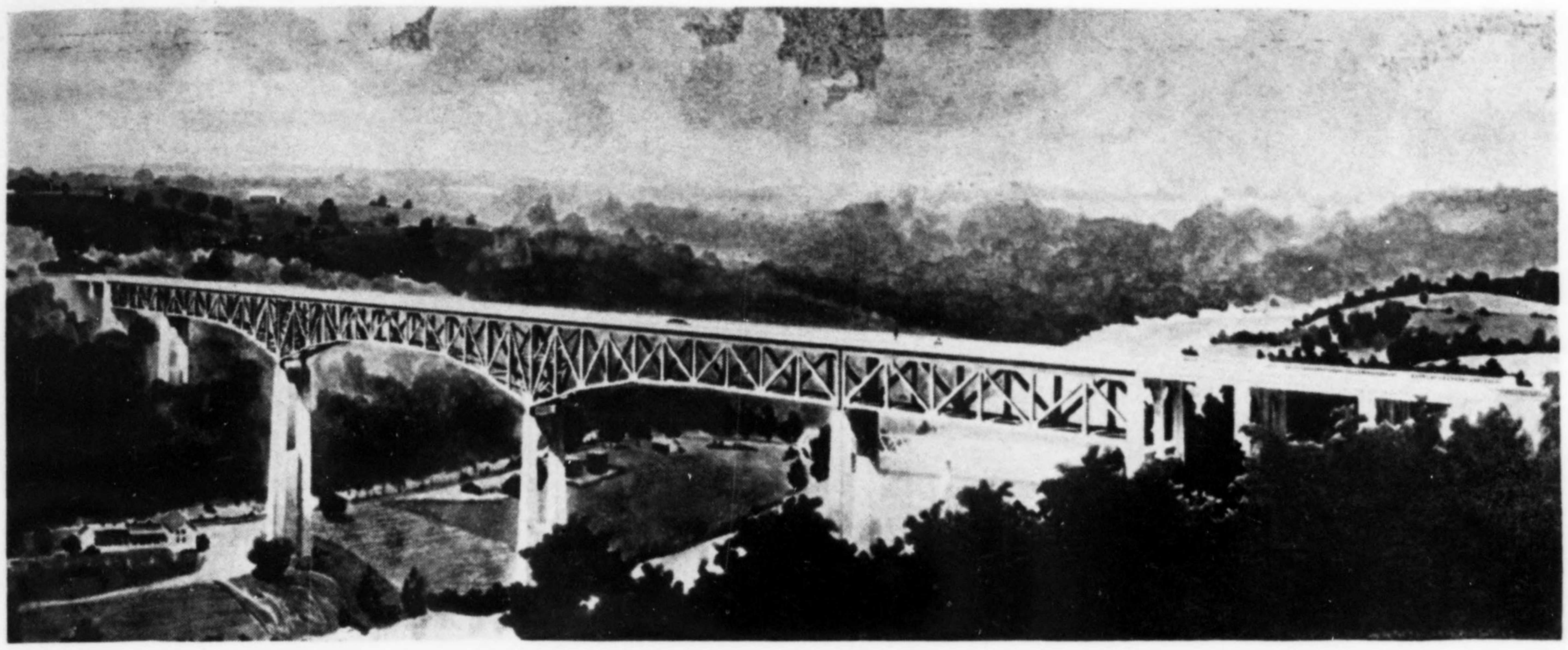

Fig. 1. The new bridge to carry U.S. Route 25 over the Kentucky River will have its deck 250 ft. above water level.

Kentucky Builds a High Bridge

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Contents in Brief—*Under construction across the Kentucky River is a highway bridge that will be 250 ft. above the water, with a maximum pier height of 198 ft. This pier will be a double column with connecting web wall for the first 90 ft., then two individual columns for 68.5 ft., topped out by a double column joined by a web member for the remaining height of 11 ft. Location and design of piers were based on extensive studies to determine the most satisfactory crossing based on operation and aesthetic requirements. The bridge, which will provide a 26-ft. roadway, will shorten U. S. 25 by 1.50 miles, eliminate six curves and 8,000 ft. of 7-percent grade.*

HIGHEST HIGHWAY BRIDGE east of the Mississippi River will be the new Kentucky River crossing of U. S. 25 at Cleveland, Ky., with a design height of 250 ft. above normal pool level. The structure will replace an existing wrought-iron bridge built in 1869 and eliminate several steep grades and dangerous hairpin curves (Fig. 2). Located in a scenic region of the state and crossing a magnificent gorge, the highway department considered the architectural treatment of the bridge before the structural design was carried out. Final design provides a central portion consisting of a three-span, continuous, Warren deck truss with a 448-ft. center span and 320-ft. side spans (Fig. 4). In addition there will be two 192-ft. simple Warren deck truss spans and six 50-ft., reinforced-concrete spans.

