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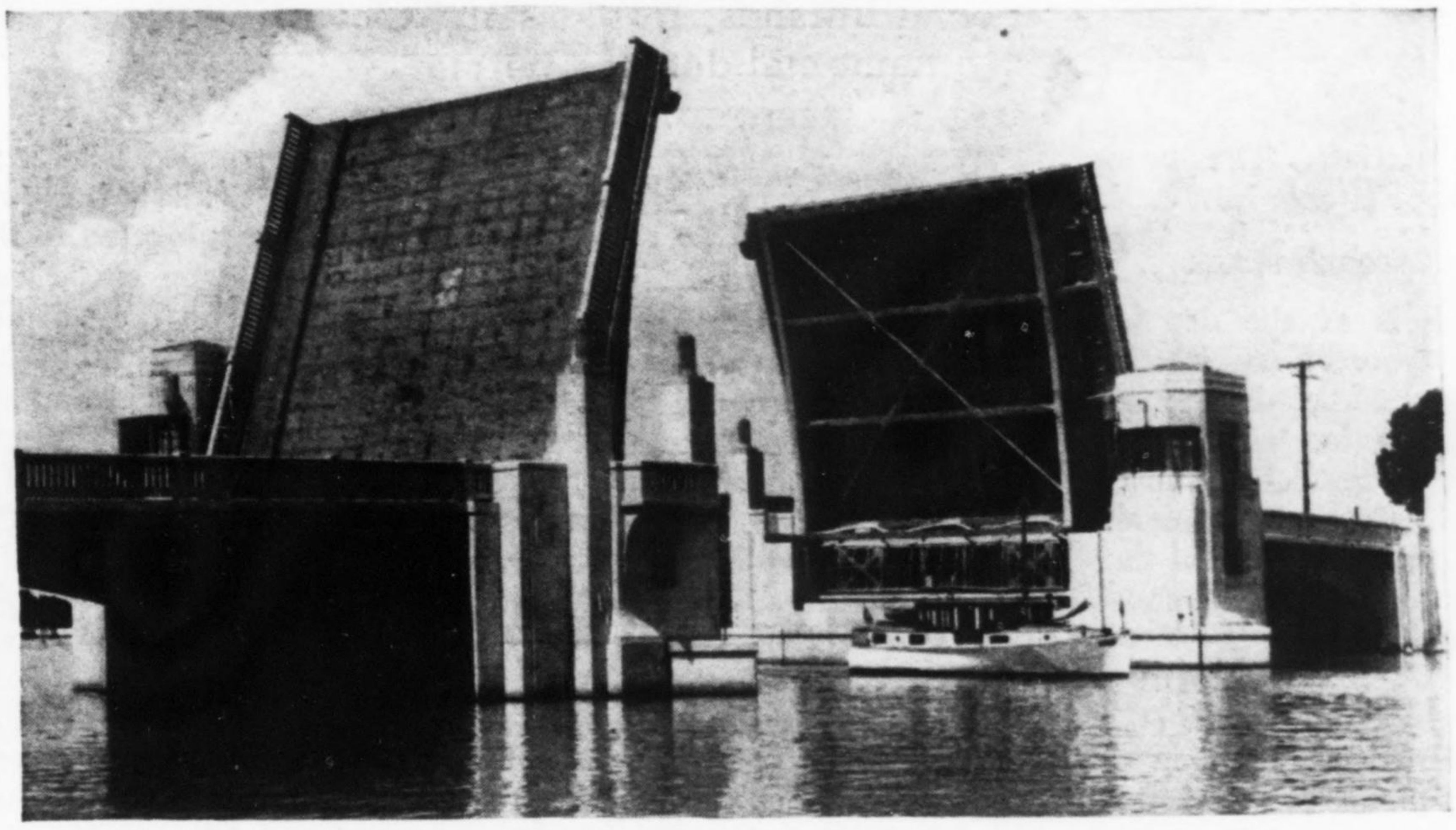

FIG. 1—FLOOR, CURBS, SIDEWALKS AND RAILINGS of bascule leaves are made up of welded steel plates and shapes. Colored concrete panels are used on the piers and colored tile trim on the control and operator's houses. Note how pier fenders are separated from the piers. Also the glass front in the machinery room beneath the bascule leaf.

