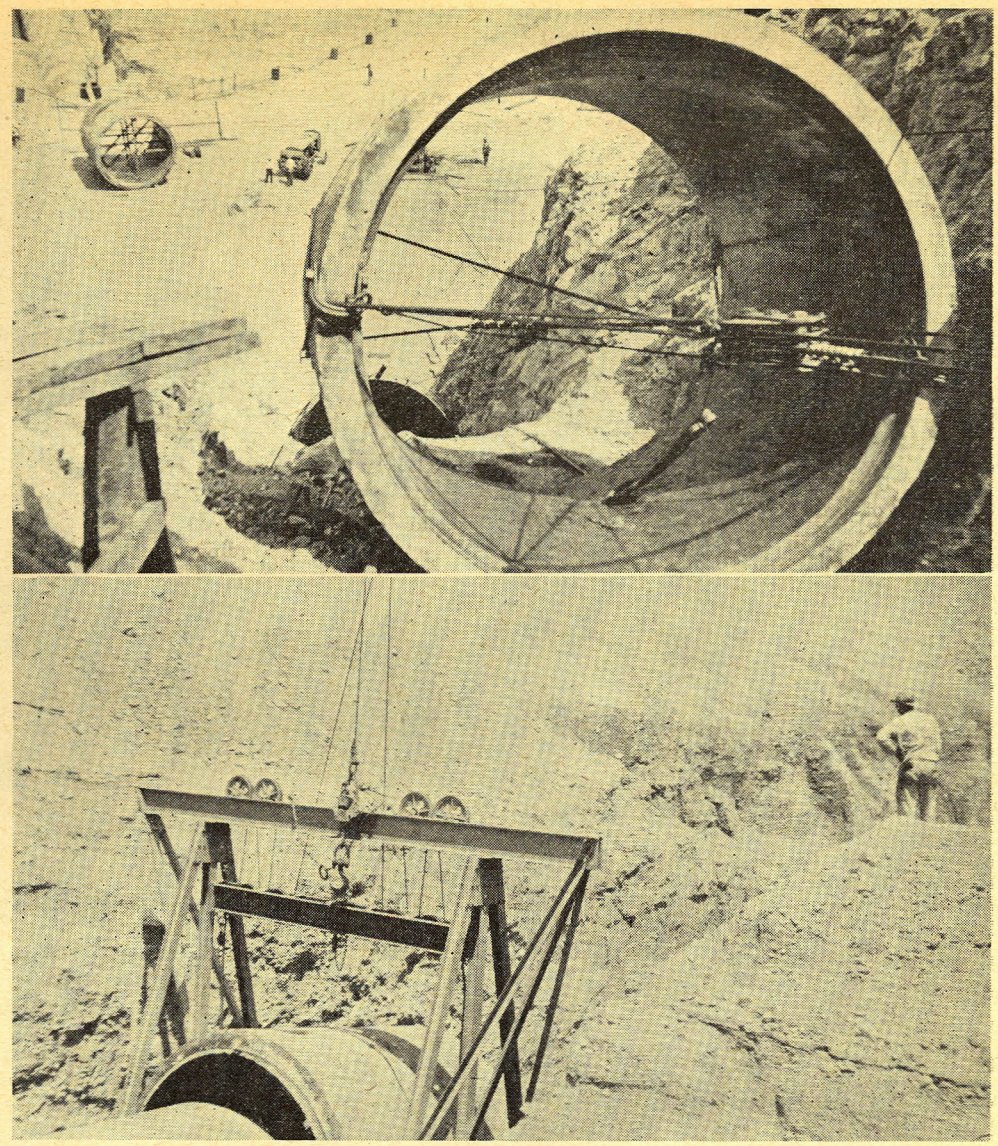
Trenches for the siphon on the canyon slopes were blasted out of hard rock. The rail sections were accurately bent to fit the alignment and grade and were held to gauge by welded-on steel ties. For concreting in the rails a platform to carry a concrete hopper was constructed on a car which was lowered and raised on the inclined track by cable.

