

Field and Office

Replacing Timber Bridge with Steel-Girder Spans

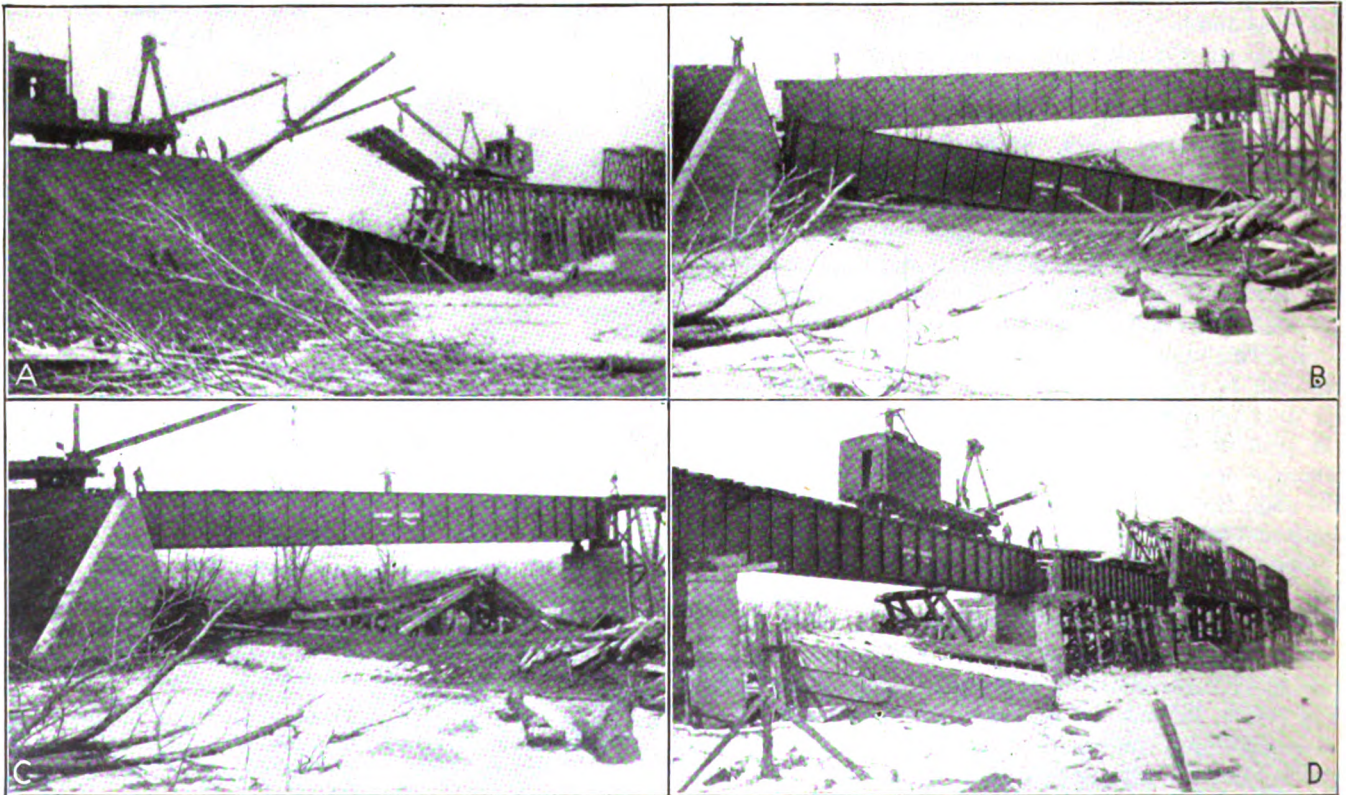
The Fort Dodge, Des Moines & Southern R.R. (a 120-mi. electric railway) crosses the Des Moines River at a point about 6 mi. west of Boone, Iowa. The original structure, built in 1903, before the road was electrified, was a wooden bridge consisting of one 150-ft. and two 104-ft. Howe truss spans, with 692 ft. of trestle approaches. The new bridge will consist of four 96-ft. and three 103-ft. steel deck-girder spans, the remaining 357 ft. being filled. Three of the 96-ft. spans were placed in the fall and winter of 1914-15, and three of the timber spans are still in place. The progress of the work is shown in the accompanying views.

