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The System: Na$_{2}$O-CO$_{2}$-NaCl-H$_{2}$O, Considered as Two Four-Component Systems

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II. *The System:* Na_2O—CO_2—NaCl—H_2O, *considered as Two Four-Component Systems.*

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The above arbitrary division is due to the fact that the experimental work does not include an examination of the vapour phases.

Experimental.

The solubility determinations were carried out in thermostats of an ordinary pattern. Glass bottles similar to those used by van't Hoff ('Ozeanische Salzablagerungen,' p. 9) were used for solutions weak in sodium hydrate. Silver bottles, as shown in fig. 1, were used for the strong sodium hydrate solutions.

The composition of the solid phases in equilibrium with saturated solutions was determined by Schreinemakers' "rest" method—'Zeit. Phys. Chem.,' vol. 11, p. 75, and vol. 59, p. 641.

Carbon dioxide was determined gravimetrically by absorption in potassium hydrate, chlorine by titration with silver nitrate (Volhard), and sodium by titration with sulphuric acid. The temperatures at which observations were made are: 0°, 15°, 20°, 25°, 30°, 35°, 45°, and 60° C. All results are expressed as weight percentage of the components.

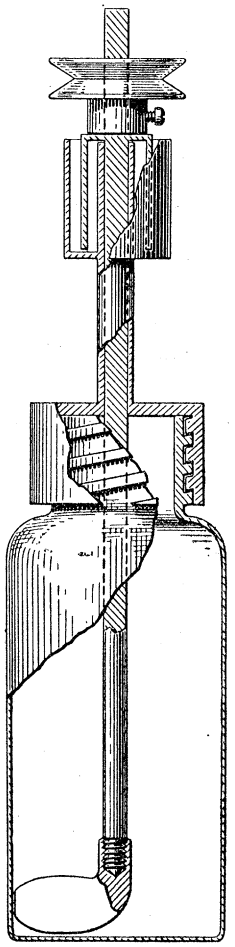


Fig. 1.

The Systems of Two Components.

The values for the solubilities of the single salts in water are taken from the well-known authors cited in Landolt and Börnstein's 1912 edition:—

Na_2CO_3—H_2O, p. 484; NaOH—H_2O, pp. 487, 488; $NaHCO_3$—H_2O, p. 486; NaCl—H_2O, p. 485.

[Published June 28, 1922.

The Systems of Three Components.

The two systems of four components with which we are concerned may be considered as made up of five systems of three components, one of which is always water, namely :—

(1) Na_2CO_3—NaCl—H_2O ; (2) Na_2CO_3—NaOH—H_2O ; (3) Na_2CO_3—$NaHCO_3$—H_2O ; (4) NaCl—NaOH—H_2O ; (5) $NaHCO_3$—NaCl—H_2O.

No experimental work has been done on the two remaining dry systems, namely :—

Na_2CO_3—$NaHCO_3$—NaCl ; Na_2CO_3—NaOH—NaCl.

We will now consider the above five systems in their order. Pressure is assumed constant (atmospheric). The results are plotted in triangles in the usual manner.

(1) *The System :* Na_2CO_3—NaCl—H_2O.

The numerical results will be found in Tables I. to VIII. : these are plotted in fig. 2. A description of the isotherms of 0° and 30° will render the remainder quite clear. At 0° the triangle is divided into the following areas :—

The area ABC, H_2O, representing unsaturated solutions.

The area A 10 B, representing mixtures of solid $Na_2CO_3.10H_2O$ and saturated solution.

The area BC, NaCl, representing mixtures of solid NaCl and saturated solution.

The area 10 B, NaCl, representing mixtures of solid $Na_2CO_3.10H_2O$, solid NaCl, and solution B.

And three areas representing mixtures of three solids, namely :—

$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O + NaCl$,
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O + NaCl$,
$Na_2CO_3.1H_2O + Na_2CO_3 + NaCl$,

