SHIPS AND ERECTS 162-FT. SPAN AS UNIT

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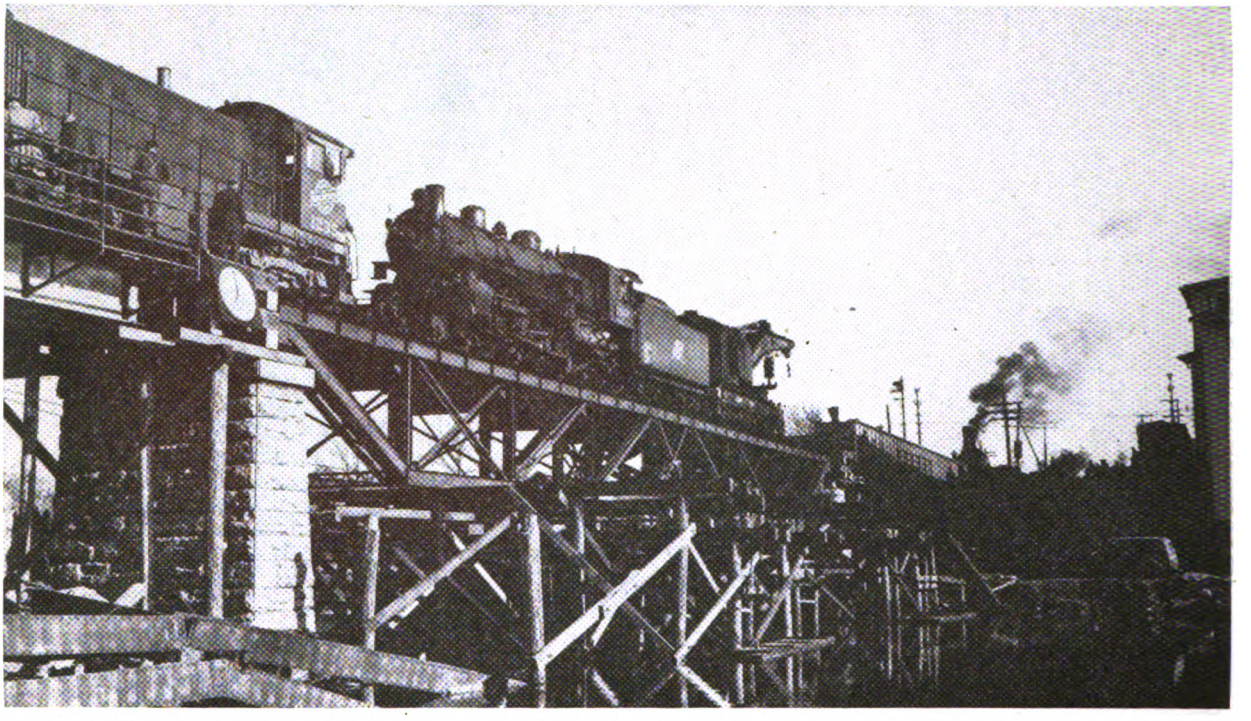
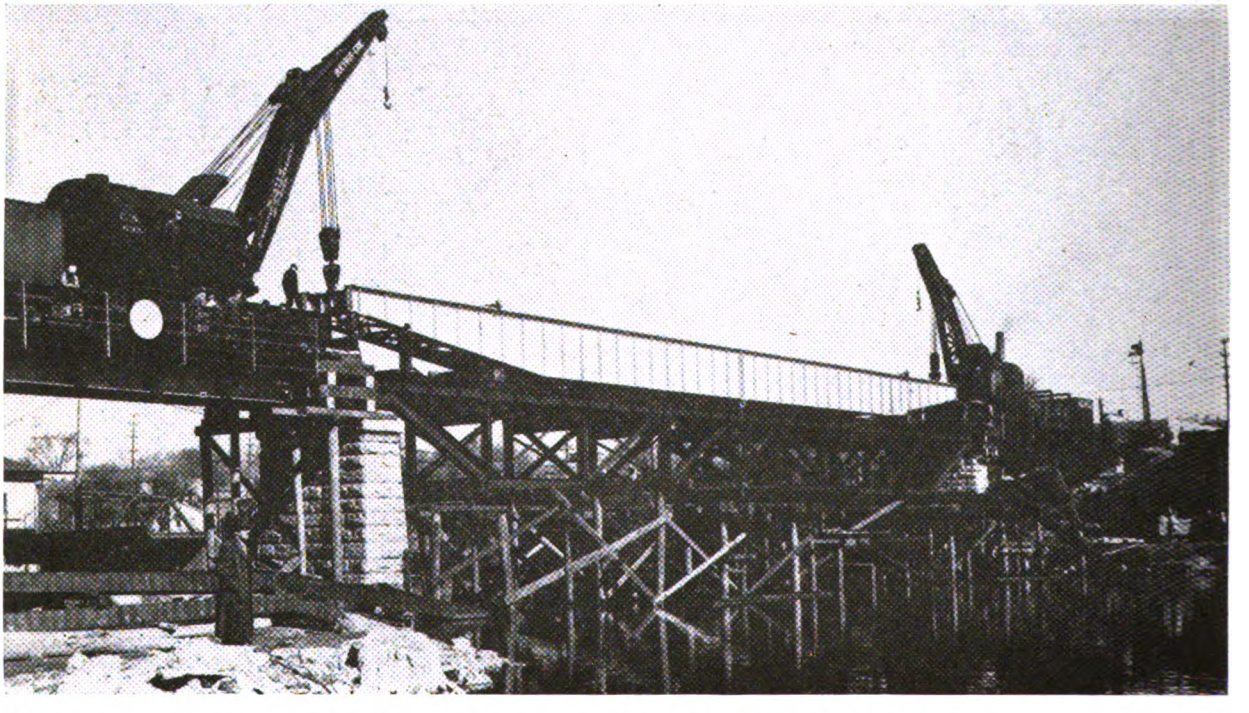


