REINFORCED-CONCRETE FLAT-SLAB RAILWAY BRIDGES*

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THE art of reinforced concrete had its inception in Europe and flourished there for a number of years before taking root in this country. Although the development here has been of the highest order, there are foreign precedents for a major portion of the various uses for which we have structurally combined steel and concrete. The style of our American design has differed from that of the European to meet the widely different economic conditions of labor and of materials. With limited labor and abundant resources—the reverse has been true in Europe—our efforts have been concentrated, in a general way, toward the simplification in design and expedient methods in erection. The results are exemplified in no greater instance than in the development of the girderless floor, better known as flat-slab construction, where the simplicity has been so perfected as to produce the extreme European effort in conservation of materials without the excessive expenditure of time and labor incident thereto.

One has only to mention the recent astonishing record, seemingly incredible, made by the use of the flat slab in the erection of the Brooklyn Naval Storehouse, to prove conclusively its remarkable utility. This eleven-story building frame covering a ground area of 180 x 260 ft., or 1½ acres, was completed in 14 weeks by 500 men working one shift a day. The building, entirely fireproof, is capable of holding 70,000 tons of supplies.

Other building achievements could be mentioned to show the extraordinary development and utility of the flat-slab system for light building loads. It is the object of this paper, however, to show that the flat slab can be utilized, with equal effectiveness and added advantages, in carrying heavy railway loadings in the construction of viaducts and especially bridges of lesser magnitude where the required span length is not prohibitive. All forms of concrete construction have this limitation.

The principal advantages of the flat slab compared with all other forms of reinforced concrete and other fireproof construction are embodied in the simplicity of both

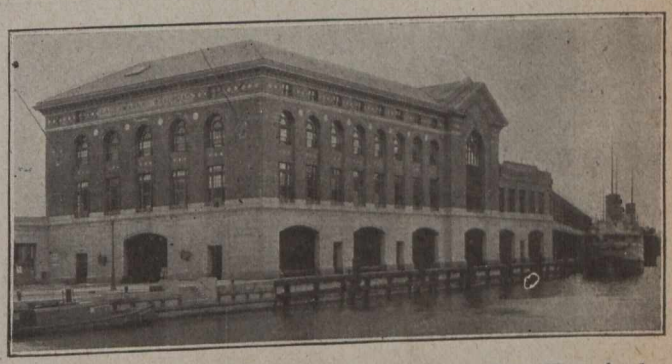

Fig. No. 1—Lackawanna Railroad's Buffalo Terminal

the formwork and arrangement of the reinforcing steel. The first cost of construction has been so reduced thereby as to put structural steel, in competition with the flat slab within its limitations, substantially out of consideration; furthermore, with the concrete construction lower maintenance charges prevail and greater permanency is obtained. The simple arrangement of the reinforcing steel, laid over a practically unbroken flat surface, insures a more positive placement of the reinforcing bars than the general beam and slab design in concrete.

In addition to these general advantages of the flat-slab construction, the salient advantages resulting from its

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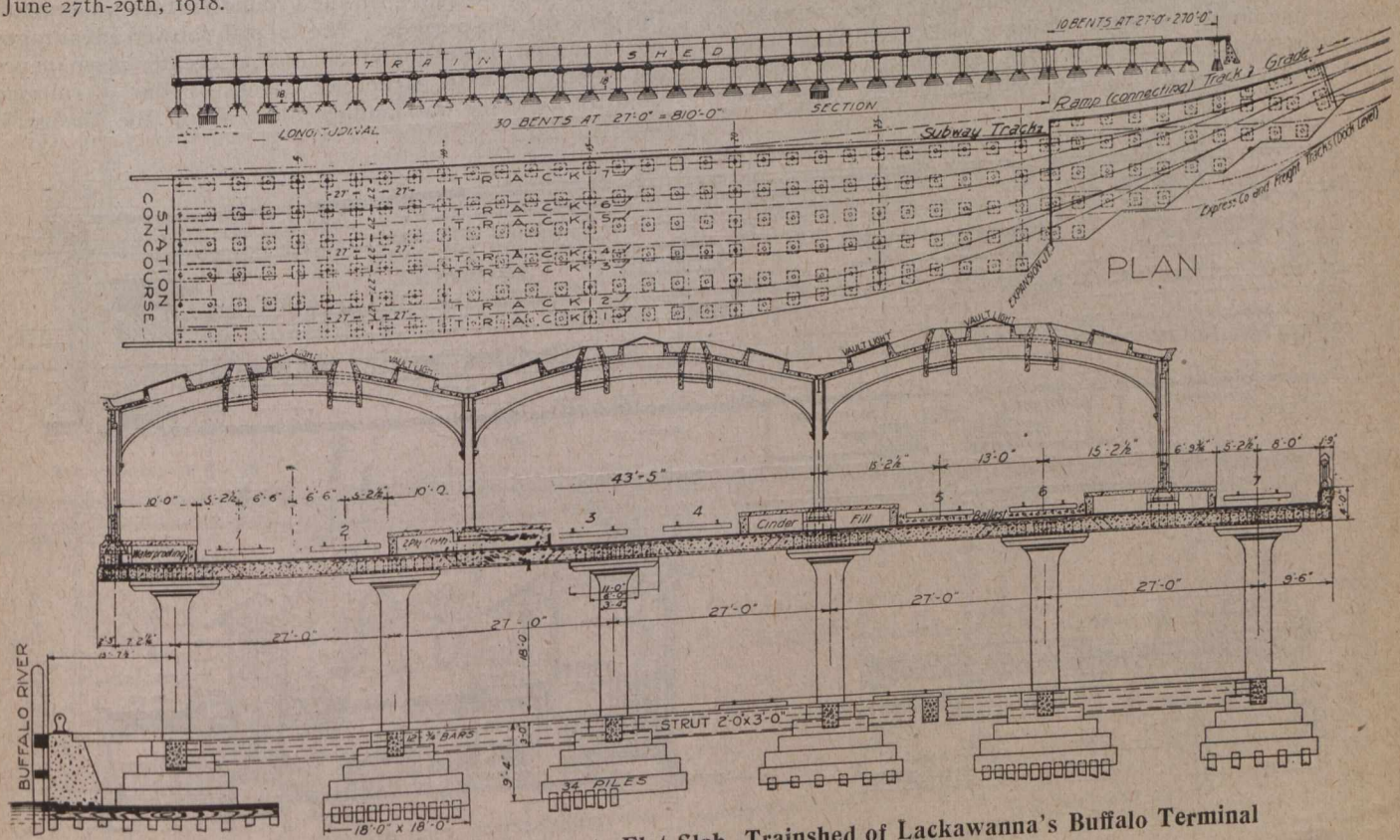

Fig. No. 2—Details of Reinforced-Concrete Flat-Slab Trainshed of Lackawanna's Buffalo Terminal