a small type three-track bridge built on the Orange Improvement over Central Avenue, 100 ft. in width. Columns on the curb and along the centre line of the driveway divide the deck into eight rectangular panels, two in the width and four in the length of the structure, with dimensions as shown in cross-sections of Fig. 6.

The simplicity of the structural details of the flat slab offers an opportunity to correct the troublesome conditions encountered in bridge abutment construction. The writer calls attention to the abutment development of the Central Avenue Bridge which resulted from the conception of maintaining throughout the deck the positive plate action attributable to the flat slab. This was to be effected by an end column support to replace the somewhat complex action in supporting the slab on the full width of the abutment. The columns are set in recesses built in the abutments as shown in sections A-A and B-B and also in the isometric drawing of the corner column, which shows the sequence of the construction. The slab is cantilevered beyond the abutment, and built integrally with the slab is the suspended beam or apron which is to prevent the back fill and drainage from percolating through the construction joints. The cantilever has a theoretical significance in giving greater balance in resistance to the negative moment over the columns. The abutment is in fact a retaining wall, since it takes no slab reaction, and it was possible to reduce its section for the reason that the suspended apron of the slab reduces to a considerable extent the live- and dead-load surcharge pressure against the back of the wall. The reduction in concrete is a saving over ordinary concrete bridge abutments and an appreciable saving over the massive abutments required in support of structural steel bridges, where the top width is fixed by wide bearing plates, or shoes, and a back wall. The wide bridge seat retains water, snow and ice, which are sources of much trouble resulting from their marked deteriorating action on the steel and concrete. Here again it is to be noted that the waterproofing details are reduced to the very simplest arrangement.

Relative to the comparison of the cost of structural steel with the flat slab for the small type railway bridge, it has been found in a number of estimates that a very appreciable difference existed in favor of the flat slab. The statement that the cost of structural steel in one case exceeded the cost of the flat slab by 200 per cent. may seem somewhat surprising. This result was obtained where deck construction would have been required on account of a yard layout involving crossovers on the bridge, and a shallow floor depth made necessary because of close vertical clearances. The estimate included the price of structural steel at its high-water mark. The appreciable saving augmented by the present high price of structural steel, which is likely to continue for some time, should give added impulse to the consideration of flat-slab construction.

From the standpoint of appearance and quantities involved a specific comparison of the flat-slab bridge can be made with a flat-top bridge, the deck of which is the common slab of rectangular cross-section reinforced in one direction for continuous action over a series of piers. Fig. 8 is an example of the latter type spanning Waverly Place in track elevation through Madison, N.J. The spans of this bridge are almost identical with the spans over Central Avenue, since here the street is also 100 ft. in width, but the slab reinforced in one direction is 12 ins. deeper than the four-way reinforced slab of Central Avenue Bridge, exclusive of the drop panel. If this type were used at Central Avenue at the same unit prices, its cost would exceed that of the present structure by 25 per cent. The noticeable advantage of the Central Avenue Bridge is the clearer vision beyond the bridge obtainable from all angles of approach.

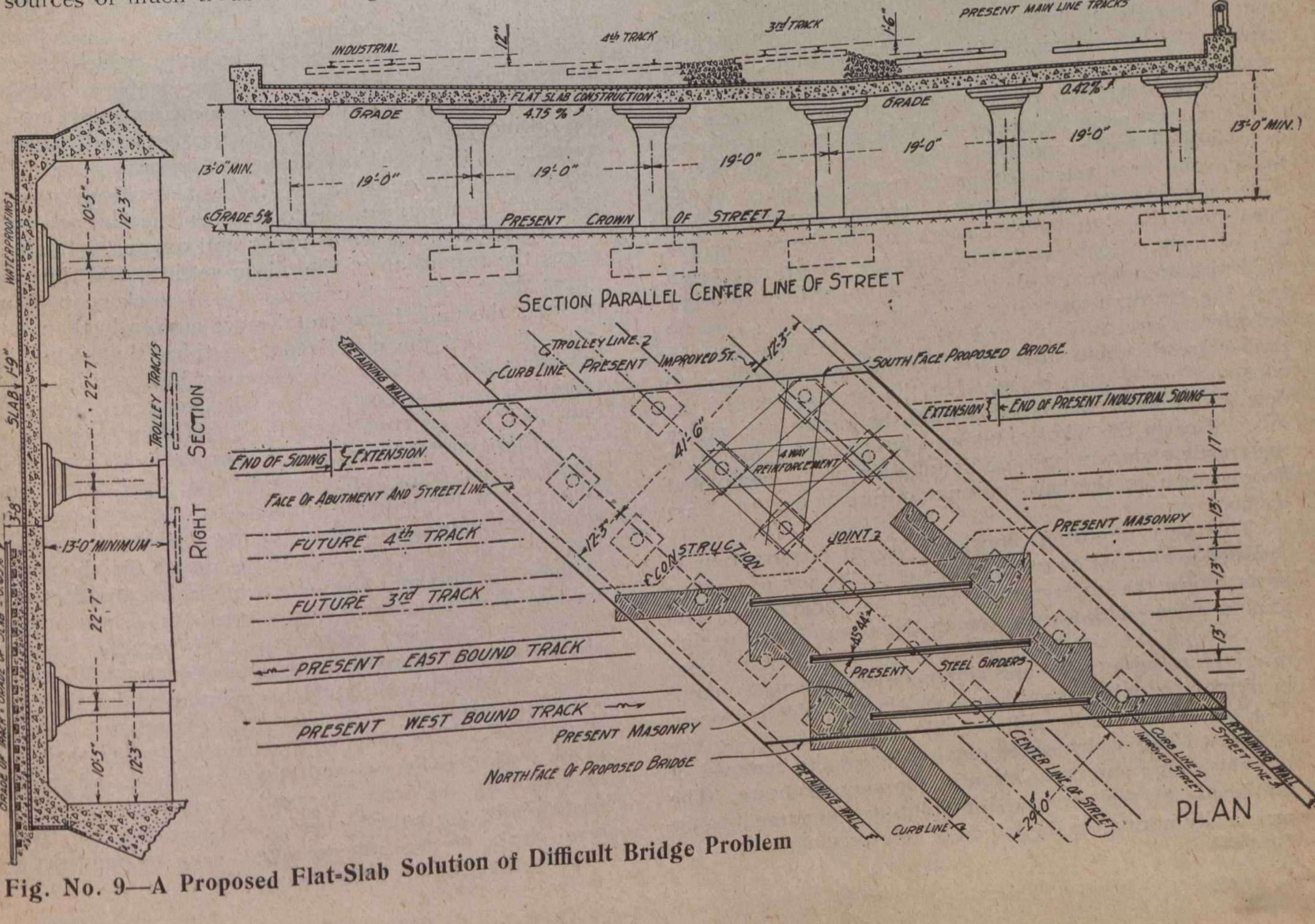

Fig. No. 9—A Proposed Flat-Slab Solution of Difficult Bridge Problem