7:00 a.m.—Getting ready to couple a Diesel switcher to a steam locomotive in preparation for pulling the new span (background) on the bridge

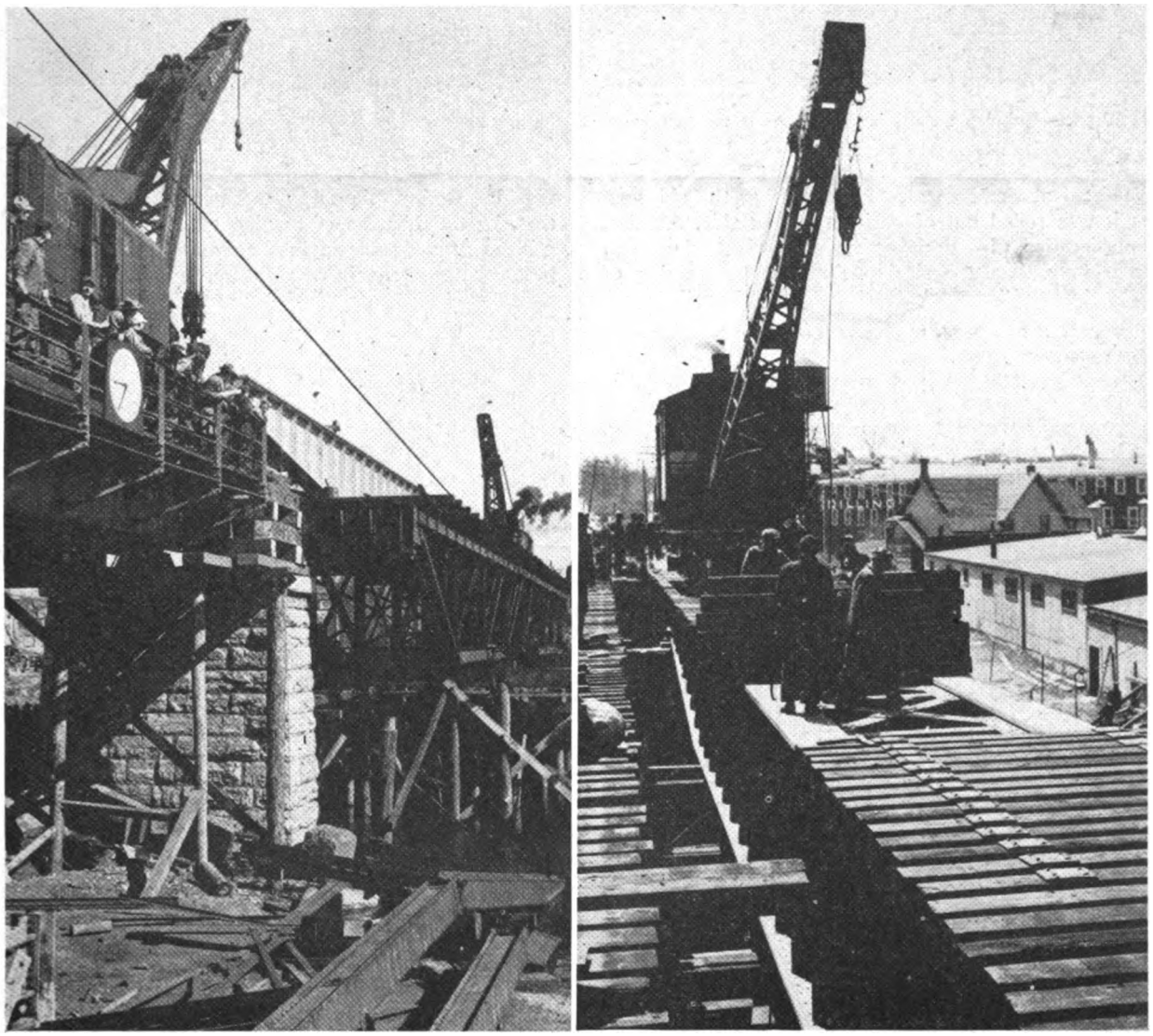


8:05 a.m.—The new span, in position on the old bridge, has been lifted into the clear by the wreckers

Long deck-girder span for installation on the Chicago & North Western over Sheboygan river was completely shop-riveted to obtain advantages in erection

In a recent bridge-renewal project involving a single-track span across the Sheboygan river, at Sheboygan, Wis., the Chicago & North Western erected the longest shop-riveted span ever to be shipped from the plant of the American Bridge Company at Gary, Ind. This was a deck plate-girder span, 162 ft. long, continuous over three supports, and was installed to replace a pin-connected deck-truss drawspan, erected in 1893, which was no longer adequate to carry present-day loads.

Decision to ship the new main span completely shop-riveted was based on several considerations. One of these was the desire to avoid the necessity for constructing the elaborate erection falsework that would have been required if the span had been shipped in two sections. As it was, the only falsework needed



Left—8:35 a.m.—With the new span suspended from the wrecker hooks, the old drawspan is being rolled to one side on falsework bents. Right—10:15 a.m.—The span has been lowered into final position and the track is being laid on the girders

12:50 p.m.—Finishing touches are being put to the track work on the new span

