

This type of construction is one which leaves considerable to be wished for. Personal experience has led me to believe that the grading of the mineral aggregate is not done with sufficient care to give a minimum of voids in the mass, with the result that depressions and ravelling are apt to occur in a period of not more than three years after the pavement is laid.

Bituminous Concrete.—The specifications covering this type of construction are no doubt familiar. In a general way, however, a grading of mineral particles ranging from material which passed a 200-mesh sieve to a maximum amount of from 5% to 11%, to particles which passed in a 2-mesh sieve to a maximum amount of 10%, is used. Where this pavement has been laid with care and by experienced contractors it has met with extreme success, and is being specified in ever-increasing quantities in all parts of the country. During the season of 1912 the City of New York awarded contracts for the construction of over one million five hundred thousand square yards of this type of pavement in the Borough of Queens. The highways on which this pavement is laid are the main arteries of travel leading to and from Greater New York points on Long Island. Over eighty per cent. of this travel consists of pleasure automobiles and heavy auto trucks, and a majority of the remainder being heavy horse-drawn farm wagons. A traffic census taken on the Merrick Road this summer showed an average of over six thousand vehicles a day, with a daily total of approximately ten thousand vehicles passing over it on Saturdays, Sundays and holidays.

The pavements have been down for too short a time yet to be able to judge of their future wearing qualities, but what they have gone through the past season with excellent results is evidence of the fact that they will bear the heavy traffic imposed upon them for many years to come without the necessity of any large amount of repairs. The old roadbed consisted, in the majority of cases, of old macadam, which had been worn down to the base course of stones. This course was lightly scarified and sufficient 1½-inch stone was added to bring the road to the proper cross section and crown, and two inches below the finished grade. A layer of screenings or sand was then applied and worked into the voids by means of hand brooms and puddling with water, and the whole foundation was then thoroughly rolled with a 10-ton macadam roller. The bituminous concrete was then laid and raked by expert rakers and then thoroughly rolled with a 6-ton tandem roller until it had an ultimate thickness of two inches. The pavement was then dusted with a coat of Portland cement to fill any surface pores and was opened to traffic after a period of not less than 12 hours.

In order that the shoulders of the roadway should be protected, a layer of 3 rows of vitrified block were butted in against each side of the roadway and the joints were then poured with an asphaltic filler. In the outlying sections the wings of the roadway were carefully graded and suitable gutters were constructed leading to masonry seeping basins. In sections where storm water sewer systems prevailed the gutters were paved with either cobble or brick and the construction extended from curb to curb.

Among the other forms of modern bituminous pavements may be mentioned those which come either under the patents or control of the Warren Bros. Co., and consist of the well-known Bithulithic pavement, Warrenite and Amesite.

There is also another type of pavement which has recently come into vogue in the Middle West, and is also

being used in some parts of the East. It bears the trade name of "Dolarway" pavement. This process consists of first laying a concrete base of suitable thickness of rather a rich mixture and providing suitable expansion joints. Immediately after the laying of the concrete and before the initial set has taken place, the top of the concrete is carefully trowelled, in order to have a uniform finish, and to bring the finer particles to the surface, after which the surface is broomed. Upon this foundation there is spread a layer of hot bitumen at the rate of about ⅓ gallon to the square yard, immediately after which a uniform layer of clean dry sand or stone screenings is spread in a sufficient quantity to cover the asphalt coat and leave a wearing coat not less than ¼ inch in thickness. This pavement is at the present time in its infancy and it is therefore impossible to form an opinion as to its permanent quality. One good feature of this type of pavement, however, is the fact that irrespective of the wear of the surface course there always remains the concrete foundation which can be used either for a new application of this same type of surface treatment, or it can be used for another type of pavement.

Sheet Asphalt.—This type of pavement has probably received more praise and at the same time more criticism than any other form of bituminous pavement, but in the writer's opinion there is no more substantial bituminous pavement laid than modern sheet asphalt pavement. In the early days, and even in more recent times, paving engineers have given too little attention to the details which go to make up a good modern pavement of this type. This lack of attention to details is slowly being eliminated, due greatly to the fact that intelligent bodies of engineers and contractors have been working together to standardize the specifications covering this type of pavement. A set of standard specifications covering the making and laying of sheet asphalt, which is the result of many years' study and labor, has recently been published by the American Society of Municipal Improvement. A digest of these specifications may be of interest:

Refined Asphalts.—The tests provide that all penetrations shall be made at 77° F., and are to be expressed in hundredths of a centimeter with a No. 2 needle acting for five seconds under a total weight of 100 grams. There is no distinction made between the so-called natural or lake asphalts and the oil asphalts; i.e., those derived by distillation from asphaltic oils, it being stated that all asphalts shall be prepared from a natural mineral bitumen, either solid or liquid, or a combination thereof, by suitable and approved methods of refining.

All shipments of refined asphalt shall be uniform in consistency, and shall not vary more than 15 points in penetration at 77° F. Ninety-eight and one-half per cent. of the total bitumen shall be soluble in carbon tetrachloride.

Flux.—The specifications covering the fluxes state in part that they shall be the residue obtained by the distillation of paraffin, asphaltic or semi-asphaltic petroleum, and shall be of such character that they will combine with the asphalt to be used to form an acceptable and approved asphalt cement.

Binder Stone.—The requirements are that the stone shall be clean, hard and free from any particles that have been weathered and are soft. It shall all pass a 1¼-inch screen, and from fifteen to thirty per cent. shall pass a ten-mesh screen. Particular attention is called to the latter requirement. Strict conformation with this phase of the specifications will produce a dense binder which