insanitary practice of maintaining considerable areas of stagnant water.

To avoid the difficulties inherent in any proposal for sludge treatment and disposal, the private owners of the sewerage system of San Marcos, Tex., disposed of the sludge on land for a number of years. The plant serves about 6,000 persons and carries an average flow of about 0.35 m.g.d. The excess activated sludge is pumped through an 8-in. cast-iron pipe and distributed on land adjacent to the sewage-works, the lift being 15 ft. Six acres has proved adequate to handle the sludge. It is very probable that less acreage would do in more arid sections or if the land were more intensively worked.

The land is plowed in furrows and the sludge is allowed to flow into successive sets of furrows on successive days. When a set of furrows has been in use for one day it is allowed to dry, after which the surface crust is broken by a single plowing down the center of the furrow and the land is again ready for use.

This method has avoided nuisance and odor, which was especially important, as the plant was located near the center of town and immediately above a swimming resort in the stream receiving the effluent—which is treated with excess chlorine during swimming season. (See "Sewage Treatment in the United States, Report on the Study of Fifteen Representative Sewage-Treatment Plants," U. S. Public Health Service, Public Health Bulletin No. 132, April, 1924, Revision.) The method has furthermore proved relatively inexpensive.

About twenty cities in the semi-arid section of Texas employ broad irrigation for disposal of their city sewage. This involves application of partly settled sewage onto land. The success attended on this simple method of sewage disposal has led to its further adoption as a method of handling sludges.

Record Construction on New Ohio River Bridge

By Ernest E. Howard
Consulting Engineer, Kansas City, Mo.

THE NEW highway toll bridge across the Ohio River at Paducah, Ky., was opened to traffic April 14 after a notable program of rapid construction. Originally delayed by foundation difficulties, actually steel erection was not begun until Sept. 6, about four months late. In spite of winter weather and high water, steel work was completed on Jan. 29, only two months behind schedule. This record is believed to be unprecedented for work in the Ohio River during such a season.

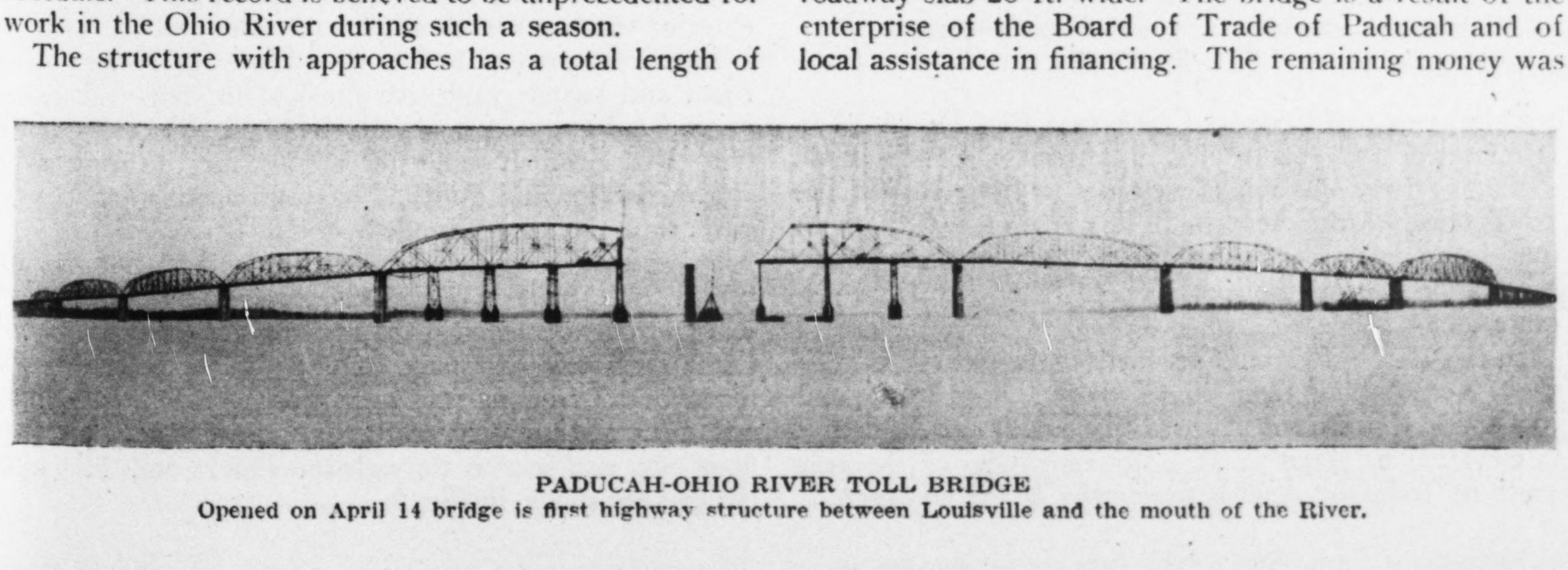
The structure with approaches has a total length of about 9,000 ft. The river at ordinary stages is about 4,000 ft. wide. The main bridge structure across this channel includes seven spans of 396 ft., one of 514 ft. and one of 716 ft. In the accompanying illustration the 514-ft. span is shown under construction at the left. The 716-ft. span is at the extreme right end of the bridge. The trusses are all of the riveted type, in part of carbon and in part of silicon steel. Riveting followed erection closely so there remained only about three weeks of riveting after the last spans were landed.

