

The Canadian Engineer

VOL. II.—No. 7.

TORONTO, NOVEMBER, 1894.

PRICE, 10 CENTS
\$1.00 PER YEAR.

The Canadian Engineer.

ISSUED MONTHLY IN THE INTERESTS OF THE

CIVIL, MECHANICAL, ELECTRICAL, LOCOMOTIVE, STATIONARY,
MARINE AND SANITARY ENGINEER, THE MANUFACTURER,
THE CONTRACTOR AND THE MERCHANT IN THE
METAL TRADES.

SUBSCRIPTION:

Canada and the United States, \$1.00 per year. Great Britain, 5s. Advertising rates on application.

Offices: { 62 CHURCH ST., TORONTO.
FRASER BUILDING, MONTREAL.

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Fraser Building, Montreal.

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RAILWAY BUILDING ACROSS PEAT BOGS.

As referred to in our report of the Canadian Society of Civil Engineers, D. A. Stewart recently presented a paper on the subject of building railways across peat bogs or swamps, in which several valuable hints are given for railway work. He observes that in building railways over such ground, the method of construction will, in most cases, either be to form a raft of some kind on which the weight of the track and trains will be, as it were, floated over the yielding mass beneath, or to fill in hard material until a solid bank is formed from the bottom of the swamp upwards. If the swamp is at all deep the plan of filling in is both expensive and uncertain, so that the first method should be adopted whenever practicable, which will be the case almost always when the grade line can be kept down close to the surface of the swamp. When the swamp can be drained to a depth of from two to five feet, the cheapest and most convenient plan will be to cut side ditches on both sides of the road bed, with such off-take drains as may be needed to take the water out of the side ditches, and to use the material taken out of the side ditches to make a light embankment. The body of partially dried peat between the side ditches is then sufficient to carry the light embankment with the track and trains. In this way railways have been carried over swamps so deep and soft that one man could push a pole into the muck for twenty feet or more, and pull it out again. If the depth of peat is so small that the ditches reach the firm stratum beneath, the raft becomes a more or less yielding cushion under the track. The side ditches should not be less than three feet deep, but it is not advisable to make them deeper than five feet. Generally the

width need not exceed six or eight feet. A high bank is not advisable except where the grade line cannot be made low, because the additional weight only tends to sink it deeper. Banks made of muck should be covered on the sides and top with sand or gravel as soon as possible after the track is laid, as they tend to become wider as they settle. The surface of swamps being either level or only sloping gently, a surface line will always give easy grades, and the grade line should as nearly as possible be parallel with it, thus making the side ditches of uniform size. The swamp will settle as it is drained, and the bank as it becomes consolidated, but in ordinary cases no attempt should be made to raise them up to the original profile grades; the cost will be greater than any gain, and the additional weight may even cause the bank to break through the crust. When the swamp is too wet to allow of a bank of this kind and drainage cannot be got, and the grade line can be kept close to the ground, a raft may be made of logs or brush, or both, with enough peat on top to hold the track and keep the ballast from sifting through. In this case it would be better to take the peat or muck from some distance outside the ends of the logs, as by cutting the skin of the swamp close to the road its bearing power would be diminished. One tier of logs should be laid lengthways of the road, to help to diminish the undulations of the track under trains. The cross logs should be as long as can be conveniently got and handled, so as to distribute the weight over as wide an area as possible; but there is no gain in putting down more than two or three tiers of logs, as the weight will tend to sink the raft down, and the object is to carry the track over the crust of the swamp without breaking through. But when the crust of the soft swamp has been broken, and the hole has to be filled up, if timber is plentiful and convenient, it may be used simply as filling, and will have a certain advantage from its not being softened and dissipated by the water as earth or sand would be, and in deep bogs may form a submerged raft capable of carrying the required load. Mr. Stewart then goes on to consider the best course of action in the event of the bog being too soft to carry an embankment, of whatever light a nature it may be, or when the grade line cannot be kept near the surface. In such cases, there will usually be no better way than to fill in firm material until a solid bank is formed from the bottom up. In making estimates for this, not only should the bottom of the fill be assumed to be at the bottom of the soft material instead of the surface, but large additions should be made to the quantities so calculated, because the soft material, being displaced by the filling, will slip out sideways and carry portions of the latter with it. In many cases the division between the bog and the underlying material will not be distinct, but the one will merge gradually into the other, and in such cases the quantities of filling required will be correspondingly uncertain. The worst cases are usually where the soft muck is underlain by soft and slippery clay. It is a common practice to get the track over such places by using timber trestles,