

## REPAIRING GRAVEL AND STONE ROADS.\*

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WE have all classes of roads and as many as they are they all need repair. The concrete, the asphalt, the brick, the wood block, have become fairly well standardized in their method, most municipalities operating along same lines. Why, we ask, cannot the repairing of stone and gravel roads become just as consistent? Is it because of the ever-changing conditions or is it a simple case of neglect on our part? Two years ago an article read at the first conference discussed at some length a method of caulking horses' shoes that the road might not be torn up. At the present time we have almost forgotten the horse-drawn vehicle and on every hand you hear the words "automobile traffic." The cities have constructed roads to meet this traffic, but the cost of these would be prohibitive in the country, so what is the next best thing?

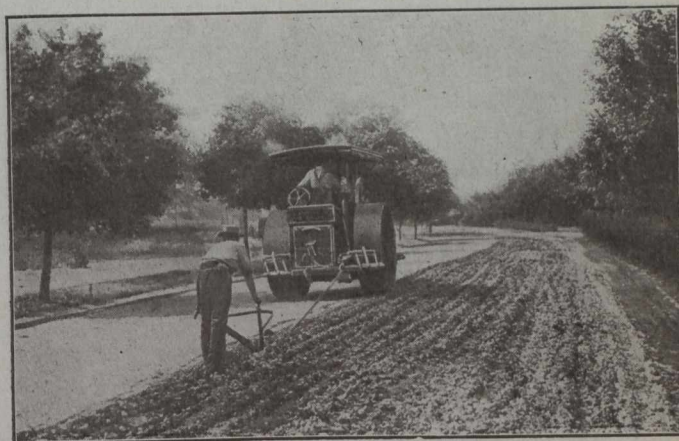
Many miles of macadam and gravel roads have been constructed throughout the province and now that they are constructed, how shall we keep them in repair under this above-mentioned automobile traffic conditions?

There are two things which should be remembered: First, roads deteriorate rapidly if neglected,—frost, heat, water, drought and traffic tending to flatten the surface and mix it up so badly that it is pounded into the sub-grade; second, the macadam or gravel road constructed at present time will not stand up under the increasing traffic without attention.

Construction or resurfacing a macadam or gravel road must never be undertaken until ditches are provided and culverts have the proper outlet. To get the water away from the road should be the first consideration; too often this, the most important item in resurfacing or construction, is neglected. The idea seems to be to place the stone on the road as fast as possible, round it into shape regardless of mud holes, soft spots and drainage, letting the water take care of itself. It is not the intention of this paper to go into the method of construction, or drainage, however, but certainly the method of construction has all to do with the method and cost of repair. Often we see gravel being dumped into a mud hole on a clay road or a soft spot in a gravel road being filled with something else. Sometimes we see bituminous patches on a macadam road which apparently have no oil elsewhere. Mixing materials in this way either causes bumps or hollows. Repair a clay road with clay; a broken-stone with stone and a gravel with gravel.

**Macadam Roads.**—Repairing a macadam road should be started as soon as the road is constructed. It is practically impossible to construct a water-bound macadam that under the traffic of to-day will not rut. Automobiles are like sheep,—if one starts a rut the next one follows. The first rain fills the rut with water and the trouble has started. "Allow no ruts to form" should be the motto of road superintendents; keep the surface round and smooth. This enables the water to get more quickly to the ditch and eliminates bumps and holes that would form otherwise. Broken stone, the same size as used in the upper course, should be used for filling ruts; it must be tamped to place, the finished surface a trifle higher than the surrounding surface, to allow for consolidation by

traffic. Pot holes are repaired in Europe by the removal of material to depth of wearing course, stone then replaced, tamped to grade with stone chips as top dressing. Bituminous material may be added, either before or after placing. Rolling in spring when road is soft has also brought good results. The earth shoulders should be trimmed up from time to time with road scraper that water may run freely to the ditch. Continuous repair is the only way to increase the life of the road. Too often roads are constructed and are left to themselves from two to three years—sometimes a considerable time longer—without the slightest attention. We must convince ourselves that repairs are essential and immediately the road is completed, not a year or so later. The greatest care that we can exercise during construction will not entirely remove all the soft spots and these soon start to put in their appearance. A few loads of material dumped conveniently along the road at the time of construction will be handy to fix just such a place. The next question that arises is: Who is to make the repairs? We must provide systematic method of repair and maintenance. Too little attention has been given to this end of the work. How often we drive on the country road directly after it



Combination of Hand Plow and Roller.

has been constructed and see signs of ravelling and rutting that with a few minutes' attention could be made as solid as surrounding surface.

The continuous patrol system that has been advocated by engineers both in Canada and the United States has either not found favor in Ontario or else we have neglected to carry the idea far enough. The railroads have their sectionmen who keep the track and surface in repair, why cannot the same system be applied to our public roads? Until such a system is inaugurated we will have the same high cost of resurfacing every few years. To save money to our councils and province it is essential that we realize immediately the importance of systematic maintenance and take steps to remedy the evil that has existed since road construction in Ontario began. When our shed starts to leak, we patch it; when our road surface is penetrated why not give it the same attention? Only one case exists, to the writer's mind, where patrol systems with continuous maintenance might not be to advantage, and that is where road is constructed of a soft material that is plentiful and easily obtained.

The time must come, however, when patch work and the best system of patrol will not suffice to keep the surface in shape; then it must be resurfaced. Where the road is full of pot holes the scarifier or picks bolted to rear wheels of roller can be used to advantage. The

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