The spans are about 100 ft. clear above low water. False work consisted of steel bents set on pile clusters. Three bents were used under each 396 ft. span, four bents under the 514 ft. span and six bents under the 715 ft. span. Bents were thus four panels, or approximately 100 ft. apart, and were equipped with jacking wedges for adjustment of camber and for removal. Under the first four panels of each span a temporary erection truss was used; erection to succeeding bents was by cantilevering.

The erection rigs, of which there were four, consisted of single-boom stiff-leg steel derricks supported on tracks laid on the floor beams, and were moved forward as erection progressed. The rig used for the 716 ft. span had a boom length of 135 ft. with a capacity of 21 tons; the other rigs had boom lengths of 115 ft. with rated capacities of 12 tons. All were standard type derricks with jib extensions.

Before the first of December, it was evident spans 9, 10 and 13 (the right hand span in the illustration is span 14) could not be completed before the end of December, the extreme date ordinarily considered safe for work in the Ohio River. Since, however, any cessation of erection would probably delay completion of the bridge about six months, it was decided to proceed with erection of these spans and to utilize specially selected long piles with additional bracing, protected in part with steel against ice erosion. There were numerous delays. On Dec. 24 a raft of some 1,200 logs landed against the falsework of span 9, which was only partly erected, pushed it out of line and temporarily caused grave apprehension for its safety. However, the logs were successfully removed and the falsework repaired. Water and ice conditions also at times made it impossible for the steel barges to be moved and there were days of wind and sleet that made it impossible to work on the high exposed spans. A 40-ft. stage of water was predicted and actually occurred on Jan. 29, but the last span had been successfully landed on the piers on Jan. 26.

The Paducah-Ohio River bridge is the first highway bridge across the Ohio River from its mouth to Louisville, a distance of about 250 miles. It carries a concrete roadway slab 20 ft. wide. The bridge is a result of the enterprise of the Board of Trade of Paducah and of local assistance in financing. The remaining money was



PADUCAH-OHIO RIVER TOLL BRIDGE
Opened on April 14 bridge is first highway structure between Louisville and the mouth of the River.

borrowed on a bond issue through P. W. Chapman & Company. The bridge will be operated as a toll structure. Richard Rudy, president of the Citizens Savings Bank of Paducah, is president of the Bridge Company. Erection work was carried out by the Wisconsin Bridge & Iron Company under the direction of D. K. Allinder, erection manager, with J. W. Marlborough on the job as superintendent. The bridge was designed and construction supervised by Harrington, Howard & Ash, consulting engineers, with Stephen G. Gould as resident engineer.

Emergency Stormwater Pumping Station at Detroit

Temporary Motor-Driven Centrifugal Pump Installed in Suction Well Built for Future Permanent Plant

By Milton F. Wagnitz
Assistant Sewer Engineer, Detroit, Mich.

To relieve the present inadequate pumping facilities for the removal of stormwaters, the city of Detroit placed in operation last summer an emergency pump in the intake well (Fig. 1) of the future Connors Creek pumping station, which will provide against flooding until this station, now under contract, is completed. The emergency pump will serve the portion of the district lying east of Connors Creek (see Fig. 2). A 14-ft. relief sewer was constructed in Jefferson Ave. in 1927, extending from this intake well east to Alter Road. The relief sewer to the west, in Jefferson Ave., will be built during the progress of the work on the permanent pumping station. From Bewick Ave. to Alter Road the distance along Jefferson Ave. is 12,000 ft.