consisted of timber bents for supporting the old span as it was rolled out of position to one side. Another consideration, in deciding to shop-rivet the span completely, was a desire to eliminate the driving of field rivets of long grip, such as would have been required in the splices for the heavy flanges of the girders.

Because of its length and weight (280,000 lb.) the shipment of the new main span presented something of a problem. Five cars were required for this purpose, including two heavy-duty flat cars of 400,000 lb. capacity on which the span was supported. An idler car separated the two carrying cars, and in addition there was an idler car at each end.

In addition to the 162-ft. main span the original bridge had a 75-ft. pin-connected deck-truss approach span at the south end, and a 90-ft. approach span of similar construction at the north end. As part of the renewal project the approach span at the south end was replaced with two I-beam spans, 30 ft. 5 in. and 45 ft. 5 in. in length, respectively. At the north end two new I-beam approach spans were installed, each 45 ft. 5 in. long. The old substructure consisted of masonry abutments, piers and center pier, and, being in good condition, these were retained with such alterations as were necessary to adapt them as supports for the new spans. In addition, a steel bent was installed at each end to support the adjoining ends of the approach spans.

The legs of these bents are each supported on a pedestal consisting of four H-beams driven to rock and topped with a fabricated steel cap. An interesting feature of these pedestals is the fact that the H-beams were given a protective coating of shotcrete before being driven.

