

centre line of the said branch at Station 69 plus 52, and extending in a north-easterly direction, to and into the premises of the said company, to a point on the westerly limit of Bridge Street, a distance of 560 feet.

5295—September 15—Authorizing the Manitoba Government Telephone Commission to erect, place, and maintain its wires across the tracks of the C.P.R. at Methven, Man.

5296—September 15—Authorizing the G.T.R. to construct, maintain, and operate a branch line from a point on the applicant's railway west of the Chaudiere Junction, and east of the Chaudiere River, in the Parish of Charny, P.Q., thence in a south-easterly direction through the Parish of Charny and the Parish of St. Jean Chrysostome, to the premises of the Chaudiere Lumber Company, with two spur tracks running westerly from the south-easterly end of the said branch line.

5297—September 16—Authorizing the Consumers' Gas Company to lay a 20-inch gas main under the tracks of the C.P.R. on Eastern Avenue, Toronto, Ont.

5298—September 16—Authorizing the Consumers' Gas Company to lay an 8-inch gas main under the tracks of the C.P.R. on Christie Street, Toronto, Ont.

5299—September 16—Authorizing the Consumers' Gas Company to lay a 20-inch gas main under the tracks of the G.T.R. on Eastern Avenue, Toronto, Ont.

5300—September 16—Authorizing the Lumsden Radial Telephone Company to erect, place and maintain its wires across the tracks of the C.N.R. at Lumsden, Sask.

5301-2—September 16—Authorizing the Manitoba Government Telephone Commission to erect, place and maintain its wires across the tracks of the C.N.R. at Mariapolis, and two miles east of Swan Lake, Man.

5303—September 17—Authorizing the Q. M. & S. to cross with its track, at rail level, the railway of the G.T.R. (Three Rivers Branch), near St. Gregoire Station, P.Q.

5304-5-6-7-8—September 17—Authorizing the Manitoba Government Telephone Commission to erect, place, and maintain its wires across the tracks of the C.N.R. at one mile east of Altamont; 1½ miles northeast of Mariapolis; 2 miles west of Somerset; 3 miles west of Miami; and at Main Street, Somerset, Manitoba.

5309—September 17—Authorizing the C.P.R. to open for traffic that portion of the double track of its main line between Fort William and Winnipeg extending from Linke to Savanne, mile 59.6 to 71.9; from Carlstadt to Niblock, mileage 89.9 to 97.5; from mileage 106.2, Shiba, to 112.6, English; from mileage 124.7, Tamarac, to Bonheur, all on the Fort William Section; and from mileage 38.5 to mileage 15.1 Scoril, on the Ignace Section, all in the Province of Ontario.

5310—To follow.

5311—September 17—Authorizing the Rural Municipality of Wallace, to erect, place and maintain its wires across the tracks of the C.N.R. between sections 21 and 22-26-10, Virden, Man.

5312—Amending Order of the Board No. 5269, dated the 3rd September, 1908, by striking out clause 2 in the said order.

5313—To follow.

5314—September 17—Authorizing the Lumsden Radial Telephone Company, to erect, place, and maintain its wires across the tracks of the C.N.R. on River Street, Lumsden, Sask.

5315—September 17—Approving by-law of the Q. M. & S. Railway authorizing the General Passenger and Freight Agent of the company, D. I. Roberts, to prepare and issue tariffs of the tolls to be charged on all traffic carried by the applicants.

5316—September 17—Approving by-law of the Wabash Railroad Company, authorizing the Chief of the Tariff Bureau, F. A. Barber, to prepare and issue tariffs of the tolls to be charged for all traffic carried by its railway.

5317—September 17—Authorizing the G.T.R. to operate its trains over the crossing of its railway by the C.P.R., near the asylum, in the city of London, Ont., without being brought to a stop.

ON THE MEASUREMENT OF LARGE INDUCTANCES CONTAINING IRON.*

By Sir Oliver Lodge, F.R.S., and Benjamin Davies.

We have had occasion lately to measure large inductances, up to and above 100 henries, with core consisting of subdivided iron in a nearly-closed circuit, as used for certain telegraphic purposes with very weak currents. Since the inductance may vary rapidly with strength of current, it is necessary in any measurement to imitate the conditions of practice, and to determine the inductance as a function of current under those conditions. To this end we have designed a maximum-amplitude galvanometer, consisting of a well-damped coil moving dead beat in a strong magnetic field, and attached to a mirror so that the amplitude of its excursion can be observed. It can subsequently be calibrated by means of a steady current giving the same deflection. The inductance to be measured is connected up in series with this galvanometer, and with a specially designed alternator of small power and known frequency $p/2\pi$, giving a sinuous or simply harmonic current. A switch allows the inductance to be suddenly replaced by a non-inductive adjustable resistance, R' ; and when under these conditions the same oscillation is produced in both cases, then the self-induction is equal to that equivalent resistance divided by the frequency constant, or $L=R'/p$. The strength of the current involved in this measurement is known by imitating the deflection with a known steady current; and the main measurement consists simply in observing the deflection caused by the sine alternator at a measured frequency, either with the inductance, or with the adjustable non-inductive resistance, indiscriminately. It is to be understood that the ohmic resistance of the wire wound on the self-induction is low. If not, a correction must be applied for that, which is easily done, since $\sqrt{R^2+p^2L^2}=R'$. The following empirical expression is found able to give the self-induction of a nearly closed magnetic circuit excited only by very weak currents since for such currents it is found to be practically constant.

$$L = \frac{k n^a}{(G+g)^b}$$

where n is the number of turns, G the width of the air-gap in millimetres, and the other quantities are constants to be determined by experiment: though a will naturally be nearly 2. In an actual case of a nearly closed magnetic circuit the following values were found:

$$a=1.99; \quad b=0.47; \\ k=18 \text{ henries; and } g=0.1 \text{ mm.}$$

Results.—The result of this method of measurement applied to inductance coils of this type shows: (1) that measurements based on a determination of the square root of mean square of current would serve fairly well for low magnetizing forces; (2) that the self-inductance of such coils is for weak currents nearly independent of frequency, or say for all frequencies up to about 20 per second, when the magnetizing force does not exceed .04 C.G.S.; (3) that the self-inductance of a nearly closed magnetic circuit is a definite and dependable function of the width of the air-gap for moderate currents and frequencies.

* Abstract of paper read before Section A at the Dublin meeting of the British Association.

Rangers on the Coeur d'Alene forest reserves in Northern Idaho, beginning seventeen miles east of Spokane, have received orders from the department at Washington to gather seeds of tamarack and white and yellow pine, which will be sown broadcast on the snow the coming winter in places where no tamarack or pine trees are grown. Several hundred thousand acres of forests are included in the reserves.