

the Great Northern Ry. is planning at present, except setting the frontage line further back from Main St., than that company's plan shows. The plans were discussed by the city's railway and bridge committee on the same day, and by the City Council on Feb. 15, representatives of the Vancouver Board of Trade being present at the meeting. Further consideration is to be given to the matter.

Lines on Vancouver Island.—The Minister of Railways for British Columbia has authorized the making of a temporary level crossing for construction purposes over the Victoria & Sidney Ry. at the north end of the Saanich Peninsula near Bazar Bay, and another one across the British Columbia Electric Ry. at mileage 17.9 north of Tripp station. These two points are almost close together.

Material and supplies for tracklaying on the Victoria-Patricia Bay line have

been delivered in considerable quantities at Victoria, but tracklaying had to be put off on account of the heavy snowfalls at the end of January and in the early days of February. It is expected that a real start will be made with the work in March.

Plans and specifications for the car ferry slips and wharves at Patricia Bay, and for the temporary transfer slips at New Westminster, were given contractors proposing to tender for the works on Feb. 16.

We are officially advised in regard to a press report that the company was surveying a route for a line from Alberni to Nootka Sound, 15.6 miles, that this line was run two years ago, and that the distance between the two points is 160 miles. No other survey work on Vancouver Island is at present contemplated. (Feb., pg. 54.)

Causes and Preventatives of Heaving Track.

By J. W. Powers, Supervisor, N. Y. C. & H. R. Rd.

The season is at hand when trackmen on practically all roads situated in latitudes where snow and ice are formed, are troubled more or less with heaving roadbed, causing more or less serious defects in surface and line of track, the extent of damage depending on the condition of roadbed as to ballast and drainage. Heaved track is one of the most annoying things and is sometimes the direct cause of broken rails and occasionally of derailments and wrecks.

The cause of heaving roadbeds has been discussed and explained on several occasions but the cause and knowledge of how to prevent same cannot be disseminated too profusely. When water freezes it expands, which means that if one cubic foot of water freezes the resulting ice occupies a space considerably larger than that of water. This takes place when wet soil freezes. Each particle of water expands and takes up more room. Considering these actions of water in connection with track work, it is easily seen how a roadbed soaked with rain will heave when it freezes. The particles of water as they turn to ice expand and since the least resistance is upward, the roadbed raises bodily. If this raising was perfectly uniform it would not be of much consequence, since it would just raise the level of the entire line. As a matter of fact the heaving takes place in a very irregular manner, due to the greatly varying proportion of water in the roadbed and also depending on the depth to which the frost penetrates, the drainage and the amount and kind of ballast.

Clay, on account of its great capacity for holding water, is about the worst material of which a roadbed can be constructed. Hence the composition of the roadbed and ballast, together with proper drainage, is an important factor affecting the heaving of track.

It is not an unusual occurrence when filling up openings, such as culverts, trestles and tops of arches, which are often substitutes for iron bridges, to have the filling made with cinders or gravel. Sometimes this material is several feet deep, and as a result of its porous condition it will not heave in proportion to the track each side of same, which oftentimes consists of clay, making it necessary to shim where openings were filled. This could be avoided by using material to fill the opening similar to that used on each side of same. Another mistake which is sometimes made by the use of clay when

strengthening shoulder on fills, is allowing the clay to raise higher than the subgrade, which is often done to save ballast, but as a result the drainage is retarded and forms a ditch under the track, as dense soil will not allow water which falls on track to pass off freely. Consequently clay should not be placed above subgrade when track is ballasted with more porous material. It is a well known fact that loam is better ballast than clay, sand better than loam, gravel better than sand and broken stone better than gravel, as a preventative for heaving, due to the fact that these materials in the order named are more porous. This provides room for water to expand as it freezes, with the result that heaving is either not noticeable at all or only to a slight extent. Another important reason is that these materials let the water pass through quickly, thus diminishing the amount of water in the roadbed and thereby lessening the tendency of the track to heave.

Where there are wet clay cuts it may be necessary to cut out the clay down to the frost line and fill in with a material like gravel or cinders; also tile drains should be laid so as to carry off the water as quickly as possible. The remedy for heaving may be readily found after its causes are thoroughly understood. The preventative should be in two directions, namely, reduce the amount of water in roadbed to a minimum and use ballast which is sufficiently porous to provide room for freezing water which cannot be entirely eliminated by drainage. The importance of good drainage cannot be overestimated and the further water is removed from track and the sooner it can be diverted, the more stable will become the roadbed. A practical illustration of this occurs during a wet season, while poorly drained sections of roads are troubled with bad track, mud slides and washouts. A mud ballast track can even be made good by keeping water away from it, while rock ballast will not prove satisfactory unless properly drained. The most important work then, in connection with general track work, consists in keeping the roadbed as dry as possible.

As already referred to, good drainage obviates the necessity of shimming. There are various methods of shimming, many of them being good and safe, but it should be the practice to shim according to well defined methods governing such work. Whatever method of shim-

ming is employed it should never be at the expense of safety. The cost of material for shimming, such as wood, frost spike, braces, etc., together with the labor of inserting, renewing and removing shims, is very expensive on some railways and as the work is only temporary, it might be considered a waste of money and material and if the expense chargeable to this work was spent for ballast or to improve drainage, it would in a short time eliminate the necessity of shimming and provide better and safer track.

The probability of accidents, as already referred to, is greatly increased on account of heaving and shimming. As it is at this season of the year more than at any other, the duties of the track forces are of the most exacting and vigorous kind. This is particularly true in reference to protection of the traveling public, and anything accomplished to eliminate the liability to accident, we consider a step in the right direction. Hence the importance of good ballast and drainage which will permit trackmen to devote more time to other duties of equal importance, as for example snow storms which close up cuts in certain portions of the road, snow and ice which have packed solid in road crossings, frogs, switches and guard rails and which keep trackmen constantly on the alert to guard against accidents. Then again occasional warm rains or spells of warm weather fill the ditches with melted snow with little chance to run off. In yards the water formed during the day freezes about the switches during the night, causing much work keeping them in usable condition, and as the melted snow raises the water in streams, causing the ice to break up in the rivers and jam against piers, bridges and trestles, frequently damaging or even carrying them away.

Aside from these points, nearly every section has its own special features which have to be closely watched to avoid accidents to trains. For instance, where water tanks, water pans, interlocking plants, etc., are located, it requires careful watchfulness on the part of trackmen to prevent accidents at such points and shows the necessity for each foreman to study his surroundings carefully in order to best meet the emergencies which may arise, as it rests with the foreman to combat all of these elements and to entirely eliminate the possibility of damage and consequent danger. Thus it is seen that the proper protection of the traveling public depends upon the intelligence, ability and close attention to duty of the track forces who on numerous occasions go many hours without food and sleep when the safety of human lives requires such services.

Not many realize, as they rest on the luxurious cushions of parlor cars and speed along over smooth track at the phenomenal speed of 60 to 80 miles an hour on a cold stormy night, of the hard work, exposure and worry this comfort and safety of themselves has caused the trackman, whose greatest reward is in the knowledge that he has performed his duty faithfully. A little thought on the subject of the duties of trackmen will convince the most skeptical of the burden which rests upon the trackmen and the importance of the work they perform. Any neglect or oversight on their part may be the cause of serious consequences. Therefore they must be eternally alert and vigilant, even to the extent of supplying the deficiencies of men in other departments.—Maintenance of Way Bulletin.