

of replacing these structures with permanent work as shown above will be about \$1,000 per bridge, or the total cost for building all the bridges of permanent construction will amount to \$1,600,000 per county, or for the ninety-nine counties in the state the cost of permanent bridges will be about \$158,400,000.

The state has expended in the past year, approximately \$7,500,000 on roads and bridges; an average of \$76,000 for each county. The proportionate expenditure for roads or for bridges cannot be accurately determined, but the bridge fund for the majority of the counties is close to \$30,000 per year. In addition to that, the townships spend a large amount of their road fund on culvert work so that the funds as now spent are about equally divided between roads and bridges.

Any railway operating on sound business principles would have an efficient organization to superintend the expenditure of any considerable amount of money. They would demand complete plans and specifications and records which would show itemized statements concerning every dollar spent. No money would be paid out of the treasury until it could be shown to the board of directors that it was a legitimate expense. To secure these results they would employ an efficient engineering organization to make the surveys, establish the grades, write specifications, draw the plans, superintend construction and keep the construction records clear and straight.

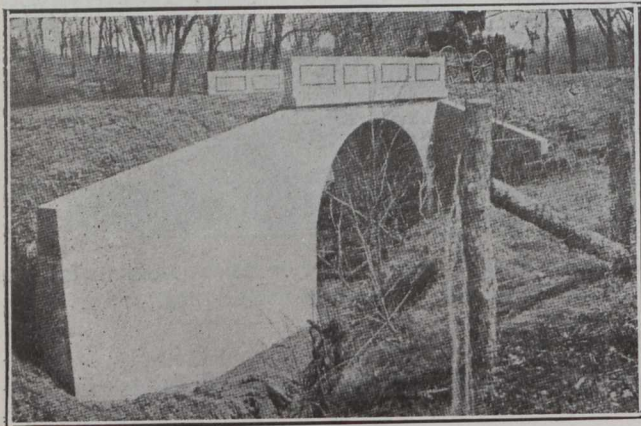


Fig. 2.—A Good Example of Improper Location and Excessive Length of Wing Wall.

Let us compare such an organization with the one in vogue in many of the counties of the state. It is a fact that the majority of the money spent on road work last year was expended without a plan or profile on file to show where or how the money was to be used.

Last season, one county confined the attention of their elevating grader crew to a short strip of road, possibly three miles in length. This work was in a hilly country where much cutting and filling was necessary, yet no survey was ever made of the road. When the work was completed, the superintendent was unable to tell the total yardage of material moved, or what the cost for moving the material had been per cubic yard. Had plans been prepared for this work and accurate cost data kept it would have been particularly valuable to the county in estimating future work under similar conditions. Most of the grading work has been done in such a manner as to provide insufficient surface drainage. Roads are graded and well crowned, yet the side ditch drainage has been incomplete. The water is allowed to collect in low places in the ditches and stand there until it evaporates or soaks into the roadway.

An example of absolute waste of money came to our attention recently. The board of supervisors, together with a number of interested taxpayers, attempted to construct a gravel road approximately nine miles in length. This road was located on low land with little surface drainage. Gravel was hauled upon this road and dumped so as to give a depth of ten inches. No provision was made for either sub-surface or surface drainage. The road was not even crowned before the gravel was placed. Such violation of engineering principles are costly experiments to the taxpayers, and show gross neglect or incompetence on the part of the supervising official.

The loss of money has not been confined to roads alone; investigations show that a very great loss has occurred in the bridge fund. Much of this loss is directly due to the yearly contract system which has been in vogue in many of the counties of the state. Under this system bridge contracts are let in blanket form. They call for no specific number of bridges and no specific location for any bridges bid upon, and as a result, the general design and the location of the structure in the field is left to the supervisor and bridge company's foreman. When such a contract is let, it is impossible to have detailed plans for the various bridges. Where any plans at all are submitted with the bids, such plans are incomplete, and will not fit the varying conditions of the different locations. Consequently when any bridge is built, there is item after item of extra charge for work not called for in the contract. Such charges, for work not covered by the contract, often run the price of the completed work up to a figure far in excess of what the work is worth, or what it might appear from the contract that the total price would be.

As an example of this, the following bill rendered by a bridge company for repairing an old 60 feet steel span is a good illustration.

To building 2 concrete abutments 12 feet deep and encasing old piers:	
Building 1 (10-ft. 6-in.) wing, one 11-ft. 6-in., one 25-ft. 9-inch, and one 11-ft. 6-in. wing.....	\$2,935.00
Driving 11 steel piles at \$7.00 each.....	77.00
Lowering old bridge 4 feet and cutting off old cylinders .....	160.00
Filling north and south sides, including removal of old approaches .....	184.00
Laying floor and hauling lumber and freight on same to Follett's .....	36.00
Steel joists for 60-ft. span at \$5.50 per ft. ....	330.00
Lattice railing on span .....	96.00
Angle to reinforce floor beams for holding joists and drilling floor beams .....	74.00
	<hr/> \$3,882.00

This bridge after being repaired was yet an old, flimsy, steel bridge with wooden floor, and will have to be replaced in a few years. Under the same contract the county could have built a new 60-foot riveted steel bridge with concrete floor for \$3,830.00 or an amount of \$52.00 less than the price paid, and this price (\$3,830.00) could have been reduced several hundred dollars if a competent engineer had been employed by the county, before letting the contract, to plan and superintend the work.

These specific examples are only a few of the many which occur each year under the present system. It is the direct result of the hit and miss methods of road construction that are costing the counties thousands of dollars annually. We are trying to build roads with only a part of an organi-