free gravel road or street with any state highway built under the supervision of the state highway commission. This would reduce the maintenance of the intersections built by the state by preventing loose material being scattered over state roads from the intersecting county roads. It would also reduce the danger at these crossings, thus making travel more safe for the public. Two-thirds of the accidents in Hendricks County occur at the intersections of the crossroads with the state highways.

The gasoline tax is a tax paid by everyone who drives a car within the state and should be used to provide for the safety of public travel and to eliminate the dust within the populated or school districts. We have the safety of the transportation of the school children to consider and the streets and roads near the school buildings should be made dustproof and the drainage and sanitary conditions of those streets and roads should be properly handled.

The money from this tax should also be used in straightening dangerous curves in roads, widening bridges, widening roads, reducing grades, and building short intersections connecting free gravel roads. It may be used for maintaining and resurfacing streets which were built by incorporated towns under the three mile road law or which were originally free gravel roads.

SPECIFICATIONS FOR WATER-BOUND MACADAM CONSTRUCTION

By Stanton Guthrie,
Decatur County Surveyor

Base Course

After the subgrade and shoulders have been constructed as usually specified, and approved by the engineer, and before foundation material is placed thereon, No. 5 screenings shall be neatly stored along the side of the highway. Then a layer of No. 1 (3/4"-4") limestone shall be spread on the prepared subgrade to the thickness of 5" after compaction (the spreading of stone to be done by the use of a stone spreader of approved type), care being taken to preserve the grade and crown. Side forms of uniform height, held firmly to proper line and grade, shall be used to fix the depth of the loose stone. If after the stone is spread the surface is not uniform, it shall be harrowed with a heavy spike-toothed harrow until a uniform and even surface prevails. Any thin,
flat, or oversized pieces of stone that appear in the surface at any time during the process of construction shall be removed.

**Dry Rolling Stone**

The rolling shall begin at the sides of the road, with the outside driver covering equal parts of the metal and shoulders, and shall continue along the edges of the metal and shoulders until they are firmly bound together. Then the roller shall be run forward and backward, parallel to the center line of the road, the rear wheel lapping on its last impression about half its width. The rolling shall progress gradually toward the center from each side until the entire course has been thoroughly keyed, the stones have ceased to weave or creep in front of the roller, the voids of the stone are reduced to a minimum, and all settlement has ceased. Any low places that develop during the rolling shall be loosened and then filled with the same kind of stone as that with which this course is constructed, and again rolled as above described. The roller used shall be a ten-ton, three-wheeled roller, and shall always move at a slow speed. (The crown of the stone shall be $\frac{1}{2}$" to 1" and shall be checked with a template of the same width as the road. Smoothness shall be checked with a twelve-foot straight edge.)

After the stone has been spread and rolled as above, No. 5 screenings (piled at roadside) shall be applied gradually during the process of dry rolling and screening, in such amounts as will completely fill the voids. The screenings shall not be dumped on the surface of stone but shall be cast thinly lengthwise of the road with a spreading motion of the shovel. Light trucks may be used to advantage in spreading screenings; however, care must be used so as not to disturb the bond of the coarse stone. The screenings shall not be allowed to cake or bridge on the surface of the stone in such a manner as to prevent the perfect filling of the voids and the direct bearing of the roller on the coarse stone during the process of dry rolling and screening. Rolling shall continue while the screenings are being spread so that the jarring effect of the roller will aid in settling them to the bottom. Spreading and rolling shall continue until no more screenings will go in dry. No excess of screenings shall be used before applying water.

**Rolling and Grouting**

Immediately after the voids of a section of the road have been filled with dry screenings, the macadam shall be sprinkled until saturated, the sprinkler being followed by the roller. More screenings shall be added where necessary. If required, the grout shall be spread or swept in with stiff brooms. The sprinkling and rolling shall continue until from the screen-
ings, dust, and water a grout has been formed that will fill all the voids and form a wave of grout before the wheels of the roller.

The macadam must not be rolled when the subgrade is soft or yielding, or when the roller causes a wave-like motion in the macadam or subgrade. Any disturbance or alteration of the surface of the prepared subgrade or of the foundation material shall be corrected before the wearing course is placed thereon.

Should the surface become wavy under the action of the roller because of soft or spongy subgrade, the rolling shall be stopped for a few days until the subgrade has dried out and settled. It may be necessary to stop rolling several times to let the subgrade dry so that the surface may be rolled to proper smoothness. Any ruts, holes, soft or yielding places which occur in the subgrade by reason of any traffic or hauling over it or from any other cause shall be corrected and rolled until firm and smooth before any material is placed thereon.

**Wearing Course**

**Spreading Stone**

After the foundation course and shoulders have been constructed as specified, and before any material is placed thereon, No. 5 screenings shall be neatly stored along the sides of the roadway.

A layer of No. 2 limestone (1 1/2"-2 1/2") shall be spread on the foundation course to the thickness of five inches, after compaction, using boards just as in the construction of the base course. The wearing course construction is the same as the base course in respect to dry rolling and screening and to screening and grouting.

After a section has been thoroughly rolled, filled, and grouted according to specifications, it shall be allowed to dry out, after which it can be opened to traffic at the will of the engineer. Before final acceptance the macadam shall be wet thoroughly and the entire road, including shoulders and berms, rolled. In addition, a thin layer of screenings shall be spread over the entire surface of the macadam before traffic is turned on the improvement.

The depth of the base and the wearing course should be varied according to the amount of traffic. From the standpoint of economy the sizes of stone used should utilize the output of the crusher.

Water-bound macadam is, in my opinion, too expensive for Class 3-4 roads, and not good enough for Class 1 unless it is followed up with a tar or asphalt binder wearing course. This in turn would eliminate dust, which is the worst evil of stone roads.