

have acted as rollers. But a waggon wheel is not always a very satisfactory roller, for the reason that the wheel tires are too narrow, and when the road is wet and soft the narrow wheels sink into the surface and form ruts, and cut and mix and mangle the dirt out of all reason, and destroy the good qualities of the roadway. If all the waggons used on country roads could be provided with tires four inches wide, they would roll the surface more smoothly and more quickly, and it would be in fairly good condition for nearly the whole year round. A good horse roller will serve much to cure this difficulty.

Rolling should follow closely upon the work of the road grader or scraper, so as to consolidate all the loose earth which the action of the scraper has laid in the line of the roadway. The roller should pass many times over the softer portions of the road, and where the road is very dry and not inclined to pack it may be slightly moistened to hasten the action of the roller. The rolling should begin at the sides of the road and work gradually towards the centre; that is, the roller should be passed from end to end along the side of the road and then the second passage of the roller should slightly lap the first until the centre of the road is reached.

#### THE EARTH IN THE ROADWAY.

Clean gravel is always desirable, and should be used wherever it can be obtained. If the soil in the roadway is found to be of a sticky, clayey nature, we can improve it greatly by adding a few inches of sand, and repeating this operation every few months, as the sand works into the clay. If the soil is composed of loose sand we can greatly improve the road by adding a layer of five or six inches of stiff clay.

In the first instance the sand tends to counteract the stiff and sticky qualities of the clay, and in the second case the adhesive quality of the clay counteracts the looseness and shiftiness of the sand and helps to stiffen it and hold it together. A little study and application of common-place rules in each locality, aided by a few experiments, will generally enable us to arrange the clay and sand so as to give the best results.

#### CROSS DRAINS AND CULVERTS.

Here and there along nearly every country road we find a place where the roadway is crossed by a small stream, and where the stream is not so large as to demand the construction of a bridge or a culvert a small cross drain may be used as a channel to conduct the water across the road; but this drain should be substantially made, so as to be solid and permanent, for the caving in or washing out of a badly built drain has broken the leg of many a good horse, and has