then ΔV is negative between this point H and the terminatingpoint of the curve on side BC. It is apparent from the position of the curves sc and sa (fig. 6) that point s is chosen on that part of the quadruplecurve, where ΔV is positive. We distinguish now again the same three cases as above.

1st. The vapour is represented by s_1.

It is apparent from the position of the points F, B, s and s_1 with respect to one another that the fourphase-reaction:

$$F + L_s \rightleftarrows B + G_{s_1} \; (\Delta V > 0)$$

$F + L + G$ (Curve sc)	$B + L + G$ (Curve sa)
$F + B + L$	$F + B + G$

takes place; it proceeds from left to right with increase of volume Hence it follows that the equilibria written at the right of the vertical line occur under lower pressures, the equilibria at the left occur under higher pressures. In accordance with the above we find, therefore, that starting from s (fig. 6) the pressure increases along sc (equilibrium $F + L + G$) and decreases along sa (equilibrium $B + L + G$).

2nd and 3rd. Also in these cases we find agreement with the previous considerations.

When a point of maximumtemperature H occurs on the quadruplecurve $B + F + L + G$, then two points of intersection s occur at temperatures a little below T_H. When we consider now a point of intersection s between H and the terminatingpoint of the quadruplecurve on side BC, then ΔV is negative. This involves that above in 1st—3rd increase of P is replaced by decrease of P and reversally. We find also the same when we consider the threephase-triangles solid-liquid-vapour. *To be continued.*)

Chemistry. — "*On the quaternary system: $KCl-CuCl_2-BaCl_2-H_2O$.*"

By Prof. SCHREINEMAKERS and Miss W. C. DE BAAT.

(Communicated in the meeting of October 31, 1914).

In a previous communication [1]) we have already discussed the equilibria occurring in this system at 40° and at 60°; the results of the analysis on which these considerations are based, we have hitherto not yet communicated. Now we will communicate the results of the analysis; all the points, curves etc. quoted in this communication apply to the two figures of the previous communication (l. c.). We want to draw the attention to the fact that fig. 1 represents the equilibria at 40° and fig. 2 the equilibria at 60°.

1) These Communications (1912) 326.

TABLE I.

Composition of the solutions in percentages by weight at 40° (fig. 1. l.c.).

Point	KCl	Ba Cl$_2$	Cu Cl$_2$	H$_2$O	Solid phases
a	0	0	44.67	55.33	Cu Cl$_2$. 2 H$_2$O
b	0	3.72	42.72	53.56	Ba Cl$_2$. 2 H$_2$O + CuCl$_2$. 2 H$_2$O
c	0	28.98	0	71.02	Ba Cl$_2$. H$_2$O
d	23.98	9.15	0	66.87	Ba Cl$_2$. 2 H$_2$O + K Cl
e	28.63	0	0	71.36	KCl
f	21.53	0	22.85	55.62	K Cl + D$_{1\cdot2\cdot2}$
g	9.79	0	43.83	46.38	Cu Cl$_2$. 2 H$_2$O + D$_{1\cdot2\cdot2}$
Curve *bh* *b*	0	3.72	42.72	53.56	Ba Cl$_2$. 2 H$_2$O + Cu Cl$_2$. 2 H$_2$O
	5.52	3.39	42.35	48.74	"
h	9.88	2.99	42.07	45.06	BaCl$_2$. 2 H$_2$O + CuCl$_2$. 2H$_2$O + D$_{1\cdot2\cdot2}$
Curve *di* *d*	23.98	9.15	0	66.87	Ba Cl$_2$. 2 H$_2$O + KCl
	21.46	8.90	8.44	61.20	"
	20.61	7.63	14.31	57.45	"
i	20.61	5.40	20.47	53.52	Ba Cl$_2$. 2 H$_2$O + KCl + D$_{1\cdot2\cdot2}$.
Curve *fi* *f*	21.53	0	22.85	55.62	KCl + D$_{1\cdot2\cdot2}$.
	21.31	2.59	22.06	54.04	"
i	20.61	5.40	20.47	53.52	BaCl$_2$. 2H$_2$O + KCl + D$_{1\cdot2\cdot2}$.
Curve *gh* *g*	9.79	0	43.83	46.38	CuCl$_2$. 2H$_2$O + D$_{1\cdot2\cdot2}$
	9.94	1.46	43.22	45.38	"
h	9.88	2.99	42.07	45.06	CuCl$_2$. 2H$_2$O + BaCl$_2$.2H$_2$O + D$_{1\cdot2\cdot2}$
Curve *ih* *i*	20.61	5.40	20.47	53.52	BaCl$_2$. 2H$_2$O + KCl + D$_{1\cdot2\cdot2}$.
	16.44	4.72	27.22	51.62	Ba Cl$_2$ 2H$_2$O + D$_{1\cdot2\cdot2}$.
	11.44	3.66	34.65	50.55	"
h	9.88	2.99	42.07	45.06	CuCl$_2$. 2H$_2$O + BaCl$_2$. 2H$_2$O + D$_{1\cdot2\cdot2}$

