The side strain produced by a trolley wire suspended between two poles on a span wire is given by the following formulæ very kindly furnished by the Stone & Webster Co., of Boston.

$$\text{For single trolley horizontal strain} = \frac{L}{2X}\left\{\frac{LW}{4} + \frac{T \times W'}{2} + \frac{Z}{2}\right\}$$

$$\text{For double trolley horizontal strain} = \frac{L-A}{2X}\left\{\frac{AW}{2}(L-A) + \frac{W}{4} + \frac{TW'}{2} + \frac{Z}{2}\right\}$$

Where W = weight per foot of span wire
W' = weight per foot of trolley wire
Z = combined weight of ears and hangers
T = length of trolley wire between supports
L = length of span between supports
L' = length of span wire
X = dip of span of wire at point of attachment of trolley.
A = distance between trolley wires for double trolley.

For a pair of 2/0 trolley wires this gives a strain of 400 or 500 pounds.

The only really satisfactory way to meet these strains is by guying to anchors buried in the ground below the frost. Experience shows that in our climate at least any other method of taking care of these strains will yield sooner or later. Guy stubs if not themselves guyed, will yield after a time. It is thoroughly recognized that the strains in bridges of either the suspension or cantilever type must be carried back to solid anchorages in the ground, and the same principle must be adhered to in pole line construction. Of course in a busy thoroughfare direct guying is often impossible, but in almost every case the construction can be extended to a point where the guy will really not interfere with traffic. It is well recognized that a pole line is not a thing of beauty but in all places except the largest cities it is to-day a necessary evil. This being so, aside from any question of maintenance or service the best looking line will be the one that has the wire cables neatly strung, reasonably tight, and kept so. In other words what will impress the eye as a piece of engineering properly designed and constructed. To attain this result the above mentioned principle of carrying all strains ultimately to an anchorage in the ground must be carried out. The proper way to set such an anchor is with a log or iron plate buried well below the frost and a rod extending from it to the surface of the ground to which a guy wire from the pole can be attached. A serious mistake is often made in putting down such anchors. This is that the hole or trench is dug at the same angle as the final direction of the pull. The result is that the anchor pulls merely against newly tamped earth and, therefore, yields to a considerable extent. The hole or trench should be put down perpendicular and a little farther from the pole than the intended position of the anchor. It should be then undercut towards the pole, and a narrow trench cut towards the pole. The object of this is that the anchor shall have a solid and undisturbed body of earth to pull against. Braces are not good as the action of the frost on them tends to heave up the pole. In country pole lines in this country the curves if properly guyed generally occur often enough to make comparatively fixed points in the line and so break up the destructive action of a rythmic swing of the line. But where straight lines of half a mile or so occur one or more poles should be guyed solidly to the ground but with head guys in the direction of the line and side guys across it and if the situation is an exposed one a few poles each side of the guyed pole should be head stayed from the top of one to the butt of the next. This is equivalent to the wind bracing and other methods of stiffening bridge structures. One other point must be taken up. When a line has been built to withstand the strains before mentioned, a new trouble has been introduced. This is the variation in the length of the wire due to variations in temperature. The co-efficient for the contraction of copper for each degree Fahrenheit is generally given in works or physics as .0000095. Recent experiments by wire manufacturers, show that for the copper wires in use, this is rather high and that .0000046 is a good average. This means a contraction of expansions of about ¼ inch in every mile for each degree, or between 60 F. and -10 F. a contraction of 1 foot 8 inches in the mile. In an unguyed line this contraction is provided for by the movement of the poles on curves, etc., but as soon as the line is guyed solidly this produces what is often a strain exceeding the strength of the wire and making what are known to linemen as "frost breaks." To meet this, tables are prepared giving the dip that is to be allowed in a given span, according to the temperature of the air at the time the wire is strung.

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

Copies of these orders may be secured from the Canadian Engineer for a small fee.

5395—Sept. 14—Dismissing complaint of the Northern Elevator Co. complaining against rates charged by the C.P.R. for hauling feed oats from the elevator at Winnipeg to company's tracks.

5396—Oct. 7—Authorizing the Brantford and Hamilton Electric Railway to temporarily operate its crossing with the G.T.R., Brantford and Tillsonburg Branch, in the city of Brantford, Ont.

5397—June 23—Ordering the County of Carleton to be joined in the application of the city of Ottawa, and directing the C.A.R. Co., the St. L. and Ottawa Ry. Co., and the Montreal and Ottawa Railway to carry the Richmond Road, Ottawa, under the railways by means of a viaduct, and to make such change in the location of the portions of their respective railways as may facilitate the construction of such work.

5398—Oct. 6—Approving agreement of the city of St. Thomas, corporation of Township of Yarmouth, and the M.C. R.R., ordering that Ross Street be diverted by being widened and carried under the railway and works of the M.C.R.R. by means of a subway; also that First Avenue be diverted and widened and a new subway constructed immediately to the west of the present subway.

5399—Oct. 6—Granting leave to the corporation of the town of Campbellford, County of Northumberland, Ont., to erect, place and maintain its electric light wires across the track of the G.T.R. at Simpson Street and Saskatoon Avenue, town of Campbellford, County Northumberland, Ont.

5400—Oct. 6—Permitting the United Gas Co., Limited, St. Catharines, Ont., to lay gas pipes or mains under the tracks of the G.T.R. at certain points in the Counties of Welland and Haldimand, Ont.

5401—Oct. 13—Authorizing Macdonald College to lay and maintain a water pipe under the tracks of the C.P.R. Co. at Ste. Anne de Bellevue, Que.

5402—Oct. 15—Directing that every accident report or information furnished to the Board, pursuant to the provisions of Sec. 292 of the Railway Act, be privileged, and only made public or given upon Order of the Board.

5403—Oct. 14—Authorizing the C.P.R. to use and operate the bridge at Rush Lake, Sask., on the Swift Current section of its line of railway.

5404—Oct. 14—Authorizing the C.P.R. to use and operate the following bridges on its Calgary section: At mileage 109.9; mileage 179.1; Irrigation Canal, near Langdon, and Irrigation Canal, near Strathmore, Alta.

5405—Oct. 14—Approving by-law of the Windsor, Essex and Lake Shore Railway Co., authorizing F. E. Low, its general manager, to prepare and issue tariffs of tolls to be charged for traffic carried by the company between Windsor and Leamington, Ont.

5406—Oct. 14—Authorizing the C.P.R. to open for carriage of traffic those portions of its line from Stoughton, on its Arcola-Regina section, to Weyburn, on its Portal section, Saskatchewan, provided that the speed be limited to fifteen miles per hour.