

this message to those who may not understand its necessity so well. I consider it the most important thing in the construction of any class of road. Lead the water away at every opportunity. Don't gather any more water than you possibly can help in the ditches alongside; then get rid of what goes into these ditches as often as possible. It is an unpardonable error to allow the storm water to run along the ditches, accumulating as it goes, for more than a hundred yards before diverting it, if there is any reasonable way to do so. This may apparently mean sacrifice on the part of some of the contiguous property owners, but in reality it is not. It is far more damaging to the contiguous property to have an expensive road ruined than to have a small ditch cut through it to carry away the water that would in a short time destroy the road. Here is another opportunity for the engineer to exercise his persuasive ability on the land owner who may be hard to convince.

It was evident that \$200,000 would not extend the system very far if all the roads were gravelled. It would add to each road only a mile and a half. In view of this fact, it was decided to spend the second bond issue on improved dirt roads. The same care has been exercised in the alignment, grade, drainage, and construction of these dirt roads that was exercised in the construction of the gravel roads. At the present moment 80 miles of these dirt roads have been constructed. It was hoped that the farmers living along these dirt roads would haul the road metal free of charge whenever they decided that they wanted their particular road macadamized, and this hope is being realized now to some extent. The commission furnishes the gravel f.o.b. Jackson, or at some nearer switch, if there happen to be any.

Madison county has immeasurable quantities of sand-clay. In fact, nearly all of West Tennessee has a sand-clay stratum close enough to the surface so that it is easily available for road purposes. It is found often on the surface, and almost any ravine shows its outcrop.

Experimental stretches of sand-clay roads have been built and are proving very satisfactory. Of course these roads get a little muddy in the winter time, but the mud is never deeper than an inch. They get exceedingly hard during the summer, and are not near as dusty as the dirt road.

Nature has been kind to West Tennessee in this respect. She has mixed the sand and clay in just the right proportions, about 75% of sand and 25% of clay, or just enough clay to fill the voids in the sand. When this material is put on the road in three layers, each layer being carefully spread and rolled with spuds in the roller, it becomes very dense, especially if a few convenient rains fall during the work. Traffic still further packs and condenses this material so that it is impossible for a muscular man to drive an ordinary pick into it farther than an inch with a powerful blow. As time goes on it becomes harder, and really partakes of the nature of incipient sand rock. Here, then, we have excellent local material which fits in well for a road that is not subject to any very heavy winter hauling. It stays comfortable all the year. Automobiles can speed up to 25 miles an hour on it any time, and as fast as any one cares to drive during dry weather. Whenever ruts or wheel tracks appear the drag can always be used with absolute success. No new material needs to be hauled for repairs, because the drag, when operated, scrapes up enough off the road. In this respect a sand-clay road may be said to be self-sustaining.

Our graded dirt roads are kept in repair by the use of the drag. Each year finds them easier to maintain than the year before, because every time the drag is used after a rain it smears the surface of the road, fills the depressions and subsequent traffic puddles the smeared surface, finally compressing and smoothing it uniformly as the weather dries it. Each dragging adds a dense leaf of mud to the surface, and as time goes on this process forms a laminated crust on top

of the road, which resists the absorption of water splendidly. One of the most important functions of the drag is that when used with intelligence and perseverance it crowns the surface of the road after each rain just right, so that it sheds the water at once. This simple little implement, which can be fabricated by almost anyone for the trifling cost of \$3, or even less, is serving Madison county well. It is being used with success. It keeps the dirt and sand-clay roads in good order all the year, and at a very trifling cost, so low that if I were a stranger to the drag and the results it produces, I could not believe it. Anyone who wishes to verify the statement that the road drag will maintain properly graded and drained dirt roads for \$5 per mile per year can do so by coming to Jackson. I will take pleasure in showing you.

In reading the Red Road Book of the Bureau of Town Highways for the State of New York for the year 1910, I notice that the cost of maintaining dirt roads by means of the drag is less than \$6.00 per mile per year. This verifies our experience.

### BETTER HARBOR FACILITIES FOR VANCOUVER.

More than the British Columbia coast cities should be interested in the movement to create extensive harbor facilities in the vicinity of Vancouver. Both Portland and Seattle are preparing for the increased trade which will rapidly accrue on the Pacific, and it is felt here that prompt action should be taken to so improve existing waterways that adequate accommodation will be provided shipping. With Burrard Inlet, False Creek and the Fraser River, provision can be made with a reasonable expenditure for all classes and amount of trade and industries. Securing the trade will mean much for the West and British Columbia.

Some time ago the movement for greater harbor facilities was begun, and this week another meeting was held. With frontage on Burrard Inlet high in price, and False Creek land taken up, short leases only being granted, attention is being turned toward the Fraser River. With the dredging of the north arm of the river miles of frontage will be made available for industrial purposes, with both rail and water transportation facilities.

It will have the advantage of being practically in Vancouver, with labor handy, in fact South Vancouver, now being peopled by those who have to pay rent, will be as close to the north arm of the river as to Burrard Inlet. The Liberal Government promised \$1,250,000 for this dredging, and it is believed confidently that the Borden administration will implement this promise since the work is such that it will benefit the whole of the West. The dredging of the river also means much for the industries being located at and near New Westminster, sixteen miles from the sea, as a fresh water channel will be provided for shipping.

The meeting held this week took action in deciding to employ an engineer to lay out a plan as a suggestion to the government at Ottawa which can be improved upon if seen fit. This will start the matter going. Action should not be delayed, for the scheme is a large one, and will take a few seasons to consummate.

### PERSONAL.

**Mr. W. P. Morrison**, until recently municipal engineer of South Vancouver, B.C., has resigned his position and opened up as a consulting engineer at 311 Crown Building, Vancouver, B.C.

**Mr. Moscrop**, of the Campbell Gas Engine Co., Halifax, England, who has been looking over the Canadian field for the past three months, returned to England last week. While