Architectural Details Emphasized in Bascule-Span Bridge

Double-leaf center span of structure at Port Clinton, Ohio, made to resemble arched side spans—Steel painted to match concrete, and green trim and aluminum lights used—Floor, sidewalk and railing welded

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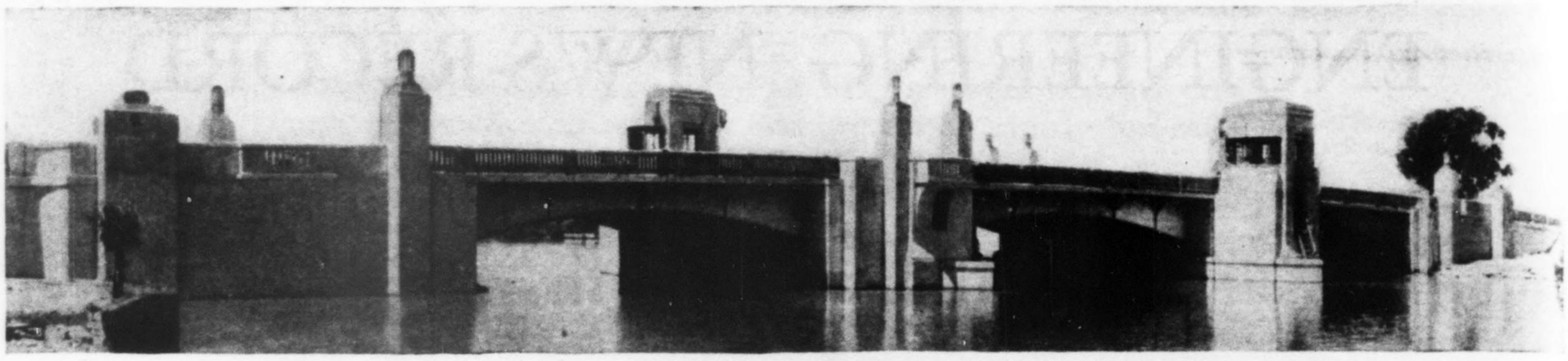
IN A NEW BRIDGE recently opened over the Portage River at Port Clinton, Ohio, particular attention was given to the architectural detail of design in order to produce a modern and pleasing appearance of the structure as a whole. The bridge consists of a central double-leaf bascule span of 80-ft. clearance, with a 60-ft. approach span at each end. The double-leaf arrangement of the bascule span was adopted so as to obtain an arch appearance that would resemble the outline of the outside girders of the approach spans. Measured parallel to the center line of the roadway, each pier is 27 ft. long, while each abutment has a length of 45 ft., providing concrete masses of considerable proportions. The total length of the bridge is 344 ft., while the roadway is 40 ft. wide between curbs, and a 5-ft. sidewalk is provided on either side. The structure was designed for an H-20 loading.

In addition to architectural details, a welded railing of unusual design and a battle-deck type steel floor are features of the project.

Architectural treatment

All steelwork was painted to match the concrete color of the substructure with an additional touch of color added by placing precast green panels of metallized concrete on the ends of the piers and on the roadway sides of the operator's house and the control house. These houses, located at either end of the bascule span and on opposite sides of the roadway, have green copper roofing and a horizontal band of green tile inserts near the top of the walls. All roadway lighting fixtures are made of cast aluminum.

The railing, massive and substantial, is of all-steel construction on the bascule and approach spans and is made to match almost exactly the concrete railing provided over the abutments and retaining-wall approaches. The makeup of the railing is somewhat unusual. The top of the top rail is a $\frac{1}{4}$-in. plate, and two steel cross-tie sections (Carnegie M-27) comprise the sides. A standard 6-in. channel forms th bottom of the top rail, and square holes, cut in the web of the channel, admit 4-in.-square steel posts used as spindles. The bottom rail utilizes a 6-in. standard channel as the top piece, while two of the steel cross-tie sections serve as sides. The railing was fabricated by arc-welding and the panel units joined to 12-in.-square posts made by bending and weld-



ing $\frac{3}{16}$-in. plate material. The posts are provided with special cast-iron caps.

