Government Railways, Halifax, N.S., born at Margaree, N.S., Dec. 6, 1878.

H. H. Vaughan, M.Can.Soc.C.E., Consulting Engineer, C.P.R., Montreal, Vice President, Dominion Bridge Co. and Vice President and Managing Director Dominion Copper Products Co., born at Forest Hill, Essex, Eng., Dec. 26, 1868.

R. C. Vaughan, Assistant to Third Vice President, Canadian Northern Ry., Toronto, born there, Dec. 1, 1883.

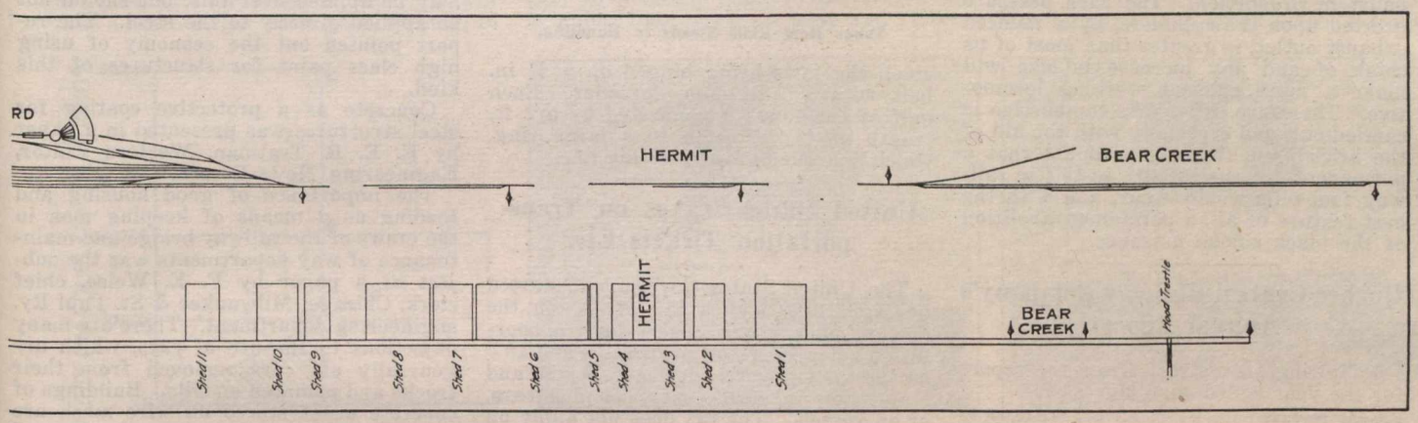
A. P. Walker, M.Can.Soc.C.E., Assistant Engineer, Ontario District, C.P.R., Toronto, born at West Hartlepool, Eng., Dec. 9, 1860.

E. H. Wood, Foreman, Michigan Central Rd., Kensington, Ill., born at St. John, N.B., Dec. 30, 1880.

Fuel Economy as Related to its use in Steam Boilers and Locomotives.

By S. H. Pudney, Fuel Inspector, Eastern Lines, Canadian Pacific Railway.

In the first two articles on this subject the losses of fuel during its combustion were shown by relating to various tests that have been made, also to actual practice in the use of fuel. There is no doubt that such losses do occur because it has been shown that by the use of certain devices a saving of even up to 25% has been made, and no saving could have been made if there was no loss before. Now the question arises, what can be done to overcome these losses and enable us to get the greatest possible efficiency from the fuel we use, and thereby not only save money but conserve our fuel and also reduce the car shortage. There never was a time when the shortage of cars of the class that is used to carry coal was so serious, and very few of us realize what the effect of a saving of fuel would mean in this line. If a 10% saving was effected in the use of fuel on Canadian railways alone, it would mean that 18,000 cars could be released for one trip, or that about 2,000 cars could be released from this service altogether. This one item alone should make us go to greater lengths to get better efficiency, to say nothing of the six or seven millions of dollars that would be saved. To make this saving we have only to do, as was said before, viz., to follow out the rules that govern the perfect combustion of fuel.



