

place each wire of the circuit at an average distance from the disturbing wire or wires. As the number of wires on a pole increases, the difficulty of planning the transpositions increases also. With two circuits it is an easy matter; if, however, we have a third & transpose it, the same as we did the second, there will be cross-talk from the second to the third, because their relations to each other are the same as if there had been no transpositions at all. To get over this difficulty we must transpose the third twice as often as we did the second. A fourth circuit may be transposed at the middle points of the third, & so on. It has not been found necessary to transpose each circuit so that the induction currents are exactly balanced, & it is possible to use the same transpositions for every second cross-arm, so that the 1st, 3rd & 5th are alike, also the 2nd, 4th & 6th. Transpositions are usually placed half a mile or a mile apart.

There has been very little change in the instruments in the past few years. The transmitter usually used is of the Hunnin's type, & is known as the solid back; it does its work remarkably well. Some of them require a little attention now & then on account of the packing of the carbon granules, but a judicious tap generally puts matters to rights. The ringer magnets of the call bells should be wound to a resistance of 1,000 ohms on long spools, bringing the wire close to the core, & thus giving them a high co-efficient of self-induction, which effectually prevents any shunting of the high frequency telephone, while allowing the ringing current to pass freely, the ringers being bridged across the circuit.

In order to connect a metallic circuit to a grounded line, what is known as a repeating coil or transformer must be used, otherwise the balance of the circuit would be destroyed and the line would become noisy. This piece of apparatus is nothing more than a specially made induction coil, the metallic circuit being connected to the primary & the grounded line to the secondary, the other end of the secondary being put to ground. In connecting together two metallic circuits through an intermediate office, the connections should be so arranged that the lines are directly connected, & the two transformers cut out; otherwise, as a transformer only has an efficiency of from 85 to 90%, there would be a serious loss in volume.

All apparatus at intermediate stations should be bridged across the lines & the parts that are permanently in connection should have a high self-induction in order to avoid shunting the telephone current when the line is being used to stations farther on. Ring off drops should be wound to 1,000 ohms resistance & also bridged. It is a good plan to use a tubular drop, as it not only increases the self-induction, but it also tends to prevent cross talk between the coils themselves, which is a frequent cause of disturbance and often not suspected.

Long distance lines should always be well equipped with protective devices. The best form for protection from lightning consists of two carbon blocks, separated by a thin sheet of perforated mica, one block being connected to line & the other to ground. These have proved very efficient & when properly installed generally prevent any damage to instruments or transformers. They also prove useful in another respect, as the static charges seem to find their way across from one plate to the other, clearing the line to a great extent. Many lines could be improved by a judicious use of these protectors at different points such as the way stations. A fuse is also generally inserted in order to prevent the entrance of heavy currents which might otherwise do considerable damage, when, as sometimes happens, an electric light or power wire comes in contact with the circuit.

In regard to the operation of toll lines, long

distance telephony is much more expensive than telegraphy, as may easily be seen when we consider that a single iron telegraph wire can easily transmit 40 messages an hour & when duplexed the number is doubled; whereas in the telephone work we have to use 2 wires & they must be of copper instead of iron, and even then under the best conditions it is hard to get more than 7 or 8 messages through in an hour. Add to this the fact that the sender of the message is aware of every minute of delay, & is usually very impatient when he has to wait a few minutes for the line, where in sending a telegram he just hands it in at the office & thinks no more about it even though the message may not be sent for half an hour or longer; & it is easily seen that not only must the telephone message cost more than a telegram, but the lines are apt to be choked with business during a few hours in the middle of the day & comparatively idle the rest of the time. A great deal can be done by keeping the subscribers posted in reference to the hours when the lines are rushed, & very often they can so arrange their business so that it will not come in the rush hours. They would thus save themselves the annoyance of having to wait for a connection & the lines would be worked more steadily.

The foregoing paper was read at a recent meeting of the Maritime Electrical Association in Halifax. In the discussion which followed Mr. Hamilton expressed surprise that telephone communication between cars on trains had not become more popular. Mr. Freeman stated that telephones were used for that purpose in Pennsylvania.

The Bell Telephone Company.

