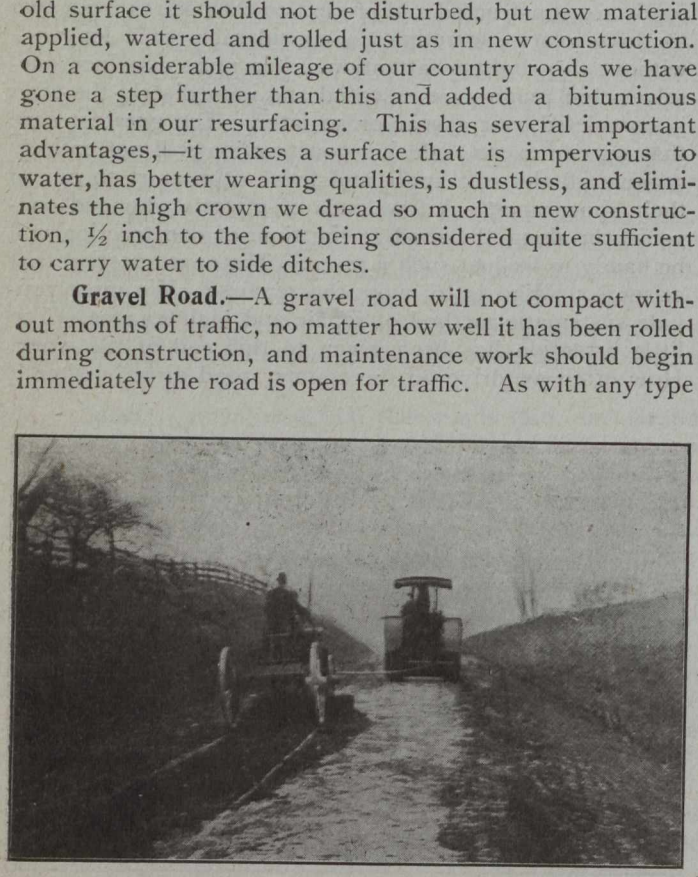
scarifier brings the stone to surface, making a better bond for the new material when placed upon the road. The surface is then watered and consolidated with the roller. Where in the original construction the stone was of a considerable depth this method of resurfacing may be sufficient for a year or so. However, if in the original construction the surface was thin, new material must be added. It is advocated by many engineers that where more than three inches of material is being placed on the old surface it should not be disturbed, but new material applied, watered and rolled just as in new construction. On a considerable mileage of our country roads we have gone a step further than this and added a bituminous material in our resurfacing. This has several important advantages,—it makes a surface that is impervious to water, has better wearing qualities, is dustless, and eliminates the high crown we dread so much in new construction, ½ inch to the foot being considered quite sufficient to carry water to side ditches.

Gravel Road.—A gravel road will not compact without months of traffic, no matter how well it has been rolled during construction, and maintenance work should begin immediately the road is open for traffic. As with any type



Grader at Work.

of road, the method of construction determines its length of life. A gravel that is dumped along the road in numerous piles with no care taken to spread or shape it, simply makes it that much more inconvenient to the travelling public.

The drainage should first be given consideration; the ditches, the culverts, waterways of all descriptions must have free and unobstructed outlets. The fact that we are simply going to construct a gravel road does not lessen the liability. This province at the present time has a considerable mileage of properly constructed gravel road that favorably compares with our macadam. The life of the gravel road depends upon the drainage and foundation. A road that is properly graded and ditched adds considerably to the appearance of the country in general.

The preparation of the subgrade depends partly upon the traffic expected and partly upon the amount of money to be expended. Proper alignment having been secured, the surface is brought to grade by use of grader wheel, scraper and roller. There are two methods of construction generally used,—surface and trench. The surface method consists of bringing the roadbed to the proper grade, as explained above, and placing the gravel upon it, care being taken to draw all large stones to the centre of the road that they may be covered by following material. The road is then rolled or allowed to be consolidated by traffic. The trench method is a little more expensive. A trench is made along the centre of the road, material being moved to the sides to act as shoulders to keep the gravel in place. The gravel is then placed upon the road, evenly spread and rolled. When second course of material is applied it is of sufficient depth to spread slightly over shoulders making a more even and better wearing surface. It has been claimed that no advantage results from rolling but certainly the public will not drive on the side of the road, cutting the shoulder away if its surface is rolled and put in proper shape. Gravel roads so far in Ontario have not been constructed with addition of bituminous material. They have, however, been built in the States but not with the same success attending the use of stone. The gravel with its rounded pebbles does not consolidate and bind together as with the angular and irregular shaped material.

To maintain a gravel road the same system of patrol applies as in macadam, the ruts must be kept filled and the surface smooth. The road drag is probably the best tool for this purpose, particularly the first year after construction, when it should be used after wet weather while the road is in a soft condition. The road drag will not have the same effect as the road ages, unless a period of wet weather exists for some time. Patching should be done when the road is in a wet condition as the new material added will bond to the old and compact much better than when in a dry state. It is also easier to locate bad places by the standing water. Care should be taken in filling these holes that the material is only raised above the surrounding surface sufficient that upon consolidation the new surface is level. Patching and the road drag, with attention to ditches and culverts, will keep a gravel road in condition until it needs resurfacing.

WEEKLY RAILWAY EARNINGS.

The following are the weekly earnings of Canada's transcontinental lines during April:—

	1917.	1916.	Inc. or dec.
Canadian Pacific Railway.			
April 7	$2,830,000	$2,482,000	+ $348,000
April 14	2,833,000	2,577,000	+ 256,000
April 21	2,708 000	2,343,000	+ 365,000
Grand Trunk Railway.			
April 7	$1,215,768	$1,155,486	+ $ 60,282
April 14	1,103,119	1,024,505	+ 78,616
April 21	1,085,031	1,059,661	+ 25,370
Canadian Northern Railway.			
April 7	$ 736,200	$ 677,000	+ $ 59,200
April 14	881,600	668,900	+ 212,700
April 21	765,600	634,300	+ 131,300

An association, to be known as the Society of Terminal Engineers, has received a charter, under the laws of New York State, for the purpose, among other things, of promoting the study of terminal engineering and mechanical freight handling.

From a study made of the water supply for the Panama Canal it has been ascertained that an average of 7.21 million cubic feet of water was used for each through lockage from ocean to ocean; that an average of 12,787.47 million cubic feet of water was wasted over Gatun spillway, or a sufficient quantity of water to make 1,773 through lockages each month. Based on 30-day operation, this would mean 59 lockages per day over and above the average traffic for the past year. According to the latest annual report of the Governor of the Panama Canal, the maximum number of lockages which can be made in 24 hours is 48, assuming that one vessel leaves the upper flight at Gatun just as another enters the lower chamber, and vice versa, both chambers being used.