Reclamation of Rogers Pass Line Material for Canadian Pacific Railway.

There are a great many authorities on this subject and they all say the same thing as regards the better use of fuel. The University of Illinois, through Professors Parr and Olin, have made some important researches on the coking of fuel at low temperatures, and in a bulletin, in speaking of the combustion of coal, they quote Prof. Bone, who is recognized as one of the highest authorities on this subject, as follows: "Other conditions, such as accelerating the reaction by introducing the principle of surface combustion, may at some time be added to the mechanical and physical conditions now in vogue in the use of fuel."

In the burning of fuel there are two distinct processes. The first action, or process, is the burning of the fuel on the grates, which, in passing through the fuel bed, takes up more carbon and at the surface has a large proportion of CO. A large proportion of the flame that is given off at the surface of the fuel bed is also unsaturated gas. The second process, or reaction, is the combination of the CO. with oxygen to form CO^2 with an increase of 10,000 b.t.u.'s for every pound of carbon that undergoes such reaction, also the breaking down or reaction of the gases or flame into their individual elements to combine with oxygen, so that in this term they evidently mean that as nearly all these gases where this reaction has to take place are at the surface of the fuel bed, the best results can only be obtained when some sort of surface combustion is carried out, or in other words, oxygen of the air must be administered to the gases independently of that which comes through the fuel bed.

Mr. Fox, a well known writer and specialist on black smoke in Chicago, says that air admitted through the fire door and allowed to pass over the surface of the fuel is the best remedy for smoke. An investigation was carried out by the United States Geological Survey, under the charge of D. T. Randell and H. H. Weeks, who, after making a considerable number of tests with different classes of boilers and furnaces, said that they found that air admitted through the fire door freely, at the time of firing and for a short period thereafter, was productive of a more perfect combustion of the gases and less smoke. These statements, made by men who had only one object in view, viz., to find out the truth, cannot be doubted. I have made some considerable experiments in this line myself and have found their statements to be correct.

Most locomotive men have had enough experience in this line to know the results. For instance, at terminal points and stations, the rule is invariably to open the fire door enough to consume the smoke. Of course, it is not possible to open a fire box door while the locomotive is running under load or trouble would soon occur, due to leaking flues. But there is one thing which a fireman does that proves to all who understand locomotive practice that the idea of surface combustion is correct and will eliminate smoke. No doubt many have seen a fireman take his coal scoop and open the fire door, then put his scoop in the fire door hole bottom up, turning it from side to side, deflecting the incoming air down over his fire. He does this so that he may be able to see the condition of his fire and can in this way see any banks or holes that may be forming in his fire box and remedy them at the next time of firing. He naturally considers that in doing this the air rushing in blows the smoke and gases away so that he can see his fire. But what really does occur is that the air, going in through the door, is being deflected down to the surface of the fuel and is performing the process of surface combustion, and the gases are all combining with oxygen at that point, so that combustion is complete. As the perfect combustion of fuel is without smoke or color at the spot where it is going on, he can see through the products of perfect combustion and note the condition of his fire. This proves again that surface combustion is the right remedy for smokeless and perfect combustion and the proper thing for fuel economy.

The proper way to admit air in a locomotive fire box for surface combustion is so that it may have the best possible chance to mix with the gases that are being liberated from the fuel, and where they may have the longest possible travel before reaching the flues. This means that it must be admitted at the door. The air going in must be deflected down in such a manner that it will come in contact with the gases at the moment they are liberated from the surface of the fuel, because at moment they are practically in their nascent condition, and in that condition all chemical action, or reaction, is more rapid and complete. That this can be done in our locomotives has been demonstrated fully, and it is quite possible to so equip them that we should be able at a trifling expense to save at least 10% of the fuel used at present.

In the article I mentioned that I considered much better results could be obtained in the combustion of fuel and that this could be done with a larger exhaust