2, 4, 6, etc., are completed, and so on until the completion of the work. (Fig. 5.)

About one-half of the work at Bates Island Bend was completed during the season of 1912, at which time it was not thought necessary to make provision for expansion joints, but during the hot weather of 1913, the necessity of expansion joints became evident when several of the

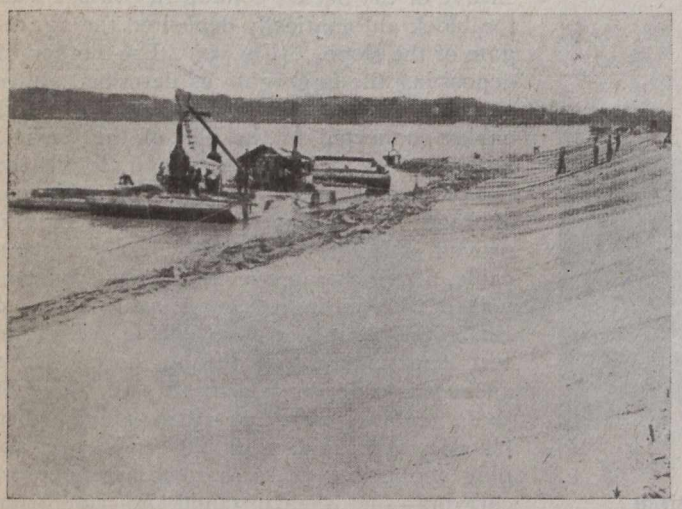

Fig. 5—Concrete Mixer and Delivery Plant; Also Completed Section of Paving

slabs buckled up at the joints. In all cases where the slabs had buckled, which occurred at about 1,000-foot intervals, the joints were cut to let the slabs resume their natural position; because of this defect the remainder of the revetment was provided with ½-inch expansion joints every 50 feet to allow the slabs to expand or contract lengthwise of the revetment.

Cost

As stated above no charge for plant depreciation has been entered into the cost of the revetment, but from the field cost as shown, a liberal percentage of cost of plant depreciation can be added and the total for this type will be under that of the standard type. The statement given below contains only field expenditures with the cost divided as follows:—

Grading bank	$0.55 per lin. ft.
Weaving mattress	1.98 " " "
Concrete blocks in place	1.16 " " "
Ballasting mattress	1.13 " " "
Concrete paving	2.76 " " "
Total	$7.58 per lin. ft.

As two other pieces of this type of revetment have since been completed under similar conditions, their costs are given here for general comparison, and, to a certain extent, permit the establishment of a proper basis for estimates.

Marthasville Bend: 11,960 feet at $8.05 per linear foot, completed November 25th, 1914.

The cost is divided as follows:—

Grading bank	$0.84 per lin. ft.
Weaving mattress	1.85 " " "
Concrete blocks in place	1.56 " " "
Ballasting mattress	.83 " " "
Concrete paving	2.97 " " "
Total	$8.05 per lin. ft.

Dewey Bend: 7,215 feet at $88.13 per linear foot, completed December 17th, 1915.

The cost is divided as follows:—

Grading bank	$0.67 per lin. ft.
Weaving mattress	2.31 " " "
Concrete blocks in place	1.45 " " "
Ballasting mattress	1.22 " " "
Concrete paving	2.48 " " "
Total	$8.13 per lin. ft.

Failures

Before the work at Bates Island Bend was completed one break occurred where the paving was undermined, and the slabs broken in a diagonal line, down stream from the water surface to about 15 feet up the slope, over a length of about 100 feet. The exact cause of the break could not be determined, for, as nearly as could be ascertained by soundings the mattress and blocks seemed to be intact and later investigations confirm this fact. The break was located in a strong eddy (produced by a submerged false point which was not known to exist at time of construction), and the nature of the soil in the bank, fine sand, below the eddy was very unstable, which may account for the bank sliding or being sucked out between the interstices of the mattress. This break was successfully repaired with a brush and stone fill to fair out the bight and break up the eddy.

The revetment withstood the high stage of 1914, only to be battered and damaged during the continued high stages of 1915. This failure was described in the Annual Report of the Chief of Engineers, 1916, as follows: "This revetment (Bates Island Bend) was badly damaged at intervals, for a distance of about 6,000 feet from the lower end; so far, a satisfactory reason for this damage has not been determined, as much of the paved bank with mattress and concrete blocks is intact at toe of slope, the breaks being mostly in the paving, 8 feet above the low-water line, where the slabs, with reinforcing strand and wire are broken in every conceivable manner and shape, the strand and wire being sheared off as though with a knife. At low water, about 1,000 feet of this revetment from the lower end, shows up with the bottom row of 8-foot paving slab intact, with a pocket of water 6 to 8 feet deep behind the line. The breaks in this revetment, except the 1,000 feet at lower end, were repaired with brush and stone fills to fair out the slope line, in all 2,956 linear feet."

Sufficient time has not elapsed to pass on the positive merits of the monolithic type, nor do the failures noted seem of such seriousness as to warrant its discontinuance, but from the many methods of slope paving and subaqueous bank protection still in the experimental stage, the problem seems to remain unsolved, and because of this, there will be no attempt made to forecast the values of any type of bank protection, as the number of unknown forces constantly in operation toward deterioration precludes any prediction of permanency.

Grant Hall, vice-president and general manager of the Canadian Pacific Railway's western lines, was waited upon at Regina recently by the Hon. Charles Dunning, provincial treasurer and director of food productions, Alberta; J. A. Maharg, M.P., president of the Saskatchewan Grain Growers' Association, and George Spence, M.L.A., for Notukeu, representing a provisional railroad organization in the southwestern part of the province with reference to the construction of branch lines in the south western parts of the province.