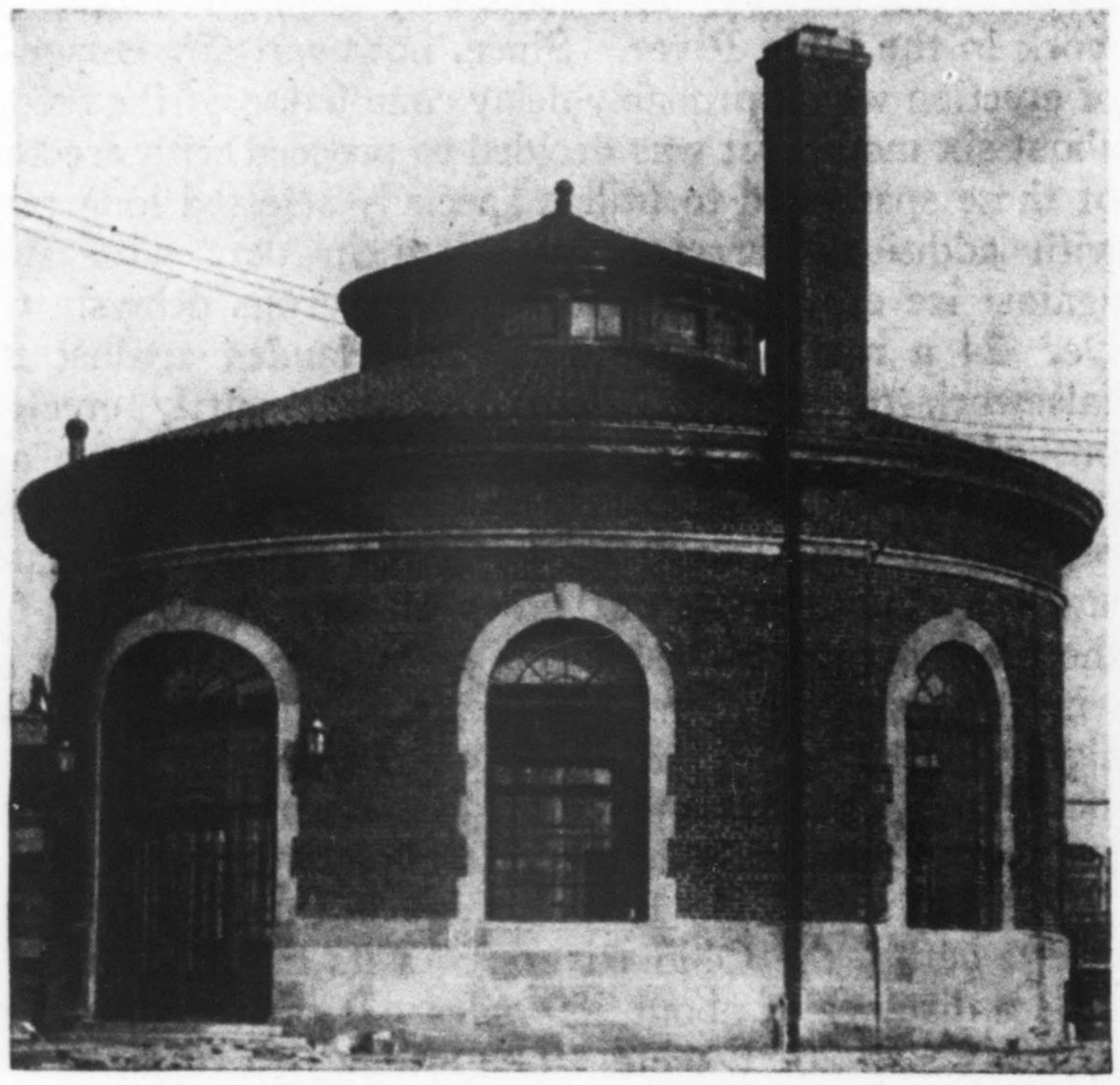


FIG. 1—STORMWATER PUMPING STATION, DETROIT, MICH.

In the East Jefferson Ave. district the ground is relatively flat, sloping from its northerly limits to a point just south of Jefferson Ave., with a maximum difference in elevation of about 12 ft. The remainder of the area south of Jefferson Ave. is practically at the elevation of high water in the Detroit River. Considerable flooding has been experienced throughout the entire district for several years, but this situation will be relieved upon the completion of the Connors Creek pumping station and the appurtenant sewers, which will be probably in 1930. The relief sewers in Jefferson Ave., and the arms connecting to them, are designed to carry the runoff of about 2,580 sec.-ft. from a storm of ten-year frequency, although the pumping station is planned for an ultimate capacity of 4,000 sec.-ft.

