Railway Age

SEVENTY-SECOND QUARTO VOLUME

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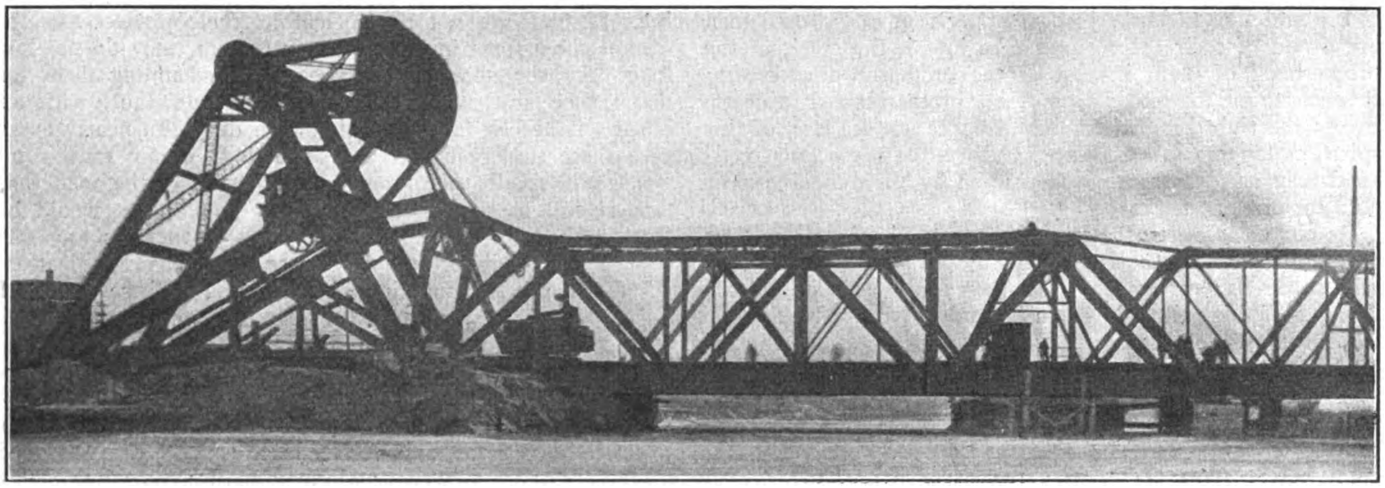
(Established in April, 1856)

SIXTY-SEVENTH YEAR

1922
FIRST HALF



View of the Bridge Just After It Was Opened for Traffic

A New Development in Bascule Bridge Design

Old Wabash Swing Span Over River Rouge Was Replaced by a New Structure on January 26

On January 26 a bascule bridge of an entirely new design was placed in service at the Wabash crossing of the River Rouge at Detroit, Mich. The bridge comprises a single leaf span of 162 ft., a tower span of 73 ft. 6 in. and a deck girder approach span of 53 ft. 2 in. It replaces a double-track swing span which would not fulfill the requirements of a statute passed by Congress in 1917 providing for the improvement of the River Rouge to afford a waterway 200 ft. wide with 125 ft. clear openings at bridges. This same project was responsible for a similar replacement of the Michigan Central bridge over this waterway, completed some time ago.

