

necessity was up-ended slowly in floating out the mixture upon the pavement. As it reached the upright position in this operation, a man, detailed for the purpose, threw a bucket of water into the box each time, so that a portion of the sand, going out of the box last, went out entirely cleaned of cement. The sand was put into a wheelbarrow and wheeled to these boxes; the proportion of sand was greater than one-half (at least an uncertain quantity), because it was not measured. A sack of cement was then put into the box and the same only stirred three times over with the hoe. In no instance was it brought to an even shade by the mixing process. The water thrown into the box while in its upright position only assisted in washing the cement to the gutter, so that in the gutter and into the place for the expansion cushion went the mixture of almost pure cement, while the crown of the street was filled with a mixture not richer than four parts of sand to one of cement; in certain parts not even so rich as this, and owing to the large quantity of the mixture deposited on the street at one time, and the water flowing promptly to the gutter before it could be swept in, it left the mixture thick enough to bridge the interstices, so that many of them were not filled at all. The use of the squeegee at angles of 45 degrees seems not to have been suggested at all to prevent hollowing out the interstices.

Even a member of the Board of Public Works contended that the application of the expansion cushion as mentioned was required by the specifications under which the street was being built, but an examination of the specifications showed them to be correct and the board member wrong. From the ignorant manner of putting in the filler the disastrous results could readily be observed, even while the work was going on. But the incongruity of the affair: such lavish expenditure of the taxpayer's money on the one hand and such woeful ignorance on the other—yet all this in a vigorous American city of unusual thrift and intelligence. The condition of that street even one year hence is perfectly apparent through this operation, the cement bond having already broken on a portion of the finished street. In less than one year the whole street will be in a far worse condition than it should be at the end of twenty years' use.

Contrast, if you please, the condition of this work with that of the five-year-old finished street, Jennings Avenue, Cleveland, O. Though utilized by two street car tracks, its beauty, utility and satisfaction as a city street and the extraordinary care and skill with which it was constructed are scarcely possible of description. Its very sight is inspiring. You can cross and re-cross the street without any knowledge of the car tracks, if you but close your eyes. Not a single wave, depression, jolt or jar discernible, either to the eye or by use of the street. The foundation is but 6 inches and the brick are but 4 inches in depth, and, although the traffic is four or five times that of the street just mentioned, its five years in use have in no wise reduced its worth. It bears every evidence and every promise of 100 cents on the dollar in value at the end of ten or fifteen years in use. If it were possible to afford a critical examination of that street on your part at this time, I do not think you would call me extravagant if I would say twenty-five years in use would not depreciate its value sufficient to call for repairs. In the one case may be found a sacrifice of \$65,000 upon the altar of ill-considered plans and unskilful and ignorant execution. In the other, the investment of a like amount is maintained at full worth and answering its purpose completely.

In one of our larger cities another brick street was in construction. In this case the specifications were right. The concrete foundation was put in in fairly good condition, but should have been much smoother. The sand cushion was not compressed, and was much intermixed with sticks, wood

and broken stone. The brick were dropped into the street regardless of best edge up. The provision for expansion was a board 5 feet in length, $3\frac{1}{2}$ inches in width and $\frac{3}{8}$ of an inch in thickness. The board was taken out and the expansion cushion even poured before the rolling of the brick, preceded, however, by the filling of gravel in the crevices at least one-half way up the brick, to prevent the roller from closing the opening entirely. The rolling began at the crown instead of the gutter. A husky, muscular fellow was delivering the portion of sand in a wheelbarrow, while a physically weak and decrepit one was delivering the cement. The proportions corresponded to the individuals doing the work. This mixture of sand and cement was made upon the sidewalk, shovelled dry upon the street, shot at with the hose. Most of the cement went into the sewer. This was overseen by an inspector in constant service for the city, supervised by an engineer, but all characterized and dominated by an ignorant contractor, in constant complaint with the citizens and officials to the effect "that it was impossible for him to make a good street, being compelled to use brick that were for the most part culls;" yet in truth and in fact I have never seen a better delivery of brick anywhere.

The engineer was not the commander, but the menial, so servile that his suggestions were met with virulent abuse from the contractor—yet this job involved an expenditure of not less than \$100,000.

Suppose you, under circumstances of this sort, that satisfaction could be guaranteed, and that the money was not thrown away? But the tension and irritation of this experience was greatly relieved by another experience, but not in the same city, yet where a like contract was being executed. At its very inception the engineer, deputies and inspectors were upon the ground. Intelligence and sound judgment were exercised in every detail, and, though the contractor stormed and fumed, he soon realized that he was bound, hand and foot, to the specification as it read. Neither argument, abuse nor irony affected in the least bit the attitude of the engineer. The contractor, in less than one hour, reversed his disposition and skilful results followed, yet no more and no less was expected or required of this contractor than that which was written in the specification. The cost of the improvement was about the same in the aggregate as the one mentioned preceding, but the taxpayer got value received, dollar for dollar.

A picture of future results is fully and fairly illustrated by what was observed by the committee on brick paving from this society in a little trip taken by them in July, in the condition of Linn Street, Cincinnati, and that of Holmden Avenue, Cleveland. Each about the same length of time in use, of similar brick and similar use, but what a difference by contrast in the present condition! Measured by money value, a difference of about 90 per cent., but that difference as found to-day was simply the difference that might have been observed at the time the two streets, respectively, were built.

These observations, gathered fresh from the field within the past few weeks, seem extreme, but they fairly represent the ebb and flow of the tide in character and practice of municipal work, and, while these illustrations involve only brick street construction, such conditions are not confined to brick street construction alone, but permeate all branches of municipal work, and to an extent that is absolutely alarming, and afford a black spot upon municipal government in this country.

Is it not, therefore, the duty of every patriotic citizen to change this state of affairs? Is it not the duty likewise of every engineer to eliminate from his profession every-