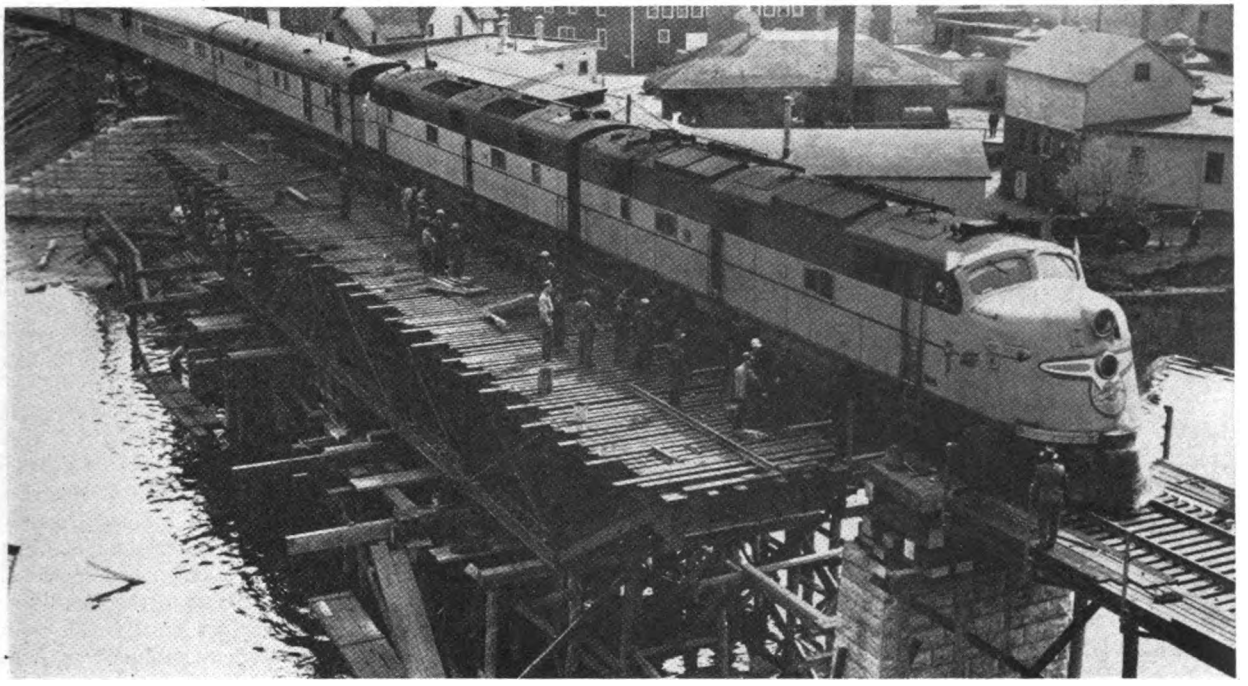
While the Sheboygan river is not at present a navigable stream the new span was so designed that, by the addition of turning machinery, it can be utilized as a drawspan in the event that this should become necessary in the future. This span is designed for Cooper's E-65 loading. The girders are 7½ ft. deep at the middle support and are spaced 7 ft. center to center.

In preparing the span for shipment an oak bolster was bolted transversely to the bottom flanges near each end. Since the plan adopted for installing the span involved sliding it longitudinally on the track rails, these bolsters were designed to work with this plan. Each of them was shod with a 24-in. I-beam laid flat, with the flanges notched to receive the rails. This meant that there would be a 24-in. bearing at each point of support on the rails. The notches in the I-beam flanges, which had contours similar to the heads of the rails, served to prevent the span from shifting sideways while being dragged along on the track.

On April 29 the span was unloaded from the cars at a point immediately north of the bridge site by two wreckers, one of 160 tons capacity from Milwaukee, which is south of Sheboygan, and one of 150 tons capacity from Green Bay, Wis., which is north of Sheboygan.

It was placed temporarily on blocking located adjacent to the main track. For connecting the wrecker hooks to the span specially designed plate shackles were used, which were attached to pin plates shop-riveted to the span.

The new span was installed on the morning of April 30. Previously the new approach spans had been erected and a number of transverse timber bents had been constructed on which the old main span was to be rolled into the clear. Also, the new steel center



2:30 p.m.—The northbound "Shoreland 400" streamliner moves over the completed span

tower had been assembled on timber staging at one side of the center pier in preparation for being moved into position on skids at the proper time.