Sections of pipe were placed on the slopes above the canyon floor by lowering them on rails from a bench cut into the side of the canyon at the portal of the tunnel on either side. This made it necessary to haul the pipe up the slope to the upper end of the siphon. This was done with a steel cable hitched to the pipe which was placed on a car running on a track laid diagonally on the slope so that it converged at the top with the line of the siphon. The pipe was rolled over the canyon floor to the bottom of the track by a tractor taking up a cable hitched to a dead man. A Universal crane with a hoist line rolled the pipe onto the car. The cable which hauled the pipe up the slope ran through sheaves anchored to a deadman at the upper end of the siphon and was operated from steam hoist on the floor of the canyon on the opposite side of the siphon.

A special sling was designed to attach the hoist line to the pipe taking the pull off the car. At the top of the incline the pipe was picked up by the Link-Belt K-55 crane and swung over onto the rails in the slope trench. The pipe was then allowed to slide down the rails to within about 12 in. of the pipe already in place where it was blocked while the special sling was removed. The cable was then attached to clevices on the bell end of the pipe, the blocks were removed and the section slid into place. The bolts for the clevices extended through the shell and steel lining of the pipe and the hole was closed by welding in a piece of steel and grouting the hole in the concrete.

Changes in alignment were made by special bends which consisted of a steel cylinder with joint rings attached and two exterior cages of rod reinforcement. These bends were finished with an exterior coating of concrete and a 2-in. gunite interior lining troweled to a smooth surface.

After the pipe had been laid, a concrete cradle was poured which supported the lower 90 degrees of the pipe. The lead joint gaskets were then given a preliminary caulking and the exterior joint between sections filled with grout. The trench was then backfilled. After the lead gaskets had been given a second and third caulking, the interior space at the joints was gunited full of mortar and finished off smooth and flush with the interior of the pipe. Additional joint rings are provided, which will be cast into the transition sections at either tunnel portal, when these are poured.



● *Picture at top shows 12-ft. diameter precast pipe being lowered into place on rails in slope trench for Little Morongo siphon. This picture shows special sling used to haul pipe up track to top of siphon and the clevices to which the cable was hitched to lower it into place after the sling was removed. Bottom, structural steel gantry with its multiple line lifting beam used to lift pipe off the car in the trench and lower it in place on the rails.*

The work was done under the immediate supervision of R. B. Diemer, division engineer for the Metropolitan Water District, of which F. E. Weymouth is chief engineer and Julian Hinds, designing engineer.

The United Concrete Pipe Corporation and the American Concrete & Steel Pipe Co. were the contractors, H. H. Jenkins, vice president of the latter company being in charge. C. A. Meade was superintendent on the job.

There will be 150 siphons aggregating 27 miles in length on the equeduct. They will be designed with two barrels, each 12 ft. in diameter but only one barrel with full capacity transition sections will be constructed at the outset. The second barrel will be built when needed. The Little Morongo precast pipe siphon and the Fan Hill monolithic reinforced concrete siphon, both now completed, will furnish the basis for the district's decision as to the type of construction for the remaining siphons.

Plumbing Contractors' Code Administration Budget

The Code Authority for the Plumbing Contracting Division of the Construction Industry has made application to the Administrator for approval of its budget for, and of the basis of contribution by members of the industry to, the expense of administering the code for the period from June 4, 1934, to June 30, 1935.

The total amount of the budget for the period is $1,583,323, apportioned as follows:

	Divisional Headquarters	State Executives
Salaries	$ 44,763	$143,325
Office Expense	53,550	236,250
General Expense	70,800	119,375
TOTAL	$169,113	$498,950

State committees— Office expense, $63,700; general expense, $286,560.

Local committees—General expense, $565,000.

The basis of contribution proposed is as follows:

One-fourth of 1% of a member's gross sales billed; the assessment to cover the period from June 4, 1934, to June 30, 1935, and be based on the gross sales billed during the twelve months ended December 31, 1933.