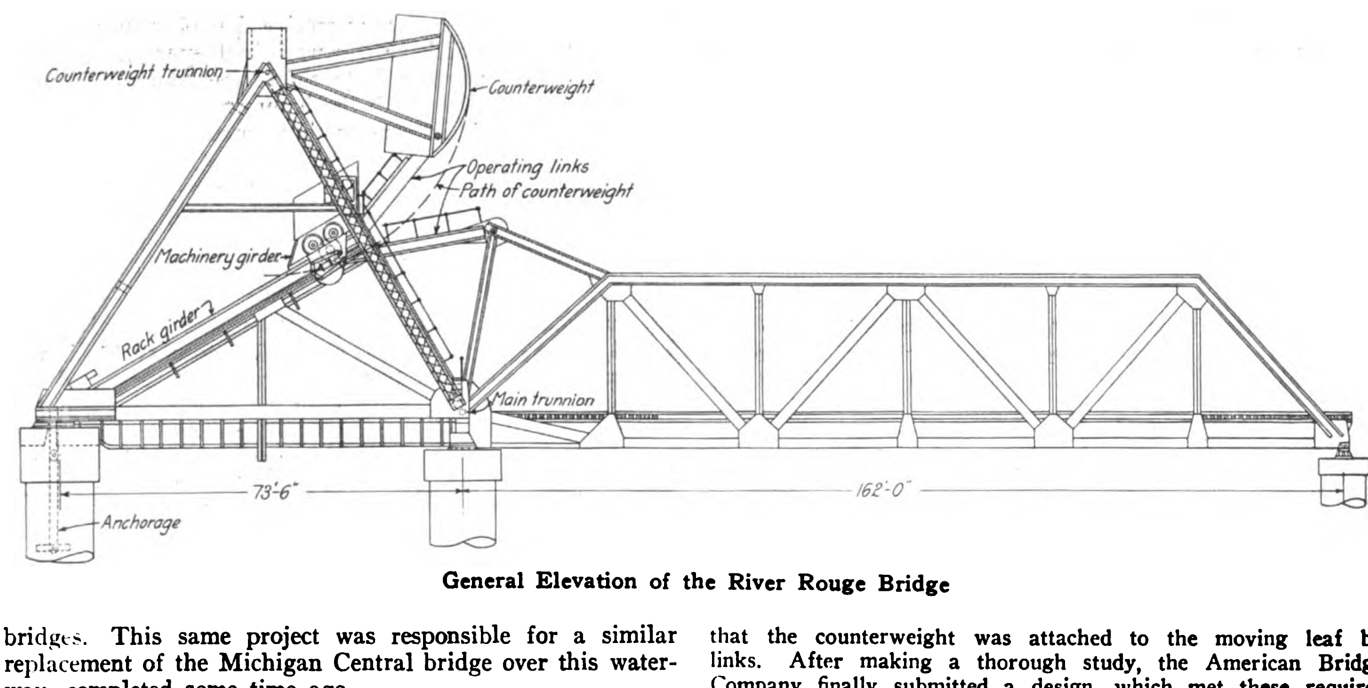
The selection of the type of structure was made after a consideration of four designs of bascule bridges and a vertical lift span. The designs considered and the conclusion reached by A. O. Cunningham, chief engineer of the Wabash, under whose direction the design and construction of the bridge were carried out, were as follows:

(1) A plan prepared by the engineers of the Wabash of a bascule bridge with a counterweight attached to the bridge.

(2) A bascule bridge invented by C. G. E. Larsson, assistant chief engineer of the American Bridge Company of New York, which required no counterweight and which was operated by combined pneumatic and hydraulic machinery.

(3) A Strauss bascule bridge.

(4) The Cummings type, patented over 20 years ago and since expired, was proposed by the American Bridge Company, but Mr. Cunningham would not accept this unless so designed that the counterweight was attached to the moving leaf by links. After making a thorough study, the American Bridge Company finally submitted a design, which met these requirements and which is now known as the "Abt type." The design so submitted being acceptable, the contract for the superstructure was awarded to the American Bridge Company.



General Elevation of the River Rouge Bridge

In this type of bascule bridge the counterweight is suspended from a trunnion located at the apex of a triangular-shaped counterweight tower. The linkage mechanism by which this counterweight is connected to the bridge span is a novel part of the design, giving to the contra-rotating counterweight the same angular velocity as the span. Expressed in other words, this means that the angle between the horizontal (or vertical) and the line connecting the pivot with the center of gravity of the counterweight is always identical with the angle between the horizontal and a line connecting the main trunnion with the center of gravity of the leaf. One of the links acts as a strut supporting the counterweight while its fellow is a tension member connecting it to the movable leaf.

The counterweight consists of a basket of structural steel filled with concrete and suspended from the counterweight trunnion by stiff hangers. This basket is enclosed on all sides, except on the side toward the pivot. This form of construction has the advantage, therefore, that it may be erected in the hanging position by a locomotive crane without the use of any falsework. Also the necessary concrete may be poured inside the structural steel basket without the aid of any forms.

The bridge is operated by machinery mounted on a cross girder of structural steel which travels up and down two inclined members equipped with racks. This cross girder is joined to the compression and tension links at their common pivot.

The machinery required for operation was assembled complete inside the girder at the shop and subjected to tests before shipping it to the site of the bridge. This arrangement greatly reduced the amount of assembly work necessary at the bridge site.

