

until an advance of fifteen to twenty yards has been made, when the same force and appliances shall be turned back and cover the same space in like manner, except to make the proportions two-thirds Portland cement and one-third sand. To avoid the possibility of the thickening at any point there should be a man with a sprinkling-can, the head perforated with small holes, sprinkling gently the surface ahead of the sweepers. Within one-half to three-quarters of an hour after this last coat is applied and the grout between the joints has fully subsided and the initial set is taking place, the whole surface must be slightly sprinkled and all surplus mixture left on the tops of the brick swept into the joints, bringing them up flush and full. After the joints are thus filled flush with the top of the brick and sufficient time for evaporation has taken place, so that the coating of sand will not absorb any moisture from the cement mixture, one-half inch of sand shall be spread over the whole surface, and in case the work is subjected to a hot summer sun, an occasional sprinkling, sufficient to dampen the sand, should be followed for two or three days. The first application should be thin in order that it may flow to the depth of the joints of the bricks, thereby insuring a substantial bond, and should be kept in constant motion while being applied, otherwise the sand will settle, and you will have water and cement instead of water, sand and cement. The water and cement wouldn't be objectionable, but the sand by itself is wholly so. It must also be mixed in small quantities, as it is next to impossible to keep the sand in suspension when more than a common water pail of each, sand and cement, is used, and unless it is deposited upon the pavement with the sand in combination with the solution you will get the cement and water in the lower portion of the joints between the bricks and the sand without the cement in the upper portion. It is preferable, after the sand and cement have been mixed dry, to apply sufficient water and mix slowly, first to a good mortar, then add sufficient water to bring the mortar to the required consistency. By this method a more thorough adhesion of the cement to the sand can be obtained."

The following practices have come under my observation:—

I have seen the filler dipped from the mixing-box with a bucket and carried many steps. In such case the sand was on its way to the bottom of the bucket and the cement was making for the top. I have seen the mixture placed in a cradle or rocking-box and in the time intervening the turning of the box the sand and cement were undergoing a like separation, and as the box was turned the richer mixture of cement flowed ahead and the weaker and sandy portion remained near the box. I have seen the water applied before the mixture in a dry state reached an even shade, thus preventing the proper adhesion of the particles. To remedy the thickening of the mixture I have seen it entirely ruined by throwing upon the street the water from an open nozzle, which served only to float the cement away from the sand. I have seen the mixture put upon the street much faster than it could be swept in. I have seen the mixture prepared in a dry state in large quantities at intervals of a few feet upon the brick, and the water applied and the sweeping-in process undertaken simultaneously. I have seen the mixture made up in such large batches that it required a sweeping of several feet before it could be made to disappear in the interstices. In such cases the last that went in was but very little better than pure sand. I have taken a quantity of sand from the supply to be used for filler purposes and found that it contained 33 per cent. of soil. Thus, I might enumerate for hours the manner, method, and means of applying the cement filler in the interstices of a brick street, each and every one of which was but to insure a failure, and in none of which is economy to the contractor subserved.

By the proper method, here insisted upon, the hoes are drawn by two workmen to the upper portion of the box, and the backward flow agitates the mixture equally with that of the stroke. The lift of the scoop immediately following, the box sufficiently adjacent to the work, so that instead of a motion which pitches it is rather a quick motion on the part

of the workmen that pulls from under the mixture the scoop, allowing the mixture to strike the surface of the brick in proper proportion, thus most nearly insuring it in place in proportion than by any other known method. By the use of three boxes and a systematized force, the greatest economy to the contractor is subserved and the greatest possibility of the cement filler is attained.

The boards in place providing for the cushion should, after a lapse of twenty-four hours and sooner than thirty-six hours, be withdrawn and the space filled two-thirds with a pitch filler. Then, finally, a covering of sand sufficient to hold moisture and protect the cement filler from extreme heat while setting is imperative. The street having been finished in all respects with great care and skill is sometimes entirely ruined by using it before the cement filler is sufficiently set. That this is done seems inexcusable, yet it is done sometimes by the very person who is taxed to pay for the street. We stand for the cement filler because it meets fully all the requirements. It forms a part and parcel of the ideal brick street, which no substitute can supply. If these conclusions are correct, that our manner, method, and practice is the best, and that they do not add greatly to the cost, neither are they difficult, why are they not generally complied with? But in asking this question again please do not misunderstand or infer it is coming from a pessimist. On the contrary, I am exceedingly optimistic in this whole matter. In many cities and smaller towns of the middle West the public have long since understood what they can have, and they will only have brick streets at their best. In certain cities of northern Ohio, Michigan, parts of Indiana and Illinois are found the best examples. To such an extent is this true that at least 80 per cent. of all the pavements laid in the last two years have been brick. Nor do I believe that the municipal engineers of the country are to blame for a non-compliance with these directions in brick street building.

One reason why a compliance with the specifications and directions are not observed is that the performance of each particular step in the construction of a brick street is left to a foreman chosen by the contractor. It is almost universally so that such foreman has his set way of doing this or that particular thing he is charged with, and rebels against an innovation in his practice. We sincerely believe that progress for betterment in this particular may be accomplished by embodying in the contract between the municipality and the contractor, as part of the requirement, that the contractor be obliged to supply his foreman with particular specifications and directions covering such portions of the work with which such foreman is charged. This suggestion, however, is only remedial to a degree, and does not, of course, meet the difficulty in full. Another reason is that, in some localities the results of a properly constructed brick street are not appreciated, because not believed in. But the question becomes interesting in the face of the fact that these specifications have been adopted in the main by practically all the progressive engineers of the country. But the principal reason why we cannot get a more universal compliance with the approved methods of constructing brick streets is due to the American political practice of awarding minor political service by the dearest compensation possible to lay hands upon. In many cases the man secures an inspectorship because he is fit for nothing else. The miserable practice should cease. More money is expended for streets and roads than for any other public purpose except only for the education of our children. The architect who plans, designs, and specifies concerning the expenditure of \$50,000 in a building is permitted to hire, train, and direct his superintendent. It is the exception to the rule if the municipal engineer in this country is permitted to do this thing. It should be part of the engineer's business as much to select his superintendent and inspector as it is to design and specify. This question is one that does not relate alone to the construction of brick streets, but it permeates, relates to all municipal work, and is the one objectionable feature in the prevailing American municipal system toward accomplishing the elimination of which every broad-minded citizen and taxpayer should lend his influence.