The trusses are to be $22\frac{1}{2}$ ft. center to center, with depths of 60 ft. at the main piers and 30 ft. at the center of the central span. Transverse floorbeams on 32-ft. centers will be used on top of the trusses and the longitudinal stringers are spaced at $5\frac{1}{2}$-ft.

Fig. 2. New crossing will shorten U. S. 25 by 1.5 miles and eliminate several sharp curves. Maximum grade in the vicinity of the crossing will be reduced from 8 to 6 percent.

centers. Permanent, creosoted-timber inspection walks will be placed between the trusses, and these will be at the elevation of the bottom chord members.

A 26-ft. roadway and two 3-ft. sidewalks will be provided by a $7\frac{1}{2}$-in. concrete deck. Principal reinforcing for the deck is to be transverse to the direction of traffic and will consist of two layers of $\frac{5}{8}$-in. round deformed bars on 5-in. centers. Transverse expansion joints on 32-ft. centers through the length of the truss spans will be provided by 24-oz. soft sheet copper and premolded joint filler. Alternate designs have been prepared for a wrought-iron handrail and a reinforced-concrete rail.

Tall piers required

The substructure will be founded on solid limestone rock and the maximum foundation pressure will not exceed 10 tons per sq.ft. The tallest pier (Pier 6—Fig. 5) will be 198 ft. high from bottom of footing to pier cap and its base will be 30x50 ft. The reinforced-concrete structure will be a double column with a connecting web wall for the first 90 ft. above its base, for the next $68\frac{1}{2}$ ft. two individual columns will be used, and then for the remaining height the columns will be joined by a web member. This pier will contain 3,800 cu.yd. of concrete.

The next tallest pier, Pier 5, is 181½ ft. high, while the shortest of the piers for the three-span, continuous-truss, central unit is the 85-ft. Pier 7. All the piers, including those for the approach truss spans, are of similar design. The approximate quantities of materials for the entire bridge will be 2,250 tons of structural carbon steel containing 0.2 percent copper, 600 tons of reinforcing steel, and 12,500 cu.yd. of concrete.

Designed for H-20 loading

The crossing is designed for an H-20 loading in accordance with the 1935 specifications of the American Association of State Highway Officials. In design of the three-span, continuous-truss unit the method followed was that outlined in *Movable and Long Span Steel Bridges* by Hool & Kinne, first edition.