Bascule and approach spans

The bascule span is of the double-leaf fixed-trunnion type. Each leaf is made up of two plate girders with curved bottom chords, connected by floor beams and supported on steel trunnion towers placed inside the hollow piers. The break in the floor is in front of the trunnion, and the floor over the counterweight is fixed, thus avoiding the dangerously large openings characteristic of certain types of bascule design.

A steel floor of battledeck type is used on the roadway and sidewalks of the bascule span and over the trunnion piers. For the roadway, $\frac{5}{8}$-in. copper-bearing steel traffic plates laid normal to the center line of the roadway are plug-welded to the supporting beams, and all plates are joined to each other and to the supports by continuous welding of the seams. In the design the floor plates were considered as part of the compression flange of the supporting frame, permitting a considerable saving in weight of steel.

On the sidewalks $\frac{3}{8}$-in. traffic plates are used, while a $\frac{1}{2}$-in. smooth plate forms the curb face. The entire assembly, including curb, is welded to form a watertight deck over the supporting framework, which consists of built-

FIG. 2 — ARCHITECTURAL composition received special attention in the design of this three-span bridge, in which the center span is a double-leaf bascule proportioned to harmonize with the two end spans.

up floor beams, spaced 14 ft. on centers between the main girders; 12-in. I-section stringers, spaced 3 ft. 4 in. on centers; and 6-in. I-section cross-beams spaced 2 ft. 4 in. on centers between the stringers. All framing is flush on top.

On the approach spans the intermediate beams are 36-in. rolled girder sections, spaced 5 ft. on centers, and the outside girders are composed of built-up sections with curved bottom flanges to give the appearance of an arch. Stiffener angles are omitted on the outside of the girders to enhance the general appearance of the structure and to produce a panel effect between the sidewalk brackets. On these spans a reinforced-concrete roadway and sidewalk slab are used.

The abutments are of U type, not filled above the natural ground level but topped with a reinforced-concrete floor of beam-and-slab construction. The fenders on the piers are of reinforced concrete, 18 in. thick, extending in height from a point slightly below low water to an elevation somewhat above high water. Each side of the fender wall is about 12 ft. long and is supported by three 10-in. H-beam columns anchored in the pier footing. A 12-in. open space is provided between the fender and the pier to allow for movement of the fender when subjected to the impact of navigation or ice. Flexibility is obtained through the bending of the steel supporting columns.

Crushed limestone and limestone sand were used for aggregates in all concrete. Mixes were 1:$6\frac{1}{2}$ for footings and counterweights and 1:$5\frac{1}{2}$ for all other work.

The control house is two stories high with the second-floor level about 4 ft. above the sidewalks. From the main control bench board located in the upper room all main operations are carried out. The remote-control switchboard is located in the lower room. The operator's house, similar to the control house, is equipped as living quarters for the bridge tender.

The operating machinery is placed in a room situated between the trunnion towers below the deck. Electric current for power and lighting is obtained from a 440-volt service line, distributed to two 30-hp. main motors, two 5-hp. sump pump motors, four 3-hp. gate motors and all lighting fixtures. Sumps are located in each pier.

The project was financed cooperatively by Ottawa County and the Ohio department of highways as part of the federal emergency relief program. The contract was awarded in December, 1932, to A. Bentley & Sons Co., Toledo, Ohio. The total contract price, including all extras for the bridge proper, was $575,825, while the contract price of the approaches was $20,742. The R. C. Mahon Co., Detroit, furnished and erected all of the structural steel and machinery.

The engineering and architectural designs were prepared in the bureau of bridges, Ohio department of highways, under the direction of the writer. W. H. Rabe is chief designing engineer and W. H. Hintman acted as coordinating engineer in the design of the structure and had direct charge of field work. Machinery and electrical features of the bridge were designed by H. W. Bowden and F. C. Nesbitt, while the architectural design of the control houses was handled by Josephine Howard, all parties being members of the bureau of bridges. O. W. Merrell is director of highways, H. P. Chapman is chief engineer, and Elmer Hilty is chief engineer of construction for the state of Ohio.

FIG. 3—ARCHITECTURAL DETAIL of the control house. Color is supplied by a trim of green tile near top and by aluminum lamp fixtures, as well as by a metallized concrete panel below the window. Railing is made up of welded-steel plates and shapes, proportioned and painted to match the concrete railing of the approaches. Floor and sidewalks are steel traffic plates plug-welded to supporting beams in a battledeck-type design.