### L = the iongitude.

D = number of days elapsed since November 1st.

The difference L - 5h must be algebraic, and in multiplying by os.16 it must be expressed in minutes of time.

To illustrate this, take the following example:—At a place in latitude  $49^{\circ}$  20' N., longitude  $80^{\circ}$  (= 5h 20m) W, an observer wishes to take an observation for azimuth between 8 and 9 p.m. on November 8th.

Here the interpolated value of the azimuth for 8h 30m is  $1^{\circ}$  of of, interpolating by second differences, and the corresponding time for the given longitude and date is:-

Sh 30m oos

+ 19 56.8 ( = 20m - 20 × 05.16) - 27 31.3 (= 3m 555.9 × 7) = 8h 22m 255.5.

To determine the meridian the observer then points to the pole star at the above computed time, after setting his vernier at a reading equal to the above azimuth, clamps the horizontal circle, and then turns the vernier to zero.

#### Determination of Time.

If the direction of the meridian is known approximately, the correction of a watch on standard time may be found by observing the watch time of transit of a star. The star's R.A. is then the sidereal time of transit, and the corresponding standard time may be found as follows:—First find the sidereal time corresponding to one of the standard times of the above table for the date and place of observation by the formula:  $S = S' + d \times (3m 56s.555) - (L - 5h)$ .

Where

S = the required sid. time.

S' = the tabular sid. time,

and d and L have the same meanings as above. Then the required standard time of transit of the star follows by the formula:—  $T = T' + (\alpha - S) (1 - 0S.16)$ .

Where

T = the required standard time of transit of the star, and T' = the tabular time corresponding to S'.

 $\alpha$  = the star's R.A.

To illustrate the use of these formulae, let us assume that the meridian transit of the star  $\alpha$  Pegasi is observed at the watch time 8h. 10m. 17.5 sec. at the same place and date as above; to find its correction on standard time.

		h.	m.	S.
Sidereal time, 8h. 10m. 17.5s. (table)	=	22	42	39.8
7 × (3m. 56s. 555)	=		27	35.9
		23	10	15.7
Difference of longitude	=		20	00
S	-	22	50	15.7
D A C		~~	50	15.7
R.A. of star	-	23	00	15.0
α — S	=		9	59.9
10 × 05.16	=			1.6
			L. A.L.	No.
Equivalent mean time interval	=		9	58.3
Τ'	=	8	00	00
			A Star	111-111
Τ	=	8	09	58.3
Watch	=	8	10	17.5
Watch fast	=			19.2

The methods described above do not take account of changes in the star places, but with ordinary field instruments and for short periods of time these are negligible.

## VIRCINIA STATE HICHWAY COMMISSION.

(Continued from Page 494.)

Should voids be discovered when the forms are taken down, the defective work shall be removed and the space filled with one to one cement mortar. The exposed surfaces shall be smoothed over with a neat Portland cement grout, laid on with a brush, until a smooth surface is secured.

Centres and forms, satisfactory to the Engineer, shall be provided by the contractor. They shall be of planed lumber and shall fit the curves and shapes of the work. The sheathing shall be laid tight, and shall be made clean before using.

The centres shall be true to the lines, satisfactorily supported and firmly secured, and remain in place as long as the Engineer may direct, or replaced by new ones if deemed necessary by him. Metal for reinforcement to be of section and quality approved by the State Highway Commissioner.

When work is done under such conditions that the mortar is liable to freeze, the necessary means shall be provided for thoroughly heating all materials, and for thoroughly protecting the masonry from damage by rain and frost during and after laying.

During warm and dry weather, and whenever the Engineer may direct, all newly built concrete shall be kept well shaded from the sun, and well sprinkled with water until properly set.



# RAILWAY ORDERS.

### (Continued from Page 487.)

8375—October 12—Approving plans and specifications for the improvement of Trigger Drain, prepared by George A. McCubbin, C.E., same to be constructed under and across the railway and lands of the Canada Southern Railway in the village of West Lorne, Ont.

8376—October 15—Authorizing the G.T.R. to construct, maintain and operate branch line to the premises of the Colonial Fur Company, County Middlesex, Ont.

8377—Ordering that the Corporation of the village of Thamesville, Ont., be made a party to the proceedings in re complaint of E. F. Best, of Thamesville, re dangerous condition of level crossings of G.T.R. and Wabash Railway Company in said village.

8378 — October 18 — Approving Standard Passenger Tariff C.R.C. No. 20 of the N.B. So. Railway Company.

8379—October 18—Approving character of work and construction of drain proposed by the Municipal Council of the Tp. of Harwich, County Kent, Ont., under the track of the Lake Erie and Detroit River Railway, now operated by the P.M.R.R.

8380—October 19—Granting leave to the Quebec, New Brunswick and Nova Scotia Railway to construct its railway across public road between parishes St. Foye and Lorette, County Quebec, P.Q.

8381—October 15—Granting leave to the C.P.R. to construct its spur to the waterfront in the town of Parry Sound, Ont.

8382—October 19—Granting leave to the C.P.R. to open for the carriage of traffic that portion of the double track of the Ontario & Quebec Railway, Smith's Falls Section, mileage 41.6 to 44.9.

8383—October 15—Granting leave to the C.P.R. to construct an extension of its railway across Arthur Street, village Elmira, Ont.