

tenance costs include a proper consideration of the initial expense or "investment," as well as the actual charges for performing the repairs themselves.

Possibly the erection of bridges and waterways came next in the line of progress and then improvements in the methods and the selection of materials for their construction.

Later was inaugurated such a consideration of the traffic and its resultant strains on the road as would tend to result in a permissible reduction in the amount of the "investment," without danger to the satisfaction with the result, and as would still further reduce the maintenance charges by a reduction in the factor of interest on the investment.

At the present time, the latter item is perhaps uppermost in the minds of highway engineers. A proper consideration of the amount and character of the traffic on a road is the basis for an accurate determination of the kind and amount of work to be done on it, and an essential also in this connection is an accurate record of the costs of repairs under known conditions of the locality, of the construction, and of traffic.

In 1907 the writer, after considerable investigation, was impressed with the unfortunate lack of knowledge on the part of highway engineers generally, concerning the amount and character of the traffic over those sections of modern roads where otherwise important conclusions might have been drawn because of the completeness of the records of the details of their construction, but from the lack of this information regarding traffic, where actually the most valuable conclusions were lost, and he then suggested in a published article the desirability of obtaining, and recording for the general benefit, detailed data of this sort. He desires here to express his cordial appreciation of the work that has since been done in this line by Messrs. Johnson of Illinois, Blanchard of Rhode Island, and by the Massachusetts Highway Commission and others, and to express his belief that the results of their work will be greatly appreciated by all highway engineers. Without just such data in connection with the records of the construction of the roads themselves, it would be impossible to prove the value of the methods of construction used, or the real value of the investment made, to say nothing of drawing a fair comparison in maintenance costs.

Just at this period, it seems to the writer that the profession of highway engineering is undergoing a greater transition than ever before. With the awakening of its importance as a branch of the science of engineering has come almost simultaneously a wonderful change in the traffic conditions to be met. It is to be regretted again that records of previous traffic conditions are not available for purposes of comparison, and the best that can be done now seems to be to secure without loss of time these records from such places as have experienced to the least extent the change mentioned.

Under the new traffic conditions, previously accepted standards seem to be unfit for following and new ones seem desirable. Many minds are at work on the problem and undoubtedly it will soon be solved. The writer believes that the solution will not only meet the new demands, but will also result in even greater economy than existed in many cases previous to the change in the traffic.

The writer wishes to call attention to what he believes an important point in this connection. He regrets the tendency apparent in some quarters to throw away, in view of the recognized agreement that even the best water-bound "macadam" is unfit for the new traffic conditions, all the carefully arrived at conclusions regarding its construction and to start entirely afresh with some, at least, new materials, ignoring the work of many years. He believes such a course

most unwise and that there are still many of the old principles that should be firmly adhered to. Admitting the introduction of a cementing medium to the broken stone aggregate as necessary for modern work, it by no means follows that the original principles of proper foundation, sufficient drainage, etc., etc., can be ignored simply because of the presence of this cement. On the contrary, any departure from these fundamentals should be most carefully considered and only made continuously. The reduction to the minimum of the voids in the "metal" is as important now, if not more so, as ever before.

It may quite likely be true that the sizing of the pieces of metal may be advantageously modified to secure better results and to partially, perhaps, offset the cost of the introduction of the cement, but it is just as likely that even greater care will have to be exercised in the performance of the sizing. It is probable that readily available materials, heretofore excluded from use because of their lack, for instance, of cementing qualities, will be made available for the use of the cement, but it is also likely, as has been suggested by Secretary Fletcher of the Massachusetts Highway Commission, that even greater care will have to be exercised in the selection of the metal in order to provide for future traffic changes induced by the new road surface itself, and that materials heretofore successfully used will henceforth have to be rejected. Let us "hold fast to that which is good" and try to develop, rather than to attempt to create just at this time, and until the information referred to as desirable in the matter of traffic conditions, and new data now being collected concerning the character, use and results of the cement media, are available.

An apparent tendency, in certain instances, to abandon all previous conclusions as to construction methods and materials, and further to issue a dictum that future work should all be done along certain lines seems to the writer regrettable and inopportune. It seems to him that conclusions along general lines will be attainable in the near future, though of course it should go without saying, allowances will always have to be made for local conditions, but that in the meantime, much work will have to be done and a large amount of information from many sources will have to be secured.

CONCRETE WEAKENED BY HEAT.

That the builders of reinforced concrete structures have room for some improvement in their methods, is evident from a report made by Mr. G. A. Stange, adjuster for a Chicago firm. It concerns a loss on the reinforced concrete building of F. B. Klock at South Elgin, Ill., used for the manufacture of drugs. The adjusters contended that the concrete floors and ceiling were not damaged sufficiently to be torn down, but the owner claimed that the concrete had been weakened by the intense heat, about 60,000 pounds of drugs having burned.

It was decided to test the building by putting a weight of 400 pounds to the square foot on the panels, which were to be held defective if they deflected more than 3-16 of an inch, that being the original test made by the architect when the building was turned over to the owners. Tests were made of eight panels involved in the fire, all of them showing considerably more than 3-16 of an inch deflection with only 250 pounds weight to the square foot. When the same weight was applied to panels in other portions of the building not affected by the fire the deflection was less than 1-10 of an inch. In consequence a total loss was allowed on six panels and a compromise on two.

The adjusters hold that had the building been of any other construction than concrete it would have been totally destroyed, owing to the tremendous heat engendered by the drugs burning. The expansion of the reinforced steel under the intense heat is believed to account for the weakening of the concrete.