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Railway Location and Construction Through Muskeg Swamps.

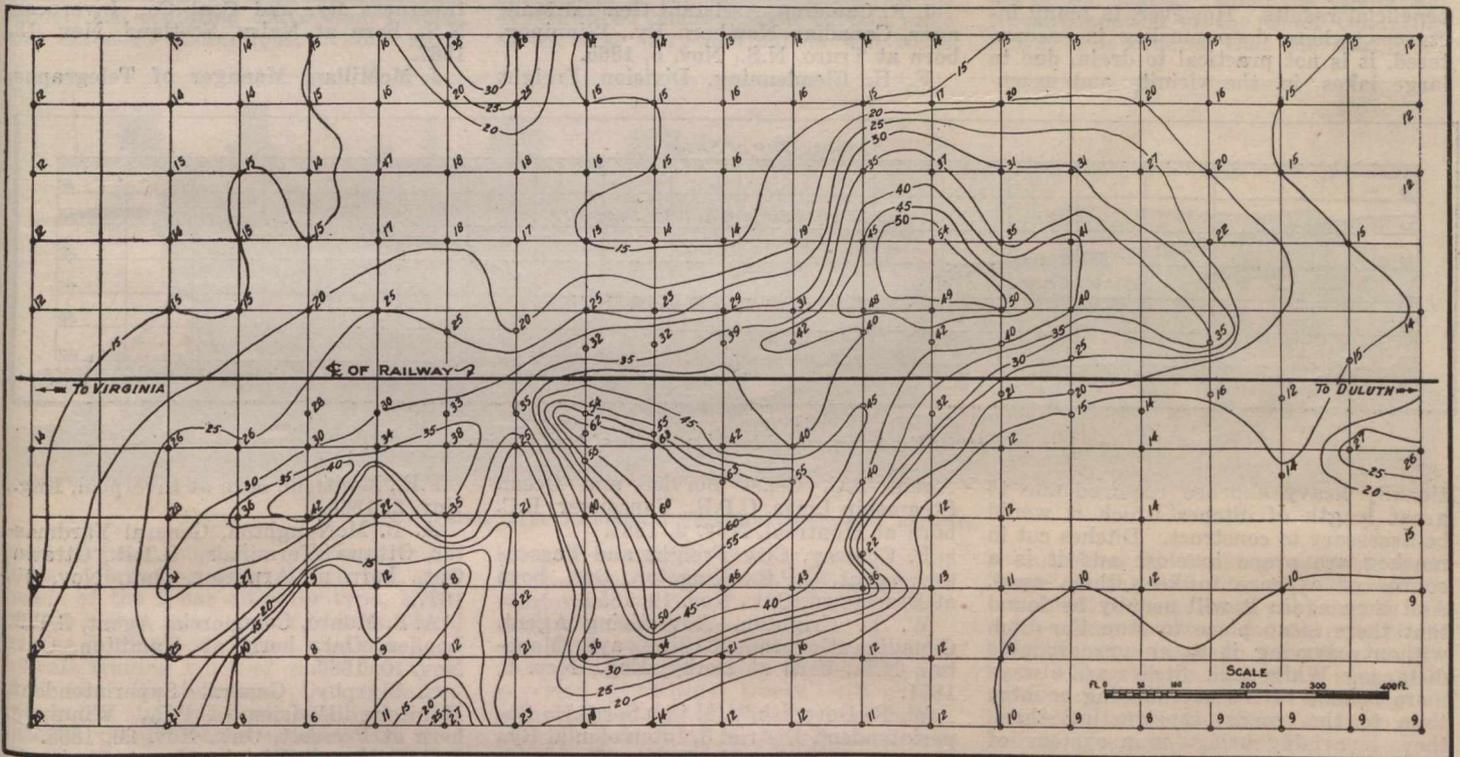
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In locating roads over muskeg country, it is well to have a slight knowledge of the geology and the accepted theory of this formation. When the continental ice cap receded, it left vast quantities of glacial drift, composed of all sorts of material, varying in size from huge boulders weighing several hundred tons down to an impalpable powder forming clay. It is owing to this glacial invasion that the surface differs from the normal type in the minor topography and drainage. The whole plateau is deeply covered with glacial deposits, which have disarranged the drainage so that there are abundant

tions over these swamps that a thorough investigation should be made to determine contours of the hard bottom. We are too apt to take it for granted that the muskeg is but of a shallow formation, and trust to our road to be supported by the decayed vegetation rather than to accept the country surrounding these swamps, which is invariably covered with very thick vegetation. There is a great temptation to run our lines through the open country, in order to avoid a more difficult location on higher ground, in which the regularities are apparent. In locations over such swamps, it would be

doubtedly cause a great deal of criticism of his location, it would in some instances be a very great economy to do so.

I have made a study of the vegetation covering these swamps, with a view to ascertain if the growth was in any way indicative of the depth of the swamp. Generally speaking, it will be found that the smaller the tree growth and the more luxuriant the growth of the moss, the deeper will be the muskeg, but I have not as yet been able to ascertain anything more than a very approximate depth by such observations. The areas found void of tree growth should be re-



Miller Trunk Swamp, Feb. 1913. Contour Map Showing Conditions of Hard Bottom. Contour interval 5 ft. A depth less than 15 ft. supports traffic.

lakes, swamps and muskegs. Overlaying the glacial drift and under the swamp is usually found a stratum of impervious blue clay. As the ice melted, the materials were deposited, as an over-mantle of glacial drift, in moranes and in a very irregular manner, so that the topography of the country did not conform to the usual regularity presented by country formed by the erosive action of water. Huge quantities of ice were left embedded, afterwards melting, which formed large circular depressions or kettles. These became filled with water in form of lakes. The muskeg is of recent formation and is composed of decayed moss and various vegetable growth, which, by constant decay and renewal, gradually filled the depressions until we have what are known today as muskeg swamps.

As the added formation does not bear the regular contours usually found, it is very necessary in determining loca-

well for the engineer to proceed in the same manner as he would in locating over frozen lakes, and not trust the moss covering to support his line until he has thoroughly tested the same and ascertained what the bearing value of the soil is. In testing it will quite often be found that the surface is floating and the lake is not yet filled to the bottom. In such cases disaster is sure to follow unless adequate measures are taken to support the track. Another weakness that is often met with in such locations is the desire to obtain long tangents. It would be much better to introduce curvature in the alignment, in order to keep the location over shallow swamps, than to produce long tangents crossing over deep pockets. It would, of course, take a great deal of stamina on the part of any engineer to introduce apparent reversed curves on what appears to be level ground; and while this would un-

garded with suspicion, as this usually indicates deep and recent formation and quite often indicates floating bog.

It has been found in some of the lines already constructed, that had adequate soundings been made previous to final locations, a great deal of money would have been saved over what was necessarily spent to bring the road up to the required standard after operation was begun. As a concrete example, I would like to draw attention to the accompanying plan. As constructed, the line at this point was first heavily corduroyed, which broke through before traffic was started. Soundings taken on centre line after failure showed a depth of about 60 ft. to apparently hard bottom. About 83,000 yards of material were required to again bring the track above water. A great deal of time and money was lost, due to the failure of the surface. All of this would have been avoided had adequate