tained by reference to the Department of Interior Sheets of Canada. The convergence is scaled off these sheets.

At point of commencement of survey, the bearing of a traverse line or course is ascertained and established by astronomical observation and from this bearing all the bearings of traverse are computed, using the angles read at each P.I. Although observations are taken at intervals along the route and corrections to the bearings ascertained, the table or list of computed bearings is not altered or corrected, but another list or set of corrected bearings is computed and entered up alongside of original computed field bearings.

Midway or thereabouts between the reference meridians, a certain course of survey will have two bearings, one referred to the easterly reference meridian and one to the westerly reference meridian. Both bearings will be recorded for the course. The angular change in the bearings in passing from one reference meridian to another will be ten times the sine of the latitude.

The bearing given for any line is the angle that the line or its production makes with the nearest 10-minute meridian, and such angle will be measured and recorded as the angle measured to right (clockwise) from north around through east, south, west, etc. The angle or bearing may have any value from 0° to 360°.

Definitions of Azimuth and Bearing

In connection with these surveys the definitions of the words azimuth and bearing as given by the Surveyor General of Dominion Lands are adopted. They are as follows:—

The azimuth of a point B from another point A is the angle formed by the vertical plane containing A and B with plane of the astronomical meridian passing through A, such angle being reckoned from north, round either east or west, to 180°. It follows that, except in the case of a meridian or the equator, the azimuth of a straight line changes as the initial point moves along the line and that a direction is not defined by an azimuth unless the initial point is specified or implied.

The bearing of a point B from another point A is the angle formed by the vertical plane containing A and B with the plane of a fixed astronomical meridian which may or may not be the astronomical meridian passing through A, such angle being reckoned from north, round through east, south and west, to 360°, east being 90°, south 180°, west 270°, and north 360° or 0°. It follows that a straight line has the same bearing at all its points, but except in the case of a meridian or the equator, a direction is not defined by a bearing unless the meridian to which the bearing is referred is specified or implied.

Apart from the mode of reckoning the angle, the difference between the azimuth and the bearing of a line is that the azimuth is the angle of the line with the meridian of its initial point, while the bearing is the angle of the line with the meridian adopted for reference of all the bearings of the survey.

Astronomical Observations

For uniformity in practice and for purposes of future reference, it is advisable that all observations and reductions be made and recorded in a similar manner.

The tables supplied by the Department of Interior of Canada for use of Canadian land surveyors are the most convenient available, and the method of using is very fully outlined in a booklet supplied with the tables.

As a rule standard time is so readily obtained when engaged upon these surveys that no difficulties should arise on account of correct determination of time.

The observation of the transit of time stars across the vertical circle of polaris in both positions of the horizontal circle often is the quickest method of observation and gives more accurate results than other methods generally in use although entailing slightly more computations. When the surveyor has not many observations to take and has sufficient time to make the computations, this method of transit of low declination time stars across the vertical or polaris is recommended. The watch correction is at the same time accurately determined.

(Concluded in the next issue)

CHLORAMINE AND CRENOTHRIX*

W. F. Monfort and O. A. Barnes

THE application by Rideal of chloramine as a sterilizing agent for water and sewage has led to renewed interest in the reactions of chlorine with ammonium salts and with ammonia. Much earlier work has since been repeated in the hope of developing control of the reactions and prevention of losses. The fundamental work of Raschig has been commonly overlooked.

Chloramine (chloroamine, monochloramine) is formed (Raschig 1907 Chem. Zeit. 31, 926) by treating dilute solutions of hypochlorites with dilute ammonia, which Raschig expresses in the following equation: $NH_3+NaOCl=NH_2Cl+NaCH$. "By subjecting such a mixture to distillation in a vacuum at about 40°, after adding $ZnCl_2$ solution to remove free ammonia and sodium hydroxide, there is obtained a concentrated solution whose analysis yields values agreeing with the formula NH_2Cl. From concentrated mixtures under greatly reduced pressure, chloramine is often obtained as pale yellow globules floating in the aqueous distillate. Because of instability in concentrated form, no attempt was made to obtain it pure. Chloramine escapes readily from its aqueous solution, has the odor of nitrogen trichloride and vigorously attacks the eyes." (C.A. 2, 1533).

Decrease in Available Chlorine of a Chloramine Solution

Hours.	Chlorine—parts per million.	Cubic centimeter nitrogen evolved from 50 cc. sol.
0	1003.443	0
1	1003.443	0
2	1003.443	0
3	1003.443	0
4	984.68	0.01
5	980.86	0.05
6		0.09
7	975.12	0.12
8		0.15
8.5	965.56	
10		0.17
11.5		0.27
17	889.08	
19	879.52	
20		0.37
21	869.96	
22		0.44
23	860.09	
24	850.	0.51
25	850.84	
26		0.63
28		0.69
29	841.28	
32		0.73 73
51	707.44	
54		1.6
73	554.48	
76		2.5
98	430.20	
101		3.25
145	296.36	
148		4.10
170	213.00	
173		4.50

With ammonia and sodium hypochlorite in equivalent amounts (in 1/3 normal solution) there is some decomposition; liberation of nitrogen or reversion to ammonia is hastened by the presence of hydroxylions.

If calcium hypochlorite in equivalent amounts be substituted for sodium hypochlorite, the reaction may be thus understood:—

$$2\ CaOCl_2+2\ NH_4OH=2\ NH_2Cl+CaCl_2+Ca(OH)_2.$$

*Read before the Illinois Section, American Water Works Association.