The first step in the actual work of installing the new span was to lift it over on the running rails of the main track, using the two wreckers. The wrecker hooks were then disconnected and the wrecker at the south end was moved ahead (toward the bridge) about 60 ft. The south end of the span was then connected to the coupler of the wrecker by a single piece of wire rope ⅞ in. in diameter, which was attached to each girder and which passed over a sheave block connected to the coupler pin by a special bent plate.

Using a Diesel-electric switching locomotive and a steam locomotive coupled to the wrecker, the span was then dragged on the rails into position over the old span. Grease was applied to the tops of the track rails ahead of the span as it was dragged along. The movement of the span in this manner proceeded smoothly and without difficulty, and no damage to the rails or ties occurred.

The wreckers were then brought in close to the ends of the new span and their front outriggers were extended and supported by blocking placed on the tops of the piers and on falsework bents provided for this purpose. Next, the new span was lifted clear of the track rails by two wreckers, and held in the raised position.

The old drawspan, with the center drum attached, was jacked up a few inches, and inverted roller units were placed at eight points between the bottom chords of the old span and the four transverse falsework runway bents. The span, with the deck in place, was then pulled out to one side of the bridge by hoisting cables reeved through double blocks. The actual time required to pull the span to one side was 5 min.

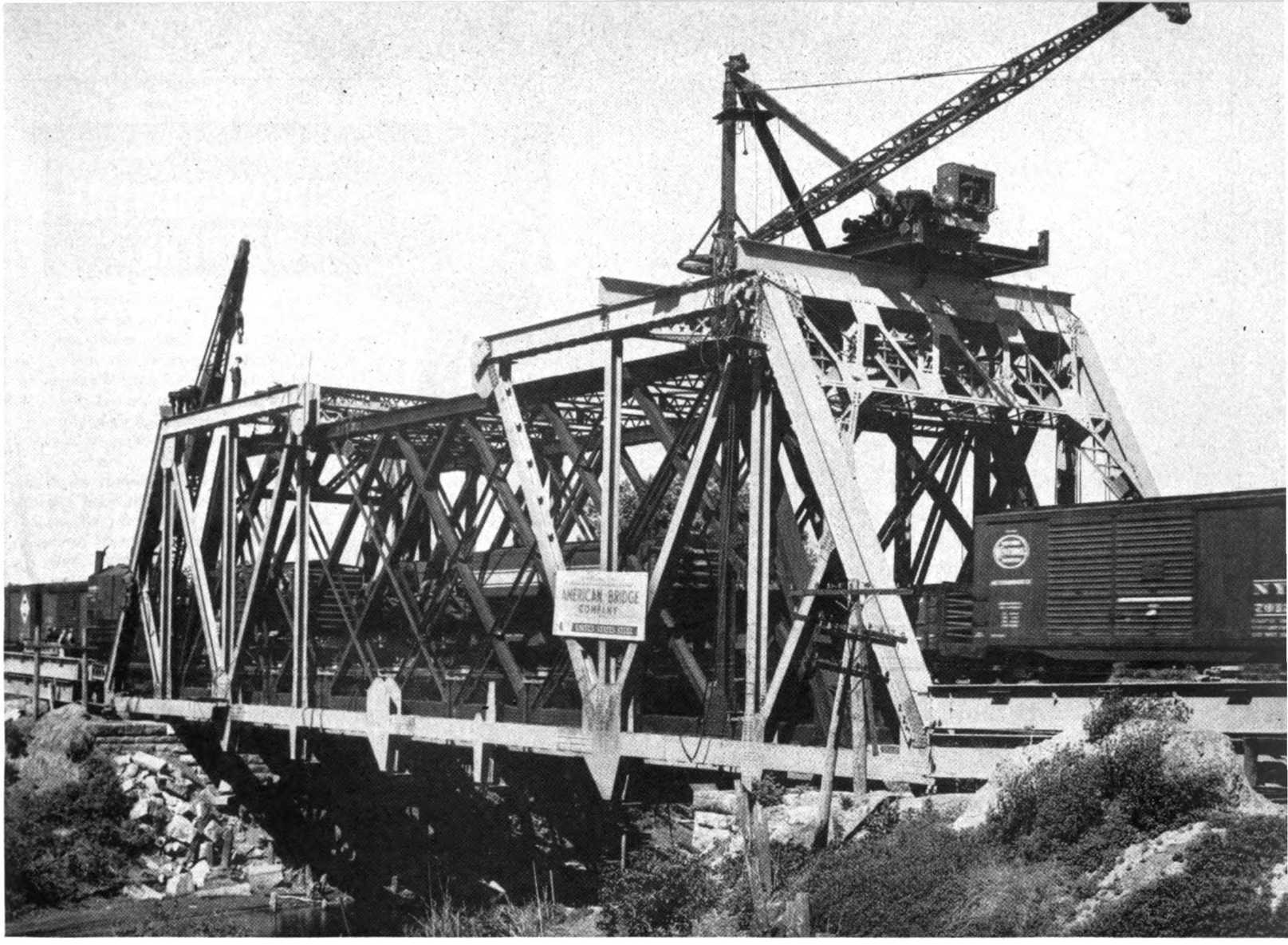
In the next step the steel center tower was shifted on skids into place on the old masonry pier. The new span was then lowered to the permanent bearings by the wreckers. The span has rocker expansion bearings at each end, and pin bearings at the center pier. The new ties were brought out to the span and distributed by locomotive crane at one end and wrecker at the other. The rails from the old drawspan were relaid on the new span.