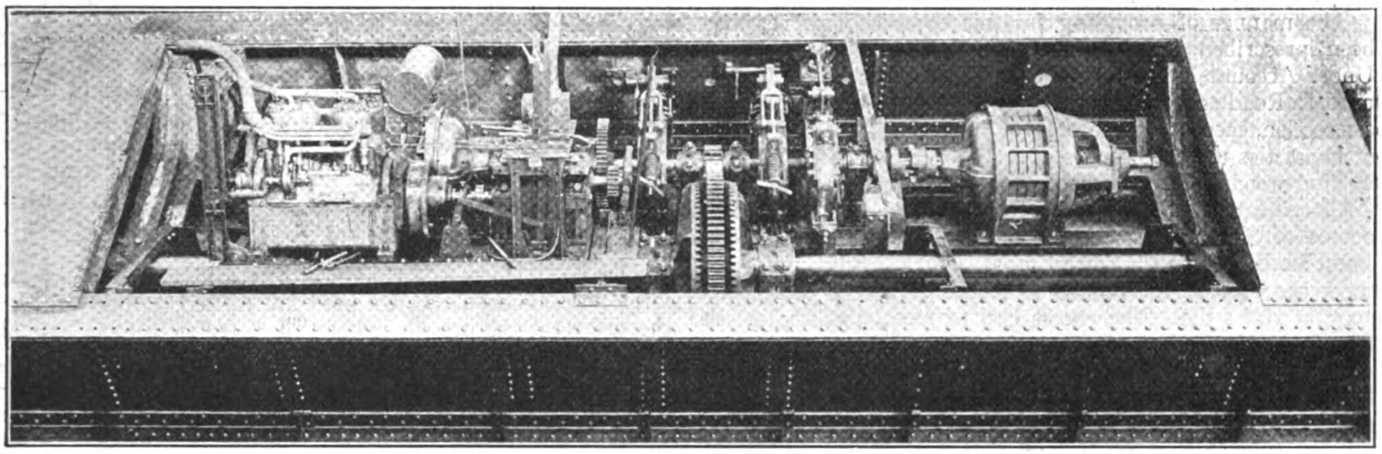
The main power equipment of this bridge comprises two 100-hp. electric motors operating on three-phase, 60-cycle, 440-volt alternating current. Either of these motors is capable of operating the bridge alone and is connected to the operating shaft by separate clutches, the object being to use these motors alternately, thereby giving greater assurance that one motor will always be in working order. To allow for failure of electrical power, a 58-hp. gasoline engine is provided as an auxiliary unit. The power equipment has been geared so that either of the motors will open or close the bridge in less than 1½ minutes and the gas engine in about eight minutes.

Each electric motor has a solenoid brake for full torque, one of these brakes having an attachment to transform it to a hand brake if the gasoline engine is to be used. On the motor shaft an air brake has been installed for full torque of the two motors; also two emergency brakes entirely independent of the machinery, arranged to grip I-beams attached to the inclined girder. These brakes can develop 175,000 lb. holding power and are supplied with air from a line entirely independent of the brakes to the motor shaft. All the brakes have been designed to set slowly and to release quickly.

The air for the brakes is supplied by a compressor rated at 25 cu. ft. of free air per minute, with a governor to insure uniform pressure. The bridge is operated by remote control from an operating house located south of the bridge, which also contains the interlocking machine.

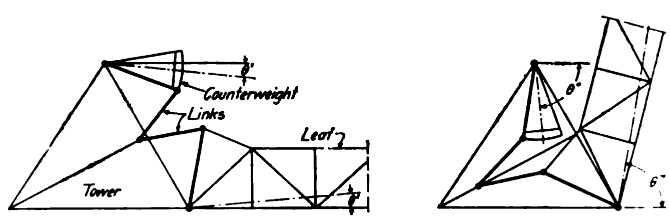
The masonry supporting the A-frame and main trunnion consists of four cylinders 12 ft. in diameter sunk to rock by the pneumatic process and connected crosswise of the bridge by a pier and abutment resting on the cylinders. The rest pier is of concrete extending below the bed of the river and supported on piles driven to rock.

The new structure was erected in the open position so as to clear the old swing span. When the new structure was ready for service, operation of trains across the bridge was abandoned for a period of about eight hours during which the old span was shifted sidewise on falsework, the new approach span was erected for one track and the rest pier put in condition to receive the new span which was then placed in the open position. During the time that the bridge was out of service, one or two through passenger trains were detoured over other lines, while service for local passenger trains was maintained by hauling passengers between Detroit and the site of the bridge in motor buses.



The Operating Machinery Assembled in the Machinery Girder

The bridge was fabricated at the Gary plant of the American Bridge Company with Albert Reichmann, western division engineer, in charge. The erection was under the direction of James L. deVou, Pittsburgh division erecting manager of the American Bridge Company. The electrical, air and gas engine equipment was furnished and installed by the Norwood-Noonan Company of Chicago. The substructure including all foundation work was done by the J. W. McMurry Contracting Company, Kansas City, Mo., this contractor also removing the old masonry. A new electric interlocking plant is being installed by the Union Switch & Signal Company.



Relation of Parts in the Open and Closed Positions of the "Abt Patent" Bascule