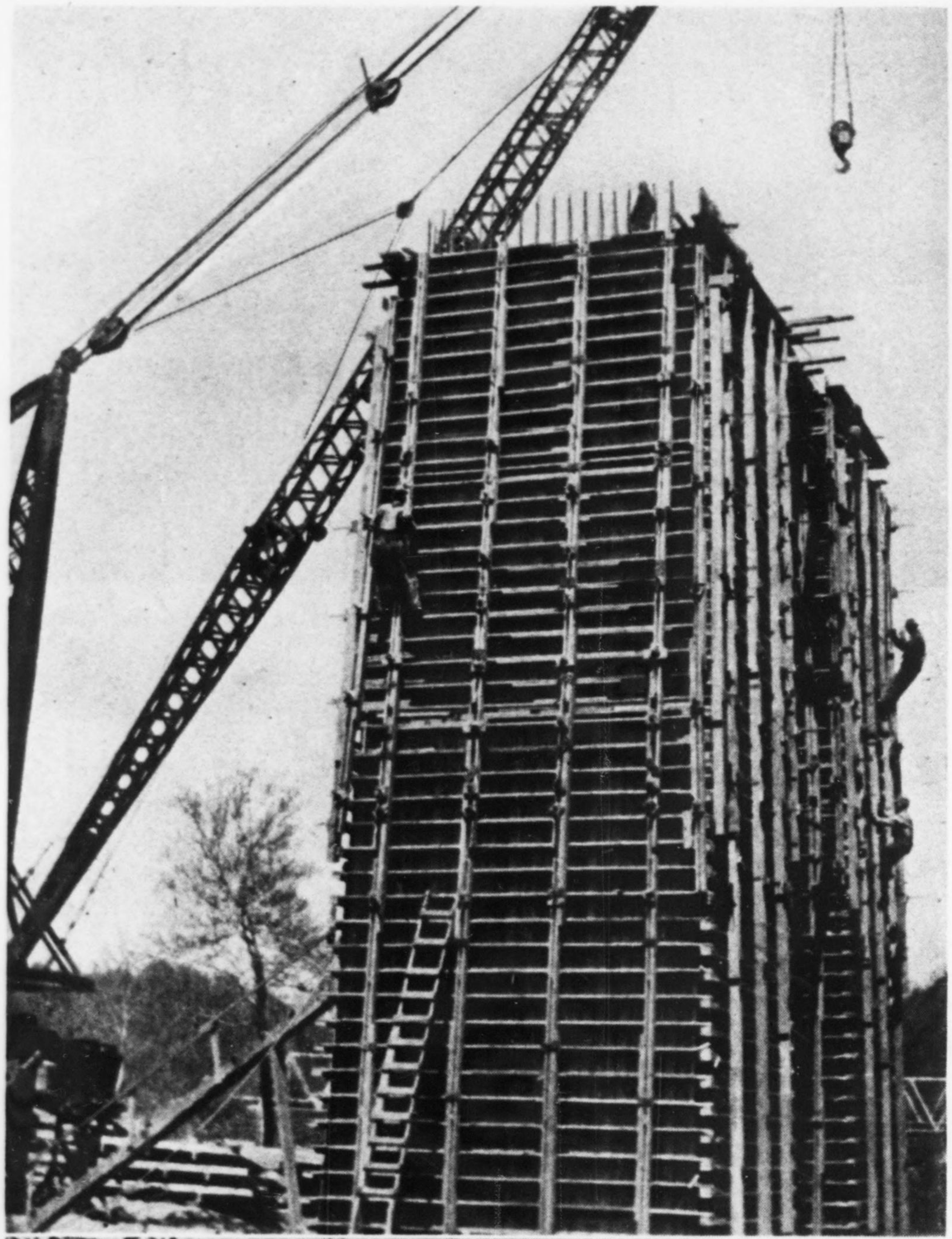
The general contractor will be required to weigh with hydraulic jacks the dead-load reactions of the continuous truss to permit comparison of the calculated and actual forces.

The steel spans will be cambered for dead load only. The calculated deflections were obtained by means of the Williot-Mohr diagram, which indicated an expected 3.6-in. dead-load deflection at the center of the 448-ft. span and 2.2 in. at the center of the 320-ft. side spans. The maximum live-load deflection for the central span is expected to be 1.3 in., while that for the side spans is estimated at 0.8 in.

Construction procedure

The cofferdam for Pier 6 was constructed of 50-ft. steel sheet piling with the three lower tiers of wales and struts of steel and the other tiers of timber. A fault in the hard underlying limestone rock extends over the entire footing area and the rock is in 24-in. thick strata that dip at about an angle of 45 deg.

Two 4-in. pumps kept the cofferdam unwatered and the concrete was placed in the dry by a derrick with a 150-ft. boom supported on timber



