Please read and send in as full a discussion as possible at earliest date.

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RAILWAY FENCING.

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The subject of railway fencing, especially of determining the most economical and efficient type, does not appear to have received the consideration that the first cost and cost of maintenance would seem to justify.

The many different kinds of fencing that one sees in common use in farming and woodland districts in Canada, where cattle are allowed to roam at large, may be estimated to cost all the way from $300 to $1,500 or more per mile, and the most expensive is not always the most efficient, durable or economical to maintain.

The continued decrease in supply of suitable timber, and the consequent increase in cost, should make this subject of keen interest to railway companies and to farm land owners.

In Canada the fencing of a railway in country districts is necessary for the purpose of protecting the trains from danger arising from running down trespassing cattle or other domestic animals, or of protecting the company from damage suits arising from resulting injury to such animals, and for the protection of the railway from the accumulation of snow.

With the modern heavy locomotive and rolling stock, there is little danger to trains to be apprehended from striking the smaller

domestic animals, except perhaps pigs, which are generally kept by the owners within a limited space securely fenced, largely because they are difficult to keep within fences which will hold securely other domestic animals.

The cost to the Railway Companies for injuring sheep or pigs is probably so small that it can fairly be considered not economical to try to fence against them in most localities.

It is perhaps unnecessary to consider rail fences, which are probably not now being built by Railway Companies, owing to their cost and liability to destruction by fire, and tendency to carry fire through the woods.

Board fences with posts spaced about eight feet apart will perhaps be continued in special locations, such as through towns and close to farmers' buildings, where they are necessary to protect their smaller animals.

Post and board fences will also continue to be used as a protection from snow drifts. For such purpose it is often desirable to build them much higher than for cattle protection. The writer prefers to use cedar posts, spaced eight feet C. to C., with the boards nailed on horizontally, breaking joints and spacing about three inches apart, selecting the widest boards for the bottom. Where a fence eight feet high is insufficient to store the snow, it is generally better to use a temporary board hurdle fence placed back fifty or a hundred feet in the field than to increase the height.

Fences built with horizontal boards so spaced do not interrupt the view greatly, and do not cause that unpleasant dazzling effect on the eyes of travellers. Where the ground rises or falls, the fence should maintain its height by adding a board to or dropping one off the top, giving the appearance of steps.

A vertical batton on the boards at each post greatly strengthens the fence and hides joints.

There are various forms of portable board hurdles for snow protection; probably the best is in the form of an inverted Y with widely spaced horizontal boards fastened to vertical frames, which will fold flat for transportation and summer storage.

In prairie sections, snow is stored clear of the rails by low embankments or hedges taking the place of the fences, or the snow is prevented from accumulating on the track by flattening the slopes of the cuttings.

Barbed wire has been very extensively used, but is justly condemned, as being destructive to stock and inefficient unless used in combination with boards or rails, which necessitate close spacing of posts, and consequent expensive construction and maintenance.

Diamond shaped woven wire fences and woven lath and wire fences with vertical laths are open to the same objections regarding cost and efficiency.

There are a number of different patterns of woven wire fence with horizontal wires connected by vertical wires, woven either in the factory or in the field, which possess varying degrees of excellence, and are rapidly taking the place of the other forms above mentioned.

In considering the value of such fencing, the following qualities are important:—(a) Efficiency in stopping horses and cattle without injury to stock or fence; (b) capability of adjusting itself to changes of temperature without unduly straining posts or wires in cold weather; (c) capability of yielding to weight of snow settling during a thaw, fallen trees, or persons climbing over it, without permanent injury; (d) liability of accommodating itself to inequalities of the ground surface; (e) low first cost; (f) low cost of maintenance.

If the horizontal wires are plain straight wires, it is necessary, in order to satisfy b, c, and d, that springs be introduced at frequent intervals, also that vertical wires be not so stiff as to remain kinked after distortion.

As the cost of cedar posts and labour is continually increasing and the cost of wire generally decreasing, the fence should be of such design as to admit of wide spacing between posts, in order to satisfy e and f.

The writer has for some years used largely a fence woven in the factory, in which the horizontal steel wires are like an elongated cork screw, with light vertical wires, and began some eight or nine years ago to space the posts 25 feet C. to C. This distance was selected so that intermediate posts might be interpolated if demanded by the Government to comply with subsidy contracts. Such intermediate posts were, however, found unnecessary, and the fences—where posts were properly set—have been eminently satisfactory, and experience has indicated that on level ground this spacing—with strong posts—could safely and economically be extended to even fifty feet. Spans should, however, be modified to suit local irregularities in the ground surface. The writer is also of opinion that true economy would be gained on a large percentage of railway fencing by limiting the number of horizontal wires to what is necessary to effectively stop cattle and horses (perhaps seven wires).

In considering the effect of such long spans between posts, it must be remembered that the longer the span between fixed points the more nearly do we comply with requirements c, e, and f.

Gates should be strong and light, capable of being locked when desired, and cheap.

These conditions appear to be fairly well satisfied by a frame gate, in which the top and botton rails are 3″ x 3″, end posts 3″ x 4″, centre posts and braces 2″ x 3″, pine or spruce, fastened together

with wire nails and strongly bound by woven wire fencing tightly stretched and securely stapled to all the members. Hook and eye hinges should be used to allow the gate to be lifted off in times of deep snow, and the gate should be fastened with a strong light wire chain (with hook) long enough to encircle the post even when it has drawn away a few inches on account of the strain of the wire fencing.

The discussion on the subject of railway fencing is not complete without considering cattle guards.

The danger of wrecking a train in which a pair of wheels may be derailed has led to the abolition on all good roads of the open pit cattle guards, in which the rails are laid on the stringers. The danger of such guards to trains is not much reduced by placing ties and guard rails on the stringers, as cattle and horses are frequently caught in them by the legs, and in such positions are a very serious menace to the heaviest locomotives.

The writer knows of no surface guards that will actually stop horses or cattle when seeking food, when driven by men or dogs, or when frightened by a train. There are a number of excellent surface cattle guards (both metal and wood) in the market, and the writer favours the wooden ones with inverted wedge-shaped longitudinal-slats, painted white for the purpose of exaggerating in appearance the depth between the slats. These, with white painted board wing fences and return fences to the right of way fences proper, form a very efficient cattle protection.

In the case of oblique public road crossings, the writer has been in the habit of locating the cattle guards and wing fences just clear of the public road boundary, and carrying the return fences back from the middle of the cattle guards to the right-of-way side fence by the shortest straight line. This excludes from the fenced-in-right-of-way two small triangles, but gives a space for frightened animals to turn in and clear the track, if caught approaching the track in the face of a train.

It is probable, in the writer's opinion, that the lengthened spans which will probably be used in fencing, and which demand heavier posts, may ultimately lead to the use of some form of iron post set in concrete base or some design of hollow concrete steel post when the cedar available becomes more expensive.

Under present conditions, it is highly desirable to set the tension posts (at gates and corners) in a pyramidal concrete base, as the cost is low compared with the advantages gained in increased strength and durability and in preventing heaving from frost.

There is such a diversity of opinion evidenced by the large number of different styles of fencing, gates, and cattle guards in common use in the country, that the writer hopes to elicit a discussion on this paper that will prove of value.