The schedule of operations on April 30 was as follows:

5:00 a.m.—Began work.
7:05 a.m.—Began to drag span along track rails.
8:05 a.m.—New span in position over drawspan and lifted clear of the rails by the wreckers.
8:35 a.m.—Old drawspan rolled out to one side of bridge on falsework bents.
9:05 a.m.—Center tower in place on center pier.
9:55 a.m.—New span in place on permanent bearings.
2:00 p.m.—Deck and track rails in place on span and bridge ready for traffic.
2:30 p.m.—"Shoreland 400" Streamliner train crossed the bridge.

Traffic over this bridge normally consists of passenger trains, including two "400" streamliners daily, and switching movements to local industries. Through freight traffic is handled over a cut-off that by-passes the bridge. While the erection of the new main span was in progress two passenger trains were handled over this cut-off.

The erection work was carried out by the railroad's forces under the general direction of E. C. Vandenburg, chief engineer. The erection plans were prepared in the office of the writer. The field work was under the direction of J. P. Datesman, division engineer, and under the supervision of A. H. Deno, supervisor of bridges and buildings, and R. Henkey, steel crew foreman.



OLD BRIDGE ACTS AS SUPPORT of new truss span being built to replace it while traffic is maintained. This type construction has been used in erecting three new bridges across the Boyer river in Western Iowa. On bridge No. 886, shown here, a locomotive crane was used for erecting the end panels. It and a hoisting engine were used for the bottom chord, and a 65 ft. boom derrick for the rest of the truss and top lateral system.

BRIDGES

C & N W Erects Bridges With Little Traffic Delay

IN THE last two years the C&NW has had four large bridge building jobs which are particularly unique for the way the work was done. The four totaled $831,350 and consisted of a 162-ft long deck plate-girder span across the Sheboygan River, at Sheboygan, Wis. on existing foundations, ($76,640); a multiple span double-track bridge on concrete pile substructure at Arion, Ia., ($284,930); and multiple-span double-track bridges on concrete pile structure at Denison and Dunlap, Ia. ($234,890 each).

All are replacement bridges. The three in Iowa on the heavy traffic double track main line between Chicago and Council Bluffs, Ia. were erected without false work with very little disruption of traffic. Temporary steel beams were bolted to the underside of the old spans as supports for the new trusses during erection. Then when the new trusses were completed the old spans in turn were dismantled by hanging temporary supports from the new trusses. As it turned out, it was fortunate that there was no false work in the channel because the structures had to be carried through two high water periods.

Because construction of ditches to confine the channel of the Boyer river will result in a faster discharge of water the road considered it necessary to provide clear spans over the channel.

At Bridge No. 876, 3½ miles west of Denison, two 86 ft 6 in. double track through plate girder spans were replaced with a 175 ft double track through riveted truss span and two 47½ ft I-beam flanking spans; and grade was raised two ft.

At Bridge No. 886, 1.2 miles west of Arion, because of a skew crossing, one 150 ft double track through riveted truss span was replaced with one 190 ft double track through riveted truss span and two 47½ ft I-beam flanking spans; with a 6 in. raise in grade.