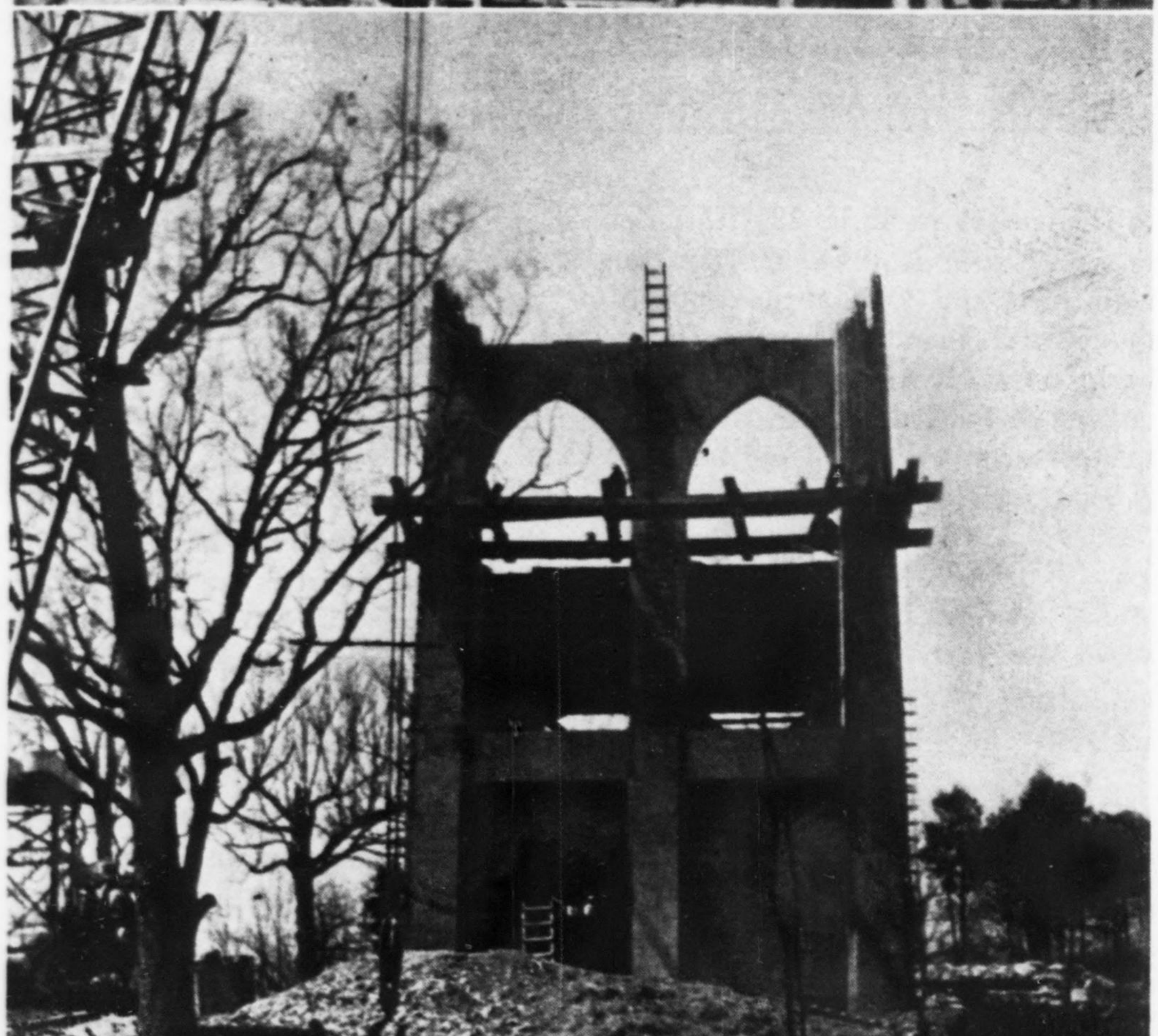


Fig. 3. Forms for the lower part of Pier 6, which will be 198 ft. high, are shown in the upper view. They are set with the 150-ft. boom of a derrick set on high falsework. Details of this pier are shown in Fig. 6. The lower view shows the type of piers, this being Pier 8, one of the shorter piers.

