RESULTS

WATER.—Measurements at 1 bar were made at 5 deg intervals from 5 to 65°C (table 2). The pressure-dependence was measured at 10, 25, 45 and 65°C (table 3).

FORMAMIDE.—Table 4 gives results at 1 bar in the range 5-60°C. Pressure runs were made at 10, 25 and 45°C (table 5). The pressure range at 10°C is restricted by the need to avoid solidification. At the foot of each table are eqn (1)-(4) fitted to the data by least-squares methods. Eqn (2) and (4), analogues of the Tait equation, gave much more satisfactory representations of the data than did simple polynomials in P.

TABLE 3.—DIELECTRIC CONSTANTS OF WATER AT VARIOUS TEMPERATURES AND PRESSURES

P/bar	ε 10°C	25°C	45°C	65°C
1	83.82_8	78.30_4	71.50_3	65.30_3
163	84.42_1	78.85_2	72.05_1	65.87_9
339	85.08_1	79.47_8	72.62_7	66.45_1
517	85.75_7	80.10_2	73.25_1	67.03_1
689	86.37_4	80.67_6	73.82_5	67.54_9
862	86.99_8	81.30_3	74.35_2	68.01_8
1 034	87.60_3	81.83_1	74.89_9	68.54_6
1 207	88.23_7	82.40_1	75.45_2	69.03_9
1 379	88.81_6	82.99_9	75.95_1	69.50_2
1 551	89.38_1	83.49_8	76.41_5	69.90_5
1 724	89.94_8	84.02_3	76.92_4	70.38_5
1 896	90.52_8	84.54_6	77.42_5	70.84_8
2 068	91.10_0	85.09_5	77.90_0	71.27_4

At fixed temperatures,

$$\varepsilon(P) = A+[BP/(1+CP)], \qquad (2)$$

where A, B, C have the following values:

t/°C	A	10^3B/bar	10^5C/bar	P_{max}/bar	s.d. of ε
10	83.810	3.840 9	4.394 5	2 100	0.012
25	78.281	3.618 1	4.840 0	2 100	0.018
45	71.486	3.529 4	6.730 0	2 100	0.016
65	65.324	3.403 0	9.0345	2 100	0.021

TABLE 4.—DIELECTRIC CONSTANTS OF FORMAMIDE AT 1 BAR IN THE TEMPERATURE RANGE 5-60°C

t/°C	ε	$\delta\varepsilon$	$-10^3(\partial \ln \varepsilon/\partial t)_{P=1\text{ bar}}$
5	117.19	−0.02	3.50
10	115.07	0.04	3.57
15	113.04	0.01	3.64
20	111.00	−0.01	3.70
25	109.03	−0.08	3.75
30	106.85	0.05	3.80
35	104.89	0.00	3.84
40	102.87	0.01	3.88
45	100.89	0.00	3.90
50	98.92	0.03	3.92
55	97.09	−0.06	3.93
60	95.11	0.03	3.92

$$\varepsilon(1\text{ bar}) = 119.208-0.408\,3\,t-2.311\times10^{-4}\,t^2+5.833\times10^{-6}\,t^3. \qquad (3)$$

$$\delta\varepsilon = \varepsilon(\text{eqn (3)})-\varepsilon$$

TABLE 5.—DIELECTRIC CONSTANTS OF FORMAMIDE AT VARIOUS TEMPERATURES AND PRESSURES

P/bar	ε 10°C	25°C	45°C
1	115.06_6	109.02_7	100.89_3
20	115.17_2	109.14_6	101.01_2
50	115.30_8	109.30_0	101.15_1
120	115.64_9	109.64_2	101.51_4
156	115.81_0	109.80_5	101.73_1
195	115.99_0	109.98_5	101.90_7
339	116.69_0	110.64_1	102.60_7
414	117.00_3	110.96_8	102.98_7
517	117.47_0	111.38_3	103.45_5
689	118.14_6	112.08_3	104.15_3
862	118.78_5	112.75_1	104.85_8
1034		113.32_3	105.55_3
1207		114.01_0	106.17_6
1379		114.59_5	106.75_4
1551		115.11_5	107.28_1
1724		115.64_7	107.81_5
1896		116.15_3	108.31_1
2068		116.64_7	108.76_5

At fixed temperatures,

$$\varepsilon(P) = A+[BP/(1+CP)], \qquad (4)$$

where A, B, C have the following values:

t/°C	A	10^3B/bar	10^4C/bar	P_{max}/bar	s.d. of ε
10	115.054	5.133 5	2.116 9	900	0.014
25	109.055	4.880 1	1.598 2	2 100	0.020
45	100.888	5.474 8	2.105 1	2 100	0.015

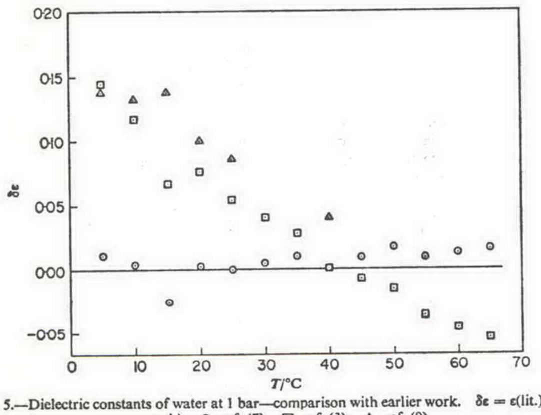

FIG. 5.—Dielectric constants of water at 1 bar—comparison with earlier work. $\delta\varepsilon = \varepsilon(\text{lit.})-\varepsilon$ (this work): ○, ref. (7); ⊡, ref. (3); △, ref. (9).