The third bridge, No. 913, 3½ miles west of Dunlap, Ia. had two 85 ft through plate girder spans and has been replaced with a 175 ft double track through riveted truss span and two 47½ ft. I-beam flanking spans, and grade was raised one ft.

The new spans were designed for Cooper's Class E-65 loading and 14 ft track centers, with 8 ft 6 in. side clearance to trusses. The old spans were designed for Cooper's Class E-40 loading and 13 ft track centers, with 7 ft side clearance.

The new piers and abutments consist of 24 in. octagonal reinforced concrete piles capped with reinforced concrete bridge seats. Because expensive coffer dams are avoided this type of construction is usually more economical than the mass type concrete piers on wood pile foundation. The concrete piles were jetted down through sand stratum and driven down to refusal in sand and gravel, using an 18,050 lb hammer, without leads. The penetration of the piles in the piers was not less than 25 ft below the lowest point of stream bed.

The bridge at Sheboygan involved the longest shop-riveted girder span ever shipped from the plant of the American Bridge Co., at Gary, Ind. and required a unit of five flat cars to transport. When it arrived at the bridge site, this 162 ft long span, equipped with special shoes,

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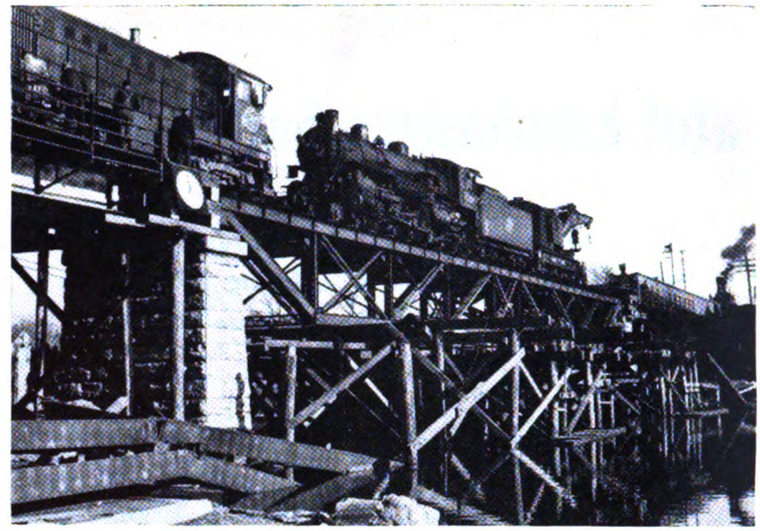
was set on the running rails of the main track by two wreckers and dragged on the rails into position over the old span by a diesel-electric locomotive and a steam locomotive coupled to one of the wreckers. To complete the job the two wreckers lifted the new span clear of the track and held it in raised position while the old span was rolled to one side on falsework. The new span was then lowered into place. The entire installation from the time track was taken out of service until it was opened for traffic was 7 hrs.

The road has found that by giving the steel crews the most modern type of equipment its erection work has been facilitated and costs kept to a minimum.

About three years ago the first real steps were taken to mechanize B&B gangs. A complete electrical tool set was assembled consisting of a small 2½ kw generator, a 12-in. portable saw, a ¾-in. electric drill, a slow speed nut runner, and a 1½-in. electric pump. In addition the mechanized unit included a gasoline-engine-driven chain saw for cutting heavy timbers. The entire outfit cost $1750 and is paying its own way.

The generator also can be used for lighting night work. So satisfactory has been the work with the 12 units the road now has that it is purchasing four additional complete sets each year. The heavy bridge maintenance gangs are being outfitted with them first. Along with these the road has also purchased eight lightweight derrick cars that will pick up and set timbers and other light structural pieces.

It is the road's policy to replace trestles with precast concrete or coated steel culverts wherever drainage conditions will permit.



WHEN THE 140-TON SPAN, longest of its kind ever shipped from the plant of the American Bridge Co. at Gary, Ind., arrived at Sheboygan for installation, a diesel switcher was coupled to a steam locomotive to pull the new span on the bridge.

Below:
THE NEW 162 FT. LONG SPAN was lifted clear of the old span by two wreck cranes and held in raised position while the old span was rolled out to one side on falsework bents. The new span was then lowered into place. The entire job took seven hours.