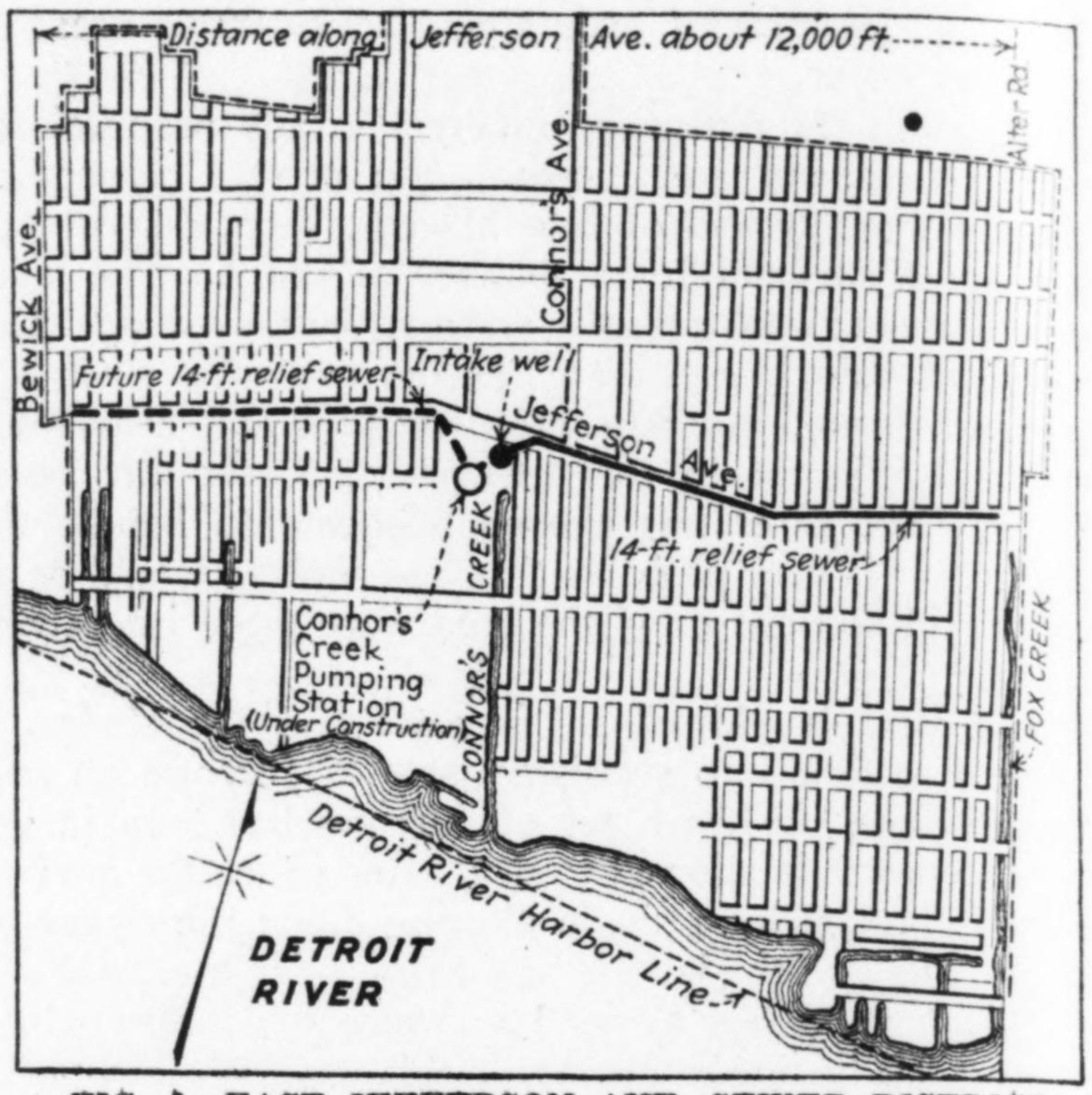


FIG. 2—EAST JEFFERSON AVE. SEWER DISTRICT

The intake well in which the emergency pump is placed is a structure 37 ft. high with an internal diameter of 40 ft. and a depth of 51 ft. below the ground surface. The lower 19 ft. of the entire well comprises the suction chamber. The pump floor is 23 ft. above the suction chamber floor and is designed to withstand the maximum upward pressure which might occur from surge following power failure. Access to the suction chamber is obtained through a shaft extending to the main floor. Underdrainage of the structure is provided by a gravel fill containing a network of tile drains which are connected to a riser pipe within the building, through which the hydrostatic pressure can be measured or relieved. The suction chamber is drained by a small sump pump; the discharge channel is drained by a pipe connection to the suction chamber.

The superstructure consists of a steel frame with columns carrying the roof trusses and the circular runway for a revolving bridge crane of 15 tons capacity. Its exterior is of red brick with stone trim and the interior is faced with pressed buff brick. The walls of the pumproom and switch vault are finished in white enameled brick. All exposed floors are finished with red quarry tile. Red Spanish shale tile is used for the roof, with copper cornice and gutter. A steam-heating plant with oil-burning boiler is installed.

Stormwater flow enters the station through a 14-ft. relief sewer built to serve the district at assumed ultimate development and to be connected eventually to the Connors Creek pumping station. The discharge is through a 7-ft. pipe into a reinforced-concrete channel and thence by a branch to the Connors Creek sewer. A floor plan and section through the station and discharge channel are shown in Fig. 3.