TABLE II.

Composition of the solutions in percentages by weight at 60° (fig. 2 l.c.).

Point	KCl	$BaCl_2$	$CuCl_2$	H_2O	Solid phases
a	0	0	47.42	52.58	$CuCl_2 . 2H_2O$
b	0	6.87	43.57	49.56	$CuCl_2 . 2H_2O + BaCl_2 . 2H_2O$
c	0	31.7	0	68.3	$BaCl_2 . 2H_2O$
d	23.09	14.83	0	62.08	$BaCl_2 . 2H_2O + KCl$
e	31.2	0	0	68.8	KCl
f	26.12	0	26.57	47.31	$KCl + D_{1\cdot 2\cdot 2}$
g	17.13	0	43.45	39.42	$D_{1\cdot 2\cdot 2} + D_{1\cdot 1}$
k	13.67	0	46.40	39.93	$CuCl_2 . 2H_2O + D_{1\cdot 1}$
b	0	6.87	43.57	49.56	$CuCl_2 . 2H_2O + BaCl_2 . 2H_2O$
Curve *bl*	6.32	5.99	43.68	44.01	"
l	12.45	4.93	44.09	38.53	$CuCl_2 . 2H_2O + BaCl_2 . 2H_2O + D_{1\cdot 1}$
d	23.09	14.83	0	62.08	$BaCl_2 . 2H_2O + KCl$
Curve *di*	23.15	10.01	12.01	54.83	"
i	23.78	5.97	24.61	45.64	$BaCl_2 . 2H_2O + KCl + D_{1\cdot 2\cdot 2}$
f	26.12	0	26.57	47.31	$KCl + D_{1\cdot 2\cdot 2}$
Curve *fi*	24.53	3.32	25.46	46.69	"
i	23.78	5.97	24.61	45.64	$KCl + BaCl_2 . 2H_2O + D_{1\cdot 2\cdot 2}$
g	17.13	0	43.45	39.42	$D_{1\cdot 2\cdot 2} + D_{1\cdot 1}$
Curve *gh*	16.50	2.51	42.20	38.79	"
h	15.75	4.75	40.84	38.66	$BaCl_2 . 2H_2O + D_{1\cdot 2\cdot 2} + D_{1\cdot 1}$
k	13.67	0	46.40	39.93	$CuCl_2 . 2H_2O + D_{1\cdot 1}$
Curve *kl*	13.04	2.52	45.24	39.20	"
l	12.45	4.93	44.09	38.53	$CuCl_2 . 2H_2O + BaCl_2 . 2H_2O + D_{1\cdot 1}$
i	23.78	5.97	24.61	45.64	$KCl + BaCl_2 . 2H_2O + D_{1\cdot 2\cdot 2}$
Curve *ih*	19.53	5.40	32.37	42.70	$BaCl_2 . 2H_2O + D_{1\cdot 2\cdot 2}$
h	15.75	4.75	40.84	38.66	$BaCl_2 . 2H_2O + D_{1\cdot 2\cdot 2} + D_{1\cdot 1}$
h	15.75	4.75	40.84	38.66	$BaCl_2 . 2H_2O + D_{1\cdot 2\cdot 2} + D_{1\cdot 1}$
	14.78	4.83	42.13	38.26	$BaCl_2 . 2H_2O + D_{1\cdot 1}$
l	12.45	4.93	44.09	38.53	$CuCl_2 . 2H_2O + BaCl_2 . 2H_2O + D_{1\cdot 1}$