

The Economy of Good Roads.

BY COL. ALBERT A. POPE.

[Continued]

In the first place, in order to have proper highways we must have them constructed under expert engineers, and not by laymen who have little or no knowledge of geology, topography, or road engineering in general.

The environment of a highway should determine its character, and the problem of properly constructing and locating a road cannot be correctly solved without a careful inspection of the surrounding country, its rocks, its surface, and its underlying foundations. The earlier engineers entirely overlooked environment, and in many instances built roads on straight lines, as, for example, the old highway from Boston to Newburyport, which turns neither to the right nor to the left for hill, dale, swamp, or forest, and which is now practically abandoned, and in its place less direct but better located roads are used.

As it is essential to have the proper kind of rocks for the foundation and superstructure of new roads, one of the first duties of a highway commission should be in the line of a thorough topographical survey of the State, with the view of locating such rock-deposits as experience has demonstrated to be of value for this work. It is well, too, for the commissioners to publish sectional topographical maps to be used by county commissioners and others who have in hand the construction and extension of local ways. The advantage of such work will be comprehended when we take into consideration the fact that the main cost in building Macadam and Telford roads is in getting the proper rock materials. In the comparatively small State of Massachusetts we have in the neighborhood of 2,200 miles of road of sufficient importance to be considered by the Highway Commissioners for State roads.

We have started on a system here in Massachusetts which, when completed, will give us good highways between all the large centers of trade, and form, in many instances, connections with through roads from other States, so that the agricultural counties can find a profitable market in our own State or within the limits of adjoining States.

The Massachusetts Legislature appropriates each year a large sum of money (in 1897 \$800,000) to be expended under the immediate supervision of her Highway Commissioners in constructing new and repairing old roadways. Wisdom has been shown in adopting the judicious policy of building first the roads considered of the most importance; nor does this necessarily mean highways in and about large cities and towns, as the Commissioners have spread their work throughout the entire State.

A pleasing educational phase of this movement in Massachusetts is the readiness with which town and county officials have followed the example set by the State in building good roads. Wherever a section of the State highway has been started, its progress has been critically watched by the local authorities, who have thus become, in a measure, road critics, if not road builders. Following out this plan of educating the public in the proper methods of constructing roads, the Massachusetts Commissioners have, as a rule, let the contract for the construction of State highways to the towns and counties through which they pass. They give to them the first privilege of closing the contract, and only open it for bids from private contractors when the town has neglected to signify its desire to take hold of the construction. As the town is doing the job, it will naturally employ its own people, who will thus become drilled road-builders, because, though the contract is executed by the municipality, a local engineer is always at hand as the general representative of the Highway Commissioners, and his instructions are so thorough and explicit that he of necessity works with the spirit of the Commissioners. A town carrying out a contract of this kind finds it of advantage to purchase road crushers and rollers and such other road machinery as is necessary, and, having once acquired this plant and finished the section of State highway, they are ready to go on in better fashion with the work on their local ways.

The cost of building roads in thinly settled districts can be materially lessened by using only a narrow width of hardened surface. The road-bed should be protected by shoulders at a width of fifteen feet, so that, in case of need, the expense of changing over to the full width of hardened surface would not be very great. There are some parts of our country where the chief thing is the length of way, and it would be waste of money to build in such districts a Macadam road of the usual dimensions.

As a large part of the cost of road materials is for transportation, the question of special freight rates on road materials and machinery should be so forcibly demonstrated to the railway authorities that they will lend a helping hand in pushing forward this reform, which, when truly analyzed, will be of inestimable advantage to the railway traffic, in that a universally passable condition of the highways will prevent congestion of

freight, and permit a uniform use of rolling-stock.

We have not had time to learn by actual experience as much about road care as we have concerning the construction of highways but this part of the work must not be considered of less importance. Drainage is essential, both for surface and for understructure, and yet great care should be taken to so arrange the grades as to avoid deep washouts on the surface or the loosening of the foundation. Hedges of sufficient growth to protect the surface of the road from the violence of the wind will do a good deal to retain the dust, which plays so important a part in holding together the layers of broken stone. Country byways, where the shoulders of a regularly constructed Macadam way of narrow width are allowed to grow over with a thick covering of turf, will more firmly hold themselves and the road-bed in place by preventing the rutting of the surface at the turnout places for wagons and by retaining in the roots of the grass sufficient moisture to assist in cementing the whole into a solid mass. A moderate number of shade-trees along the highways assists in preventing the surface of the road by preventing a complete evaporation of the water. Their chief damage is the possible disturbance of the foundation of the road by the spreading roots of the trees.

Of course the care and preservation of country roads differs materially from that of city streets and parkways, where we can depend on regular watering and scraping. Right here it seems worth while to call attention to, and emphasize the necessity of, a radical change in the method of watering our Macadam roadways. In the majority of our cities and towns where the Macadam structure is in use, you will find that the watering carts, instead of spraying the surface throw on so large a quantity of water that it immediately seeks the little irregularities in the surface, and in a short time forms miniature gullies, which, as soon as the first goodly rain-storm comes, wash out to a considerable depth, and make repairing far more expensive than it is necessary.

In the metropolitan park system of Boston we have adapted water-carts equipped with broad tires, the front wheel running inside the track of the rear wheels, thus rolling a broad surface on each passage of the cart. This, with the use of a fine spray for wetting the surface, has proved to be the best contrivance so far devised for preserving the road.

The question of equipping all draft-wagons with broad tires has received considerable attention in Massachusetts, and has more than once been presented for the consideration of our Legislature; but, while it is of great value to have carts act as road-rollers rather than road-destroyers, and we are decidedly of the opinion that the broad tires are the proper equipment for Macadam surfaces, we believe that this change will naturally follow the advent of good roads, and that legislation for broad tires would at present be of advantage to one section of the country, but a detriment to others.

The financial benefits of good roads are numerous and pretty well understood by those well equipped understood by those who have given the subject careful thought, but the question of increased convenience and greater values must not be considered of any more importance than the civilizing effect that passable highways would bring to the community at large. Men are gregarious by nature, and the freer the intercourse between all parts of the country, the greater will be its development, commercially, intellectually, and morally.

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difficulties of road, distance, time, and climate, it would be at least as worthy admiration as the breaking of records upon the race-horse or bicycle track, as the winning of a base ball, football, or yachting trophy—feats to which the world properly gives its applause and its reward in rich measure. But even a mere effort to reach the pole has vastly more to commend it, since it is impossible for an expedition to approach the pole without exploring seas and lands now unknown, without gathering a multitude of facts for which every physical science awaits with eagerness.

The north pole can be and probably will be reached during the next few years. In arctic exploration as in everything else there is progress. It is only now that the combined experience of all who have ventured in this field teaches us precisely what the conditions are that must be coped with and precisely how they are to be overcome so that we are able to say we know how the pole can be obtained.—From "Arctic Exploration and the Quest of the North Pole," by Walter Wellman, in American Monthly Review of Reviews for February.

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