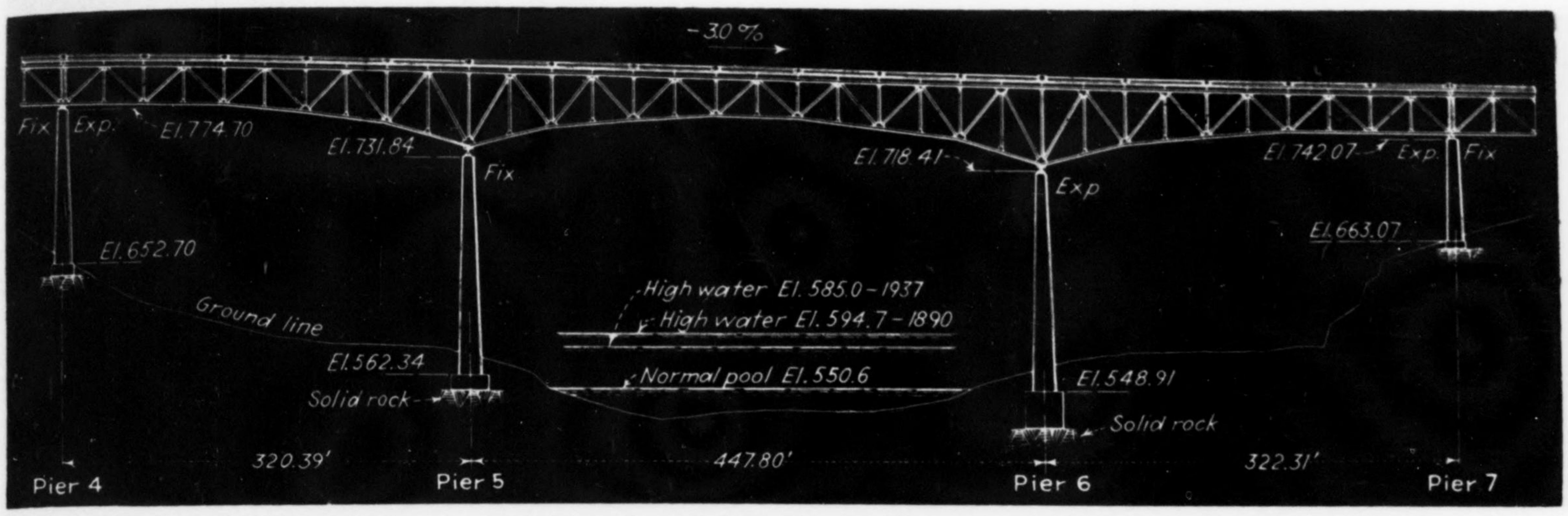


Fig. 4. Central portion of bridge is a three-span continuous truss with a 448-ft. center span and 320-ft. side spans. In addition, there will be two 192-ft. steel spans and six 50-ft., reinforced-concrete and girder units.

piling 10 ft. above the ground. This derrick will be used in placing concrete for the other tall piers.

The bridge's substructure is being built by the Massman Construction Co., Kansas City, Mo., at an estimated cost of $345,800, and the Mount Vernon Bridge Co., Mt. Vernon, Ohio, has a $465,000 contract for fabricating and erecting the steel superstructure. Bids will be opened this summer for construction of the concrete deck and the reinforced-concrete approach spans. The total cost of the bridge will be about $900,000, or $20 per sq.ft. of roadway. Due to the war, no completion date has been set, but the foundation work was 39 percent complete at the end of April.