The concrete work on the abutments and piers was done by company forces. The equipment consisted of a $\frac{5}{8}$ -yd. mixer and a timber tower with a steel boom to support the chute. The boilers supplying the mixer and hoist engines were interconnected. Water for boilers and mixer was drawn from the river by means of a steam jet fitted with a Y connection, which could deliver water either to boilers or to mixer.

The gravel was hauled to the site in ballast cars and dumped over the side of the bridge at a point convenient to the work. The cement was chuted from the cars on the bridge above to a platform at the cement shed.

The original plans called for 700 cu.yd. of concrete in the abutment and 200 cu.yd. in each of the three piers, but the footing of the abutment was placed about 4 ft. lower than at first intended, thereby increasing the yardage to 1,450. The force consisted of two engineers, two firemen, one man operating the hopper, one man wheeling cement to the mixer, three men wheeling gravel, and one man spading concrete as it was dumped into the forms. Four men were used on the forms, and from eight to ten men were excavating for the piers while the concrete of the abutment was being placed. With this force and equipment 80 cu.yd. per day was placed when no delays were incurred. The average for the total number of working days was 60 cu.yd. per day.

The filling of 280 ft. of the pile approach on the south end was started Nov. 25. The average height of this fill was 25 ft. The material was hauled from the company's gravel pit, about 2 mi. from the bridge. The equipment consisted of a Vulcan 2-yd. steam shovel, 40-ft. side-dump gondola ballast cars pulled by a 35-ton electric locomotive, and a standard gravel plow with a 1 $\frac{1}{2}$ -in. cable. The plow cable was coupled to the engine by a Goodman wrecking hook, which after trials of other devices was found the most satisfactory for this purpose. This work was finished Dec. 8; 8,000 cu.yd. was placed by this method in the ten elapsed working days.



REPLACING A TIMBER-TRUSS BRIDGE WITH PLATE-GIRDER SPANS, FORT DODGE, DES MOINES & SOUTHERN R.R.

A—Girders for new end span landed on the ground and two derrick cars removing deck of old trestle. B—Placing the first girder with two derrick cars; note sway bracing on girder. C—First girder span completed. D—Two derrick cars setting girders of third span in place, girders temporarily outside of normal position, resting on cap timbers on piers. Three of the old timber spans still standing.

The work of steel erection was done by contract in February, 1915. To handle the girders the contractor used two derrick cars, one of 75-ton and one of 50-ton capacity. The plan first proposed was to build falsework bents upon which to land the girders; but after only two bents had been driven, the ice went out, carrying the bents with it. This plan was then abandoned, and the girders for two spans were first landed on three 8x16-in. stringers, 32 ft. long, placed flatwise across the piers. For the end span, the girders were placed on the ground.

The old wooden deck was then cut directly over the piers and halfway between them. A derrick at each end of the span picked up half of the deck and carried it out to the fill at the end of the bridge. Then with a derrick at each end the girders were landed in place. These changes were made, the new track laid and traffic resumed in three hours. One span was erected each day, all the steel being placed in three consecutive days.

The work was done under the direction of the Maintenance-of-Way and Bridge and Building Department: L. E. Gagnon, Superintendent of Maintenance-of-Way; R. L. Cooper, Chief Engineer. The late W. M. Hughes, of Chicago, was consulting bridge engineer. The Farrell Construction Co., of Chicago, had the contract for the steel erection.



Power Shovels for Trenching

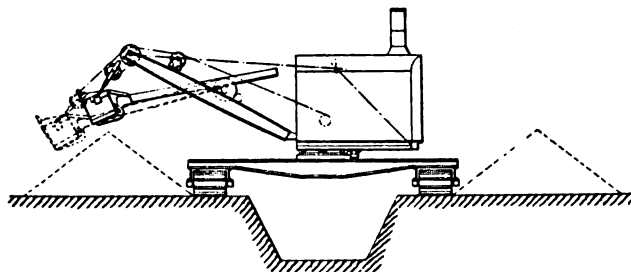
Practically any power shovel can be rigged to dig a trench. The best one for such service is the one that requires the shortest time for set-up, can handle the most material in a given time and costs least for repairs. Ordinarily a steam-shovel boom is maintained at a definite angle by means of hogrods. In the past six months at least two manufacturers have concluded that an arrangement for raising and lowering the boom has advantages over the rigid boom rods. This involves the use of an extra drum installed on the stayframe and geared to the main hoisting drum. A 5/8- to 7/8-yd. shovel—the popular size for small contractors—is generally equipped with a 17-ft. boom and dipper sticks 18 to 19 ft. in length. In order to go down 14 ft. or deeper, this boom and dipper handle have to be replaced by a boom 20 ft. long and a dipper handle 22 ft. in length.

