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## BEST ROADS FOR FARMS AND FARMING DISTRICTS.

By ROY STONE,

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So few really good roads have been made in purely agricultural districts that experience avails but little toward determining what will best serve the needs and suit the means of the average farmer.

In the first place, the road that will best suit the needs of the farmer must not be too costly; in the second place, it must be of the very best kind, for the farmer should be able to do his heavy hauling over it when his fields are too wet to work and his teams are free.

The roads which have been built by counties have not always satisfied the farmers who had to use them. In some portions of Ohio we find the country people in dry weather traveling in the ditches to save the bare feet of their horses from the rough stone.

### KIND OF ROAD FOR THE FARMER.

The road that would seem to fill the farmer's needs, all things considered, is a solid, well-bedded stone road, so narrow as to be only a single track, but having an earth track alongside. A fine, dry, smooth dirt track is the perfection of roads; it is easy on the horses' feet and legs, easy on vehicles, and free from noise and jar. It holds snow better than stone or gravel, and requires less snow to make sleighing; and where such a track has a stone road alongside to take the travel in wet weather it will suffer hardly any appreciable wear. The stone road, on the other hand, wears by the grinding of the wheels and the chipping of the horses' calks in dry weather more than in wet. If it can be saved this wear for an average of six months in each year, so much will be clear gain.

The questions raised regarding this method of construction are, Can the junctions of the earth and stone sections of the road be kept even, so as not to have a jog in passing from one to the other, and can the meeting and passing of loaded teams be provided for? But practical experience has already been sufficient to settle both these points. The Canandaigua (New York) roads show no sign of division between the earth and stone, and those who use them say no difficulty is found in

the passing of teams, since practically no two teams ever turn out at exactly the same spot, and no rutting of the earth road occurs. The purposes of a wide, hard road are better served by a narrow one, and all the objections to it removed, while the cost is cut down one-half, and the charges for repair nearly three-fourths.



FIG. 131.—Cross sections of Canandaigua roads.

The cross sections of the Canandaigua roads shown in figure 131 give the simplest forms for narrow, hard roads; both these forms are symmetrical, having the stone road in the middle. One of them has a dirt track on each side; the other has only a shoulder of earth to keep the macadam in place. While the users of these roads are so pleased with the novelty of their hard roads that they do not seem to care for the dirt track, they will doubtless in future find their advantage in having at least one such track in all cases. One of the great highways in



FIG. 132.—Underdrain for wet places in roads.

Ohio was built in this manner thirty years ago and has given great satisfaction.

Where roads are already graded wide enough, it is better perhaps to have the three tracks, one of stone and an earth track on each side, but two will serve all purposes of use quite as well. Two tracks will require a roadbed about 21 feet wide.

In all wet soils or springy places there should be an underdrain beneath the stone track, as shown in figure 132, with side outlets at places where they are practicable. The space above the drain tile up to within 6 inches of the surface can be filled with any cheap coarse



FIG. 133.—Underdrain for porous roads.

material, first covering the tile with straw to prevent the earth washing into the joints. Field stone, common gravel, sand, or burnt clay will serve for such filling. This should be well rolled and the road finished with a layer of the best broken stone or gravel obtainable, also well rolled; or, better still, with two layers of 3 inches each, rolled separately.

Where the underlying soil is naturally porous, the simple construction in figure 133 is all that is required, but the ground under the macadam should be well rolled and compacted and all soft places exca-



FIG. 134.—Drainage for macadam bed.

vated and filled with good material. If the ground is not porous, yet is not wet enough to warrant the expense of subdrainage, it is well to provide a drainage for the macadam bed, in the form shown in figure 134. All that is required for this is to give a slight outward slope to the bottom of the bed, roll the ground thoroughly, and provide an occasional drain through the earth shoulder into the ditch.



FIG. 135.—Three-track road.

The three-track road, figure 135, requires a roadbed about 27 feet wide; its construction corresponds with that of the two-track.

#### FARM ROADS.

Another form of narrow, hard road is one used by Judge Caton, of Chicago, on his Illinois farms. While these roads are made for farm use they would serve equally well for the lesser public roads of the neighborhood. The roadbed is made by plowing two furrows, 16 inches



FIG. 136.—Prepared roadbed.

wide and about 12 inches deep, under what are to be the wheel tracks, turning the earth inward, and two more for ditches, also turned inward, which results in a slight raising of the bed; the inner furrows are then filled with field stones or coarse gravel and a light coating of fine gravel spread over the whole.



FIG. 137.—Finished road.

Figures 136 and 137, respectively, show the roadbed prepared and the finished road. This plan gives a very solid bed of material under the wheels and a sufficiency elsewhere, and if occasional side outlets

are provided the furrows are quite efficient as blind drains. Occasional passing places would need to be provided on public roads for the meeting of loaded wagons; elsewhere a width of 11 feet between the ditches would be sufficient for ordinary light travel. Such a road would use the minimum of material with the maximum of efficiency, and, having a great depth of stone just where it is needed, should bear the heaviest loads without injury, and require only an occasional resurfacing to last indefinitely. The amount of material required is less than 800 cubic yards per mile.

#### MAINTENANCE OF ROADS.

Regarding the maintenance of roads, what Mr. Charles E. Ashburner, jr., C. E., who has had a wide experience in such work, says of the macadam road applies with equal force to any, even the simplest of roads, and his observations are reproduced here for the benefit of those who utilize the suggestions above offered, as well as of all who are interested in the road question generally:

The old saying, "A stitch in time saves nine," never applied more appropriately to anything than it does to the maintenance of a macadam road. Inspect your roads constantly and carefully; never allow the smallest hole to remain, but use the pick to loosen the surface as one forms and then carefully fill with chips one-half inch in diameter, or even smaller, of the same material of which the road is built, and roll. In filling be careful not to change a hole into a hillock, which would eventually cause two holes, one on each side. Equal attention should be paid to maintaining thorough drainage, so that the water will run off without saturating the edges of the roads. When the road surface at last becomes worn out, pick it thoroughly (picking by the steam roller is by far the most economical), then apply stone, and proceed as in the original construction.

Roads now in my charge, built four years ago of Virginia gray granite (rejecting such as contained much mica), were only 7 inches thick. They have been constantly under heavy traffic of the worst kind, namely, country teams, which drive one behind the other in the center of the road, yet not one cent has been spent in repair, and they are as free from holes as the day they were constructed. They are worn, however, as the fine granite dust taken from the gutters will prove; but the wear has been denudation simply, owing to the fact that they were constructed upon a road-bed of uniform hardness and smoothness, and all material used was uniformly tough.