In the Ontario Divisional Court, May 3, in the case of Bonn vs. Bell Tel. Co., Judges Boyd & Robertson gave judgment on motion by defendant to set aside verdict & judgment for plaintiffs in action for damages for injuries sustained by them, caused by the buggy in which they were driving coming in contact with a telephone pole planted in Main St., Wallaceburg, 14 ft. from the south limit of the street & leaving a passage way on the north of 22 ft. The Erie & Huron Ry. Co. had procured authority from the corporation to run its line over the town streets & subsequently made an agreement with defendant to use its wires, the defendant on its part to keep the poles in order, the pole, the cause of the accident, being placed there by it, the former one placed by the railway having worn out. Defendant contended that the pole was not an obstruction of the highway. The jury found that the public right was sensibly interfered with by the pole being placed where it was, & that it formed a place of danger, owing to the proximity of the railway track, which laterally encroached on a great part of the street. Held that the defendant had no right to use the streets without legislative sanction, either directly or indirectly, though the action of properly authorized municipal bodies & the right of the public was to have the whole width of the roadway preserved free from obstructions, & it is not confined to that part which is used as the *vio trita*. The effect of Canadian legislation is to legalize the obstruction created by the poles so far that they cannot be abated or complained of as a public nuisance, but the defendant may be liable for particular injury to a traveller if the obstruction is found to be dangerous, as in this case. Motion dismissed with costs.

Wm. Quinn, of Lindsay, has been appointed Manager of the Co.'s branches at Port Hope & Cobourg, Ont.

The Co. has decided to place its wires on Main St. & Portage Avenue, Winnipeg, under ground, as asphalt pavements are to be laid shortly.

Underground conduit cables & wires are

being placed in a number of additional streets in Toronto. Similar work is being done in Hamilton.

A plan to prevent non-subscribers using telephones without paying is being introduced in Montreal. The number of people who use other people's 'phones throughout the city, particularly those in the drug stores, during the course of the year, would doubtless number thousands. Druggists & most store-keepers are usually repaid for the use of their telephones by the popularity which they suppose it attaches to their stores & some of them have provided an extra 'phone with a switch, so that it can be placed in a convenient position for the use of their customers in particular & the public generally. Lots of places in Montreal have 50 to 100 people a day use their 'phones in that way, & the Bell Co. has been seeking for a plan to derive some financial benefit from the telephone borrower. The new system will be distinct from the ordinary telephone in the store, having no connection therewith. The person who desires to use the instrument will call up Central, when he will be requested to put 5c. in the slot & the required number will be called. If the person desiring to speak does as requested an indicator before Central will signal that the money has been deposited & everything will be all right, but if no money goes in the slot that ends the matter so far as Central is concerned. Central will be supposed to keep a strict watch on all private 'phones where a slot one is available to see that no one but those who are entitled to use it are permitted to do so. The girls in the exchange will become so well acquainted with the voices of those who ordinarily operate them that it will be easy in most of the cases for them to detect who should & who should not use the various instruments. Among the advantages of this scheme is that people who cannot afford to keep a telephone will be able to use a convenient one without being under an obligation to any person. Another advantage is that druggists & others who have telephones will be saved a great deal of inconvenience.

In the recent case of Atkinson & others vs. the Bell Co., before Judge Ferguson, in Toronto, it was shown that the Co. had planted a pole on a street 66 feet wide under the superintendence & with the sanction of the Corporation & by agreement. The pole was 12 feet from the centre line & near an angle formed by a sharp turn in the street & far enough from the sidewalk to allow a beaten track for carriages to pass. The plaintiffs were driving a sleigh to which were attached a team of horses, along the street in daylight, when the driver lost control at some distance from the angle & the sleigh was dashed against the pole by which it, the horses & one of the occupants were injured. The Judge held the plaintiffs should recover. That the pole was an obstruction & defendant had notice & knowledge of it & of its dangerous character. That the fact that the team of horses had once before run away would not help defendant & that the Corporation could not recover from the Telephone Co.

After negotiations extending over 2 years, during which the Co. has paid nothing for a franchise in Brantford, Ont., the city has granted it an exclusive franchise for 5 years for \$450 a year.

The Co. will put up a copper-metallic line between Ottawa & Arnprior, Ont.

Telephone Items.

It is proposed to convert the Nicola, B.C., telegraph line into a telephone line.

The Pontiac Telephone Co. recently offered for sale its rights & plant, including about 60 miles of line.

A bill to enable towns of 1,000 people & over to acquire & operate electric light & telephone