Home Course In Road Making

VIII.—The Sand-Clay Road.

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A SAND-CLAY road is composed of sand and clay mixed in such proportions as to form a compact and firm support to traffic. The perfect sand-clay road should be neither sticky nor sandy. The sand and clay may form a natural mixture, in which case the road is termed a "natural sand-clay road." The two materials may have become mixed in the fields along the road by

MIXING THE SAND AND CLAY.

successive cultivation of the soil, and if this soil is used in the construction of a road it is known as "top soil road."

There are many varieties of clay and consequently a wide variation in the characteristics of a sand-clay road. The quality of the sand is a variable factor, as it may range all the way from fine, dust-like particles to coarse grains and gravel and may be perfectly clean or mixed with loam and other material. In consequence of these wide differences in the materials constituting sand-clay roads it is impossible to maintain a uniform standard as to quality of the road or methods of construction.

Not all but most sand consists of tiny grains of quartz. While quartz is one of the hardest minerals known, it possesses practically no binding or cementing power. The grains of sand, instead of cohering in a tough mass under the impact of traffic and the action of water, remain loose and shifting. Fine sand when dry is easily displaced by the wind, which produces in this way the ever shifting sand hills. No road is so difficult to travel as one through fine sand.

If clay has been carried in small quantities by running water and deposited as sediment it is known as "sedimentary clay." If the feldspathic rock has been disintegrated in place by water the clay is known as "residual clay." The sedimentary clay, having been carried in the form of fine particles, is finer grained than the residual clay and is more sticky and plastic. In contrast with sand, which possesses no binding power, but is very hard, clay is a powerful binder, but does not possess the quality of hardness. It is evident that in the construction of a sand-clay road the important property in the clay is its plasticity or tendency to become sticky and elastic when mixed with water. The clays which are most plastic are called "ball clays." Another important property which is possessed by clays in widely varying degrees is the porosity or capacity for rapid absorption of water. Clays which possess this quality in the highest degree fall to pieces under the action of water. These clays are called "slaking clays." It will readily be seen that the plastic or ball clays will form a better and more powerful binder for sand-clay roads than will the slaking clays; but, on the other hand, they will be much more difficult to mix, as they disintegrate with far less rapidity.

The shrinkage of clay is an important characteristic in connection with the building of roads. When water is mixed with clay expansion results, and when the water evaporates the clay contracts. This characteristic of expansion is much more pronounced in some clays than in others, and it must be apparent that the clays which expand the least are preferable for road building.

The theory of the sand-clay road is very similar to the theory of the macadam road. In the latter rock dust and screenings fill the voids between the angular fragments of stone and when wet serve as a cement or binder. The grains of sand may be likened to the angular fragments of stone and clay to the rock dust binder. In the most successful sand-clay road just a sufficient amount of clay is used to fill the voids between the grains of sand. In this way the sand sustains the wear, while the clay serves as a binder. If too much sand is used the result will be loose sand on the surface; if too much clay is used the surface of the road will become sticky after rain.

The best mixture of sand and clay can be made when the materials are wet, and particularly is this true of the plastic or ball clays.

If the clay is a plastic or ball clay much greater effort will be necessary to obtain a complete mixture; if it is a slaking clay the mixture will be much more readily obtained. This kind of clay is not as satisfactory, however, as the ball clay, as its binding powers are much less. In selecting clay for road purposes it is always best to select the stickiest clay available. A common test is to wet the thumb and place it against a piece of clay. If the clay will not stick to the thumb it is safe to assume that it will be a poor binder in a sand-clay road.

As the desirable proportions of sand and clay are such that the particles of clay barely fill the voids between the grains of sand, it is well in determining the quantity of clay to be applied to a sand road or sand to be applied to a clay road to know approximately how much is needed. A simple method for determining the relative quantity is to take two glasses of the same size and fill one with dry sand, which it is proposed to use and the other with water. The water should then be poured carefully in the glass of sand and allowed to trickle down through the sand until it reaches the bottom of the glass. When the water has been poured into the glass of sand to the point of overflowing we may assume that the voids between the grains of sand have been filled, and consequently the amount of water taken from the full glass would represent the volume of clay needed to fill the voids in a volume of sand equal to that in the other glass. It is better to use a little less clay than would appear to be necessary, as the tendency is to overestimate the amount needed.

Good drainage is the most essential feature of the sand-clay road just as it is of all other types of road. A sandy or gravelly soil affords better natural drainage, and if the sand is present to an exceptional extent the only provision necessary for drainage will be to crown the surface of the road in the same manner as prescribed for earth, gravel or macadam roads. If the road is located through land that is so low as to be continually wet it will be necessary in addition to crowning the road to provide wide ditches on each side and to raise the roadbed a little higher than the surrounding country.

After proper drainage has been secured the roadbed should be crowned, beginning near the source of supply of the clay or sand. The clay should then be spread to a depth of from six to eight inches in the center, sloping off gradually to a thin layer at the sides. Upon the clay should be placed a thin covering of sand. If the clay is of the plastic kind it will then be necessary to plow and harrow it, advantage being taken of rains to puddle the surface with a disk harrow. Sand should be gradually added until the surface of the road ceases to ball and cake.

If the clay is placed on sand to a depth of six inches a cubic yard of clay will cover fifty-four lineal feet; consequently a sixteen foot road treated in this manner would require one cubic yard of clay for each three feet of length. A mile of sixteen foot road would therefore require 1,760 cubic yards of clay.

If the clay subsoil is to be treated with sand it should be plowed and harrowed to a depth of about four inches. On this prepared subsurface should be placed from six to eight inches of clean sand, spread thickest at the center and sloping to the sides in much the same manner as the clay is applied to a sand road. These materials should then be mixed dry instead of the wet mixing, which is preferable when clay is applied to sand. This is preferable because the clay can be better pulverized when in a dry state. After dry mixing the road should be puddled following the first heavy rain. When the materials are thoroughly mixed and puddled a road

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machine or grader should be used to give proper crown to the road, and if a roller is available the road can be improved by the use of it. As it is impossible to determine exactly the proportions of sand and clay to be used in the first place, it is necessary to give careful attention to the sand-clay road for a considerable time after it is completed, in order that additional sand or clay may be applied as needed.

In 1904 there were only 2,900 miles of sand-clay roads in the United States, but at the present time there are approximately 25,000 miles.

More Favorable Ground.

When our son was a boy of four a family of children moved next to us who were simply incorrigible. Of course their doings were much commented on in our family, and many a time I talked about "those dreadful Smith children."

One day I had occasion to correct my little son, talking to him seriously. He listened quietly for awhile, then looked up at me and said with the most engaging air: "Don't let's talk about this, mamma! let's talk about the Smith children."

Advice From Kindly Busy Body.

"Oh, my! Your house has an odor of burning milk. Don't you know how to avoid that?" asked the K. B. B.

"I didn't think it was so terrible, I'm sure. Everybody has accidents of that kind," said the woman she was visiting rather irritably.

"Now it's all right, of course, I don't mind it, my dear, but next time just sprinkle some salt on the stove at once after the milk is spilled and you will avoid that unpleasant odor."