

roadways. Heavy traffic cuts it up, but by the use of broad tires this difficulty may be obviated to a great extent. No matter how well constructed, the stones are liable to work out, and it is dusty or muddy according to the season. By the use of trap rock, instead of granite or limestone, the highest perfection of macadam may be attained. There is a large deposit of trap near St. Joseph's Island, on the north shore of Lake Huron, which costs little more than the expense of quarrying. An experiment in its use was made at Cleveland several years ago. Two miles of road was made in one of the parks, which has worn well. The foundation is crushed limestone ten inches deep, then eight inches of trap in three layers—coarse screenings, fine screenings and dust—all well rolled. The road cost \$3.10, \$3.19 and \$3.65 per square yard according to grade. Trap is extensively used in Germany, where it has proved very satisfactory. There are extensive layers of trap rock on the St. Lawrence near Kingston, convenient for loading on vessels, and therefore easily available for use in cities situated on the great lakes.

A very unlikely material for paving has been employed in the vicinity of the stock yards in Philadelphia. It is supplied from a plant set up at Norfolk, Virginia, to manufacture the grass that grows in the salt water marshes into paving blocks. The grass is subjected to enormous pressure, and then cut by circular saws into blocks $5\frac{1}{2}$ inches thick. These are treated in three tanks containing different kinds of oil, which renders the fiber supple. A wire helps to hold each block together. The pavement is said to be smooth, noiseless and free from slip. The most remarkable paving material which the readers of this journal probably ever heard of is molasses! In the process of sugar refining in the Southern States large quantities of molasses are produced, which is a waste material, sometimes difficult to get rid of. The head chemist of a refinery in Chimo, Cal., bethought him of a means to turn it to account, and he had a walk, 1,000 feet long, constructed of slabs of molasses mixed with sand. It dried quickly, became hard and was not affected by the sun. A slab two feet long and one foot wide was tested by being placed on supports for a couple of inches at each end. When struck with a heavy hammer it showed no sign of either cracking or bending.

As cost is a very important factor in paving, a statement is appended showing the approximate cost per square yard of the pavements in general use in Toronto. The relative cost will be much the same in other Canadian cities. The figures are for a roadway 24 feet wide:

Heavy asphalt, 6 inches concrete, $2\frac{1}{2}$ inches asphalt	\$2 70
Light asphalt, 4 inches concrete, 2 inches asphalt.....	2 30
Brick on 4 inches concrete	1 60
" on broken stone	1 45
" on gravel	1 30
Cedar block on 6 inches concrete	1 40
" on 6 inches gravel (wooden curb).....	70
Macadam	1 20

THE WHITE SLAVES OF THE PASS.

That there is no slavery under the British flag has been our boast for two generations and we have looked not uncomplacently upon the people of the United States, who by law made all men free and equal, yet for many years bought and sold their fellowmen in the open market. It is no longer lawful for a man to sell himself into bondage, or his wife or children, to pay his debts, but in Canada we have discovered recently that men may be decoyed into the waste places of the earth and there forced to toil their lives out in misery at the pistol's mouth. We quote one paragraph from the voluminous report of the

commission appointed by the Dominion Government to enquire into the subject: "We note some special facts, such as, for instance, the fainting of men on the works; the refusal on the part of teamsters, whose wagons were hardly loaded, to give a ride to wounded men, such as young Joseph Bourignon and Theodore Lambert; some threats of Noble, one of the foremen, to kick them; the alleged bad treatment by the same foreman of men who had had difficulties with the company, and who were discharged one day after they had returned to work; the refusal of food generally to all men discharged or quitting work, and the hardship experienced on account of this, which caused one Weir, for instance, to faint, and others to feel very weak, three men having to subsist for a whole day on one onion; a pinch of salt refused to men leaving camp, which they asked for in order to salt fish they might catch with a fish-hook given them by one of the men. All this when they were at distances ranging from 70 to 150 miles from, and having to walk to McLeod, often having no money, and, even with money, being unable to obtain food, and having sometimes to rely on remnants thrown away on the road." We do not repeat the tale of horror which recites the death from most painful disease of men who passed their last hours under such conditions of exposure to hunger and cold that their companions who were in health could not have avoided freezing except by the most continuous exertions.

The president of the Canadian Pacific Railway when interviewed on the subject is reported to have said that the contractors could not provide feather beds for the laborers. When a public complaint was brought to the attention of Sir Wm. Van Horn's fellow-countrymen, that other great United States railway dictator, Jay Gould, he said, "The public be d—d." The question which should be considered by every thoughtful Canadian is whether we are governed according to the B.N.A. Act or the C.P.R.

SANITARY EXPERIMENTS AT COLOGNE, GERMANY.

BY W. M. WATSON.

The city of Cologne, Germany, reframed its plumbing and private drainage by-laws, some years since, to comply with the fashion of the times, ordering back-air vents on all fixtures, and also traps and breathers on the main line house drains, but, after giving them a few years' trial, it was proved that the advantages of the system were not equal to expectation, or even so good as the method previously employed, which was erecting the appliances with as much simplicity, coupled with good workmanship, as possible, and a short time since the city fathers appointed a committee, together with Herr Maniewski, the leading architect, and Herr Unna, the noted sanitary engineer, to make a thorough investigation of the whole system.

The committee erected sets of soil pipe and drains made from glass; they also had a variety of water-closets, traps and small waste pipes made from the same material, and fixed them to a temporary erection, consisting of three flats, in the most public place in the city. They also got permission to cut out and examine a number of the oldest back-air vents in the city. They had been in use several years. Having lately finished the investigation, their report has been published in detail in No. 4 and 5 of the *Gesundheits Ingenieur* for 1898, a German engineering journal, and as the experiments are of great importance, the report has been republished in the English-speaking papers. This report relates that all the old back-air pipes the investigation committee cut out were choked up with either grease or coffee grounds, or cobwebs, which would of course prove that the vents had been useless, on several