With a boom raising and lowering device the extra reach required for deep digging is obtained by dropping the boom a few feet. The Osgood Co., of Marion, Ohio, which employs this arrangement except where the contractor specifies hogrods, cites a recent case where one of its Model 18 shovels, equipped with this device, excavated a sewer trench 46 in. wide, 15 ft. deep and 150 ft. long in a 9-hr. day. The material consisted of very dry and hard clay mixed with boulders. In another instance a similar machine excavated a sewer trench 17 ft. deep, 9 ft. wide and 76 ft. long in 7 1/2 hr., loading one half of the material in wagons and depositing the other half on one side of the trench.

Like other shovels, this model may be equipped with a 3/4-yd., a 5/8-yd. or a 1/2-yd. dipper, depending upon the nature of the material encountered and the kind of work to be done. For sewer-trench work the manufacturer recommends a special narrow dipper with the hitch on the back. In extremely deep work this type of dipper greatly reduces interference in filling. The dipper is

generally fitted with five teeth, three in front and one on each side, the side teeth serving to draft the dipper into the side banks of the trench. A cutting lip is available (instead of teeth) wherever the character of the soil suggests its use.

The raising and lowering arrangement is, of course, not an exclusive feature of any shovel. All makers have



SMALL REVOLVING STEAM SHOVEL MOUNTED ON WIDE TRUCK FRAME EQUIPPED WITH CATERPILLARS

This arrangement—Osgood 18 fitted with boom raising or lowering device—is applicable naturally to soft ground, and avoids planking or artificial foundations. It is effective in excavating lateral ditches and in deepening or widening old channels.

used it in special instances, such as where the shovel is equipped with an exceptionally long boom for grab-bucket work, for locomotive-crane or derrick service, or for work in cities where the shovel must pass under overhead obstructions. If the contractor is willing to pay the extra cost occasioned by this device (about \$150 in the case of small shovels), any shovel manufacturer can accommodate him. That the expense is worth incurring where there are trenches to be dug with steam shovels cannot be denied.



Red-Lead Finishing Coats

Since the Havre de Grace bridge test showed three-coat red-lead work in first and second place for endurance there has been some attention given by bridge engineers to the use of red lead for finishing coats. The most interesting recent case of red-lead top coats is the heavy plate-girder crossing of the Nickel Plate over the Illinois Central R.R. at 79th St., Chicago, whose design and construction were described in *Engineering News* recently. The structure was painted with three coats of red lead, the second and third coats being tinted with lampblack to different shades. The third, or final, coat was mixed with 6 lb. of lampblack per 100 lb. of red lead, giving a very dark brown color. The total rate of paint consumption on this structure was 1 gal. per 20 tons of steel, but in considering this it must be mentioned that the floor steel is incased in concrete and thus does not expose any painting surface; if the figures are corrected by taking account of the tonnage not painted, the steel covered is about 11 tons per gallon, according to George H. Tinker, Bridge Engineer.

The lower 5 ft. of the Sewall's Point coal pier, Virginian Ry., was painted three coats of red lead—the top coat black and the second coat brown, obtained by different admixtures of lampblack. F. F. Harrington, Engineer of Structures of the railway, says that the following paint mixtures were used, after cleaning the steelwork and removing the rust with scrapers and iron brushes:

	First Coat	Second Coat	Third Coat
Paste red lead, lb.	100	100	100
Lampblack-in-oil, lb.	6	52
Chinese blue-in-oil, lb.	16
Linseed oil, gal.	2.9	3.64	15.20
Paint, gal.	5.02	6.42	24.55