point, since it obviates all danger of battery injury by the burning out of the rheostats, a danger that has been, and in some types still is, found only too frequently. The imbedded type of rheostat is in two styles, designed for use with either IO to I4 or 20 to 24 cells, when charged from a 125 volt line, will each carry continuously 30 amperes, and may be mounted with several of the same type or with the grid type. The life of the battery itself practically has no limit. Its efficient existence is merely a question of renewing the plates at long intervals when they are worn out.

The Westinghouse outfits have no loose wires, thus doing away with all danger irom fire. If, from ignorance or carelessness, a mistake is made by the operator, the fuses cut cut the current.

TRACTION ROADS AND COLONIZATION RAILWAYS.

Editor Canadian Engineer:-

Sir,-This is an age of gigantic enterprises and colossal financial operations; only millions are considered worthy of notice and economical schemes are hardly even thought of. But the Mogul engine was almost eclipsed by the bicycle, and the daily needs of the workmen of America may yet take precedence of the wants and wishes of our monarchs of the moneyed world. What I desire to place before the eye of the engineering public is the practicability of a cheap method of feeding colonization railways, and aiding the progress of new districts, by means of cheap roads. If, from each station on a railway, roads are built on both sides as far out as surveyed (or at first only 25 miles) with a fair roadbed for wide tires; and swamps and marshes crossed by laying flattened logs on cheap ties every 6 or 8 feet, a traction engine with 2 or more trailers could be run at a moderate speed more cheaply than by constructing an average turnpike, and using horse wagons.

The crew might consist of a conductor, engineer, and brakesman, who would not only handle freight, passengers, and stock, but be authorized to do postal and express business, forward telegrams, law forms, and other documents. They would also be required, if not making daily trips, to see to roadbed, extensions, supply of fuel, and other necessities. Of course, only good, active, intelligent, and reliable men would be employed, (as on railways), and a new avenue of employment would be opened for young men properly educated for such duties. Its effect on new districts would be to spread most of the benefits of the railway over the whole width of their operations; and it would remove many of the drawbacks so prominent in new settlements.

To be more specific—the engine, being intermediate between a locomobile and thresher, need not be very heavy or costly; and the trailers, of same gauge, of best wood and nickel-steel, (to carry 50 cwt. or less) need not load down the road as much as a lumber wagon. Ruts would be abolished by 6 inch tires and the wooden rails over soft portions of the road. Wagons could be left at mills and stores to be loaded, taken up on return to depot or harbor; and thus lessen the labor and save the horses of the farmer for home employment. A reasonable tariff should be maintained, and any balance in arrears be added (with commission for collection) to the tax collector's roll, to insure its payment.

An inspector of tractions should be appointed by the nearest County Council (or Councils) who would be the final authority in disputes—with appeal to the appointing Council. The benefits to both settler and railway need not be more than mentioned; but the impulse to colonization would be incalculable. The ease by which lands could be reached, the convenience of getting out persons or produce; the better prices regular communication would insure to both goods and farms would far outweigh first cost of outfit and working expenses. It would remove the most potent objections to pioneer life, and make the tourist familiar with remote scenery now inaccessible.

To the prospector, miner, lumberman, merchant and homeseeker, it would enhance the value of the district; while to the hardy farmer and his family it would make life worth living—despite of wintry storms and summer flies. The wild fruits alone brought within reach of market by such a system would be a boon to the city gourmand as well as the rural berry picker.

There are other enterprises peculiar to New Ontario to which I may call attention at a future time—meanwhile the traction road, supplemented by a good turnpike beside it, for light carriages, bicycles, and pedestrians, will complete the work of civilization the railway makes accessible. THOMAS FROOD.

Little Current, Ont.

HEAT CONVECTION.

Convection is the act of conveying or transmitting. The convection of heat is its transmission by means of currents formed in liquids or fluids as a result of applying heat to and changing the temperature of a portion thereof. Convection may be caused by stirring or agitation of any kind. When through the application of heat, the lower portions of a fluid are caused to expand or increase in volume, such heated portions become of less weight per unit of volume, and have a tendency to move upwards, giving place to the colder and denser portions of the whole body, which in turn take up heat, expand, become lighter and rise, developing what is called circulation, or the act of moving from and returning to the same point in a circuitous route or direction. By such means, the heated water or fluid passes in its turn to and through the upper and colder water and by a divisional contact of the hotter and colder portions the heat is spread or diffused throughout the whole mass of liquid or water. Circulation by heat is always in an upward direction, circulation by loss of heat is always in a downward direction, thus completing the circuit to and from the starting point. The better the opportunity given to the water of a boiler to carry or convey away to other localities or neighborhoods the heat it receives at the heating surfaces, the more efficient will the boiler be. Hence all heating surfaces should be at or as near the bottom of boiler and water, and as near the heat developing locality as possible. The route or path of circulation should be direct, long and far-reaching, so that ample time and opportunity may be had for the heated water to discharge its surplus heat. The route or path should be direct, so that no eddies shall form to blockade a free movement. The same may be said of the heat, air and gases of combustion while acting or doing duty in the flues, chambers and heat passages of a boiler and its furnace.

THE TRACKLESS TROLLEY.

One of the great obstacles to the spread of trolley communication through the country is the cost of the track. It does not pay to build a new line until there is a certainty of enough traffic not only to pay the running expenses of the cars, but interest, repairs, and sinking fund on the track, and until there is a good deal of traffic on the line, these items amount to more than the cost of motive power. In France and Germany they have got around this difficulty by the simple expedient of doing without tracks. The trolley wires are strung along the highway, and the cars have rubber-tired wheels. The amount of power required is about double what would produce the same speed on an ordinary track, but that is a small thing. By the time the cost of power becomes equal to the expenses of a track, the line has become profitable enough to warrant the building of a track, and the rubber-tired trolley omnibuses can begin work on a new line. The Germans have the advantage of us in having roads while we have only ways. To work trolleys on our highways would require both an enormous increase of power for propulsion and something wonderful in the way of steering gear. There are places, however, where power need not be expensive and attempts to make something of the roads have even been heard of. The snow in winter would doubtless be a considerable obstacle to this development, but winter traction is easier and it would be a great thing to have it even for summer. The cost of construction of this system is only about thirteen hundred dollars a mile, or perhaps a tenth of the cost of a line of track,