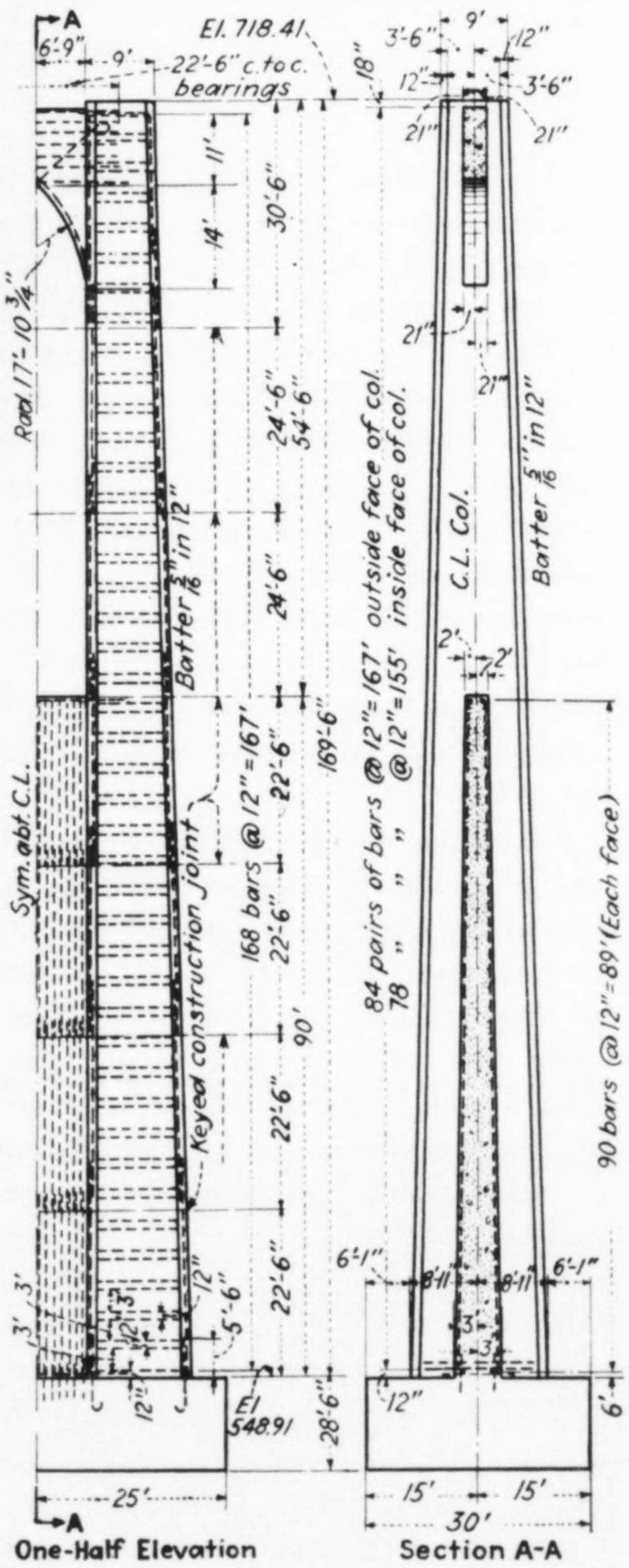


Fig. 5. Pier 6, will be 198 ft. high and will require 3,800 cu.yd. of concrete and 172,000 lb. of reinforcing steel.

Austin Griffith of the Kentucky Department of Highways and his bridge squad designed and prepared plans for the structure under the writer's supervision. J. Lyter Donaldson is commissioner of highways; Thomas H. Cutler, state highway engineer; G. L. Logan, director of construction; H. R. Creal, bridge engineer; R. W. Tripp, chief location engineer; W. W. Pardon, district engineer; and T. J. Hopgood, resident engineer. Mack Galbreath, senior highway engineer for Kentucky, is representing the Public Roads Administration, which is supplying one half of the cost.

Mexico Expands Its Railway System

THE Republic of Mexico now has two railroad projects underway that together total 800 miles of construction, according to the Mexican federal railroad department. The longest is the 465-mile Puerto Mexico-Compeche project in southeastern Mexico. The two terminals are both Atlantic seaports, Puerto Mexico being in the State of Vera Cruz and Campeche being the capital of Campeche State. This line is mountainous construction and is scheduled for completion in 1949.

The second project is 335 miles in length and is in the level desert country of northwest Mexico. This work, known as the Sonora-Baja California line, is scheduled for completion in 1945.

Completed railroads in Mexico total 14,100 miles, including 11,425 miles of standard gage track and 2,675 miles of narrow gage. In all 10,090 miles are operated by the federal government, the remainder being operated as private enterprise.

For new construction, steel rails are imported only when not available from the mills at Monterrey, the capital of Nuevo Leon State in northeastern Mexico. However, considerable of the steel must be imported for the bridges, especially those structures requiring wide plates, as Mexican mills produce no plates wider than 18 in. It is also necessary to important silicon steel members, since this steel is not manufactured commercially in Mexico.

Some indication of the rate of steel importation for railroad work can be gained from the fact that during 1940 the United States supplied 86 tons and a 220-ton shipment was obtained from Germany to complete a 1,460-ton German order. The German steel was for the Marques Bridge on the 80-mi. Caltzontzin-Apatzingen line, which is in southeastern Mexico, and was placed in service early this year. During 1942 some 1,000 tons may be imported from foreign sources.

Locomotives and rolling stock are purchased from manufacturers in the United States.

Federal employees engaged in railroad work include: 126 civil engineers, 28 in the medical service, 2,342 laborers, and 277 miscellaneous employees. Railroad contractors also employ large staffs.