

and accepted also by Mr. Woods, the assistant chief engineer of the Grand Trunk Pacific.

Mr. Doucet says that he discussed the matter with Mr. Lumsden, and that Mr. Lumsden assented to Mr. Doucet's view—that a fair working rule would be to classify as solid rock material which contained at least 50 per cent of solid rock in mass.

Mr. Lumsden was asked whether he remembered having a discussion with Mr. Doucet upon the subject, and said he did not remember (see page 436); but it is apparent that some percentage of other material than rock must, in any case, form part of such a mass.

The controversy as to solid rock is almost the only one arising out of the construction of the work upon District 'B.' On this district, according to the evidence, large quantities of boulder rock are found in deposits which, according to the evidence, were cemented together and required continuous blasting to remove. The resident engineer upon Residency No. 28, District B (Mr. Cressman), gave evidence as to the character of the rock, which is of special value because it is given by the engineer actually in charge and resident on the work while the work was in progress, and upon whose residency occur the larger number of localities referred to by Mr. Lumsden in his illustrations of District 'B,' submitted to the committee in Exhibit No. 2, page 79 of the proceedings.

With regard to District 'F,' the questions are different. The question of the allowance of solid rock where boulders occur in masses of cemented material, is, according to the evidence, not of much importance, although there were some cuttings containing assembled material found in the eastern end of the district.

Four questions, however, are the subject of criticism by Mr. Lumsden and are discussed in the evidence.

1. The first of these is what is termed 'overbreak,' or the allowance for material in rock cuttings outside of slope lines, and the question whether it should or should not be allowed depends upon the construction of clauses 34 and 37 of the specifications. Without repeating these clauses, which have been already quoted, the evidence of the engineers seems to be in agreement, that the material behind the slope line is to be allowed and paid for unless removed by the excessive use of explosives. The evidence agrees that a certain amount of breaking away behind the slope line in rock cuttings is inevitable, and usually occurs on one side where the lines of cleavage of the rock make it necessary, and usually on the opposite side of the same rock cutting the slope can be, as a rule, adhered to without much removal of material outside the line. There are cases, however, where large masses of rock are necessarily shattered and brought down by the effect of the blasting in the cutting below, and where the engineer will, in the interest of the work, require the contractor to bring down loose or shattered rock, which is liable later on to fall in the cutting and cause disaster. There is no difference among the witnesses as to the interpretation of the specification; it is simply a question of applying the judgment of the engineer to the conditions which prevail at each locality, and apart from the removal of the rock in the cutting, the application of the rule which prohibits wasting of the rock if it should be used in the construction of embankments. Any errors which may have been made in the classification of solid rock owing to the undue allowance of overbreak is a matter that can be readily adjusted by engineers examining the work, and according to the evidence of Mr. Grant such examination has in a great many cases already been made.

2. Mr. Lumsden does not in his letters or explanations refer to the subject of the measurement of frozen material as loose rock, but some evidence has been given with regard to it. The conditions which give rise to it are variously stated. Mr. Lumsden said that he had himself given express instructions that frozen earth or material which would be classified as common excavation, requiring to be removed for the purpose of opening cuttings, should be classified and paid for as loose rock. Mr. Poulin