

macadam and treating this as a foundation upon which to construct a macadam top course 3 ins. thick after rolling, this construction being adopted on account of amount of available funds preventing any more permanent construction. The work was carried on by County Superintendent J. Y. McClintock by the pay-roll system under the general supervision of the Maintenance and Repair Bureau.

The following points are taken from the specification for repair:

The upper course is to be composed of No. 3 limestone of an average thickness of 3 ins. After this is rolled and filled, spread over it $\frac{3}{4}$ lb. of pulverized feldspar per square yard of surface, and mix it in with the limestone by means of rakes. Roll with steam roller. Sprinkle with mixture composed of one part glutrin and three parts water, so as to get $\frac{3}{4}$ gal. of glutrin into each square yard of the surface. Roll it until the stones are firm enough to walk over without any apparent movement.

For wearing course spread on limestone screenings. Put on enough to thoroughly fill the crevices between the stones. This will require thickness of about $\frac{3}{4}$ in. Now sprinkle with water and roll as usual until about one-half of the amount of water necessary has been applied. Then finish the sprinkling, and wet rolling with mixture of one part glutrin and three parts water. Now put sprinkling cart ahead of the roller and put on enough of the mixture to thoroughly flush the surface and wash the dust and small stones into the crevices. You cannot get the surface too wet, and you cannot roll too much. Keep on wetting and rolling until the surface puddles, which really means that it will not take in any more of the glutrin and water, the plan being to use about $\frac{3}{4}$ gal. of glutrin per square yard of completed road. Just before the surface dries, and this may be three or four days or a week later, the sprinkling cart should be filled with the mixture of one volume of glutrin to one of water, and the flow so regulated as to spread only 9 ft. wide. Sprinkle until $\frac{1}{2}$ gal. of water or $\frac{2}{3}$ gal. of mixture is applied to each square yard of the middle 9 ft. of the road.

This work was begun during the latter part of the month of September and progressed through October and November, when it was necessary to shut down for the season, due to the setting in of freezing weather. This necessitated building a portion of the road without glutrin in order to make it passable for the winter, with the idea of concluding the glutrin treatment in the spring.

The entire expense for this construction for the season's work, including all of the materials necessary to finish it up in the spring, is:

Use of steam roller	\$ 392.23
Labor	873.12
Teaming	1,077.87
2,616 tons of stone	2,051.49
3,352 gals. of glutrin and crushed feldspar.....	403.58
Miscellaneous items	14.51
Total	\$4,812.80

The number of square yards treated was 5,913, making an average expense of 81.4 cents per square yard of surface. It is fair to state that a portion of the labor, possibly one-quarter, should be charged to fixing the shoulders and ditches. A portion of this road, a few hundred feet upon which the glutrin was placed, was entirely constructed of No. 2 stone, and before winter set in, it showed signs of displacement because of being so small.

Glutrin was first used in Orange county in 1910 on roads Nos. 44, 93 and 160. The results were as follows:

On road No. 44, Goshen to Florida, the product worked especially well. About one mile of road on No. 44 is macadam. Before the application of glutrin this section of the road ravelled badly every year. The glutrin seemed to have a binding quality and the macadam section held tight the entire season of 1910. On the gravel section the product worked well as a dust layer. About the only fault one can find with it is that it is soluble in water and one or two days' rain causes it to move to the shoulders of the road. The results on road No. 93 were about the same as on road No. 44.

The department considered it satisfactory on roads Nos. 44 and 93 in 1910 and it was recommended for use on these roads for 1911. The residents seemed to like the glutrin and many citizens in the village of Florida ordered it in barrels for use in front of their dwellings.

On road No. 160 the results were not so good as on Nos. 44 and 93.

The chief complaint from the public was that after rains it left the road in a soft and sticky condition. It is believed this was partly due to the poor material used in the construction of the road. The supervisor and several citizens requested that oil be used in the place of glutrin in 1911 and oil was recommended for No. 160 this year.

Glutrin was used again this year on roads Nos. 44 and 93 and is giving such good results that the first deputy in charge of maintenance has recommended its use next year. The people along the roads seem to be particularly well satisfied with it this season and many requested its use in 1912.

Details of various experimental pavements in Munroe county, among which are the Rocmac on road No. 83, the Mixing Method Asphalt, road No. 94, the Kentucky Rock Asphalt also Amiesite on road No. 5, and the Cube pavement on road No. 6 were given in Engineering and Contracting of November 15, 1911. The conditions of these various surfaces one year later, after they have been under traffic for over one season, are thus described in the report for 1911:

At the close of the season 1911 the Rocmac pavement on road No. 83 in the town of Gates was in perfect condition. It has not shown any indication of either raveling or rutting. It is only slightly dusty. Continued wet weather does not produce any mud upon the surface. The surface being quite gritty gives excellent footing for horses and also reduces the liability to skidding of pneumatic-tired vehicles. Maintenance expense practically nothing.

The Mixing Method, Asphalt, laid on road No. 94 at the close of the season of 1911, was in perfect condition, there being little indications of wear, the surface being very smooth. The maintenance cost on this section during the season having been nothing except for work smoothing up the earth shoulders.

The Kentucky Rock Asphalt on road No. 5 at the close of the season of 1911 was, where laid during warm weather, in good condition. However, the end which was laid during colder weather was in rather poor condition and had necessitated considerable repairs. It is evident from the results on this road that it is absolutely necessary that this material be laid during the hot summer months in order to secure good results. The good portion was generally smooth, showing, however, occasional bare spots where the stone appeared through the asphalt on the surface.

The Amiesite on road No. 5 was partially laid during both seasons, 1909 and 1910, and at the close of the season of 1911 was in good condition. However, during 1910 an effort was made over a portion of this surface to roll on a thin sealing coat of the treated screenings size material. Where this was done there was a tendency for this thin surfacing to break off. However, the pavement underneath