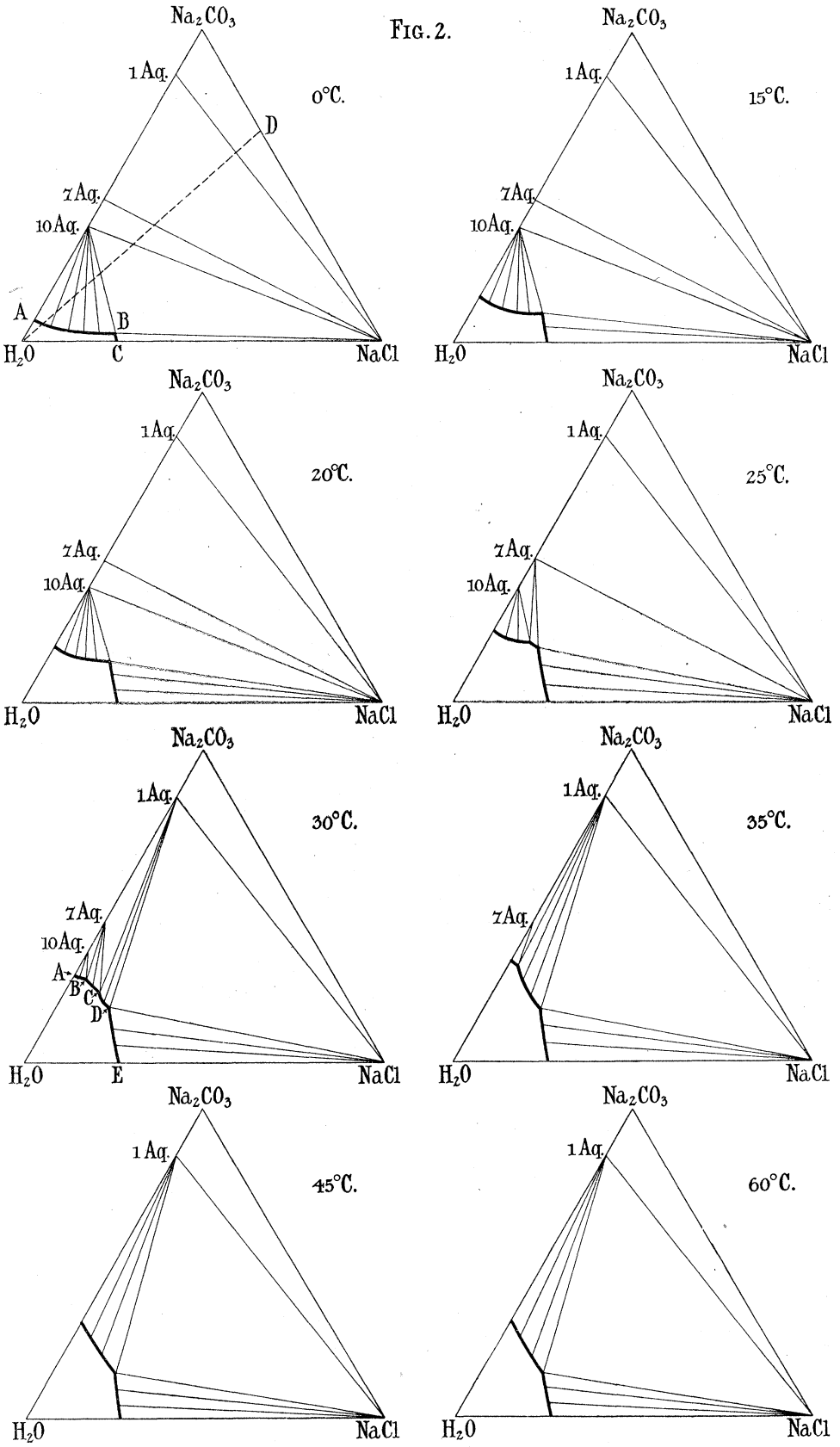
these areas being formed by the triangles made by joining up the points representing the composition of the solids in question in their appropriate groups.

The meaning of the lines bounding areas follows directly from the above. For example, the line AB as the boundary between the areas $Na_2CO_3.10H_2O$ + saturated solution and unsaturated solution, is naturally the range of clear solutions which can be in equilibrium with $Na_2CO_3.10H_2O$.

Since any mixture of the components or their compounds can be expressed by a point in the triangle Na_2CO_3—H_2O—NaCl, we can at once determine the quantities and composition of stable phases which will be formed from any mixture or mixtures whatsoever, as, for example, along the line H_2O D.

The amounts of phases into which any total composition represented by a point in a three-phase area will split up are found by the same construction as that employed

FIG. 2.



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to find the weights which would have to be present at the corners of a triangle in order that the point in question should be its centre of gravity.

If the total quantity of matter under consideration has a composition represented by a point on a line or in a two-phase area, the relative amounts of phases present are inversely as the distance of the complex point from the ends of the line.

As we are not concerned with two liquid layers in any of these systems, all our two-phase areas are solid-liquid; consequently, the point representing our complex will lie on one of the tie-lines of such an area and the above statement will hold for this line.

At 30° C. two of our three-phase areas have disappeared, namely, 7 Aq, 1 Aq, NaCl, and 10 Aq, 7 Aq, NaCl, and have been replaced by two two-phase and three three-phase areas, namely:—

$Na_2CO_3.7H_2O$ BC, representing mixtures of solid $7H_2O$ and solution.
$Na_2CO_3.1H_2O$ CD, representing mixtures of solid $1H_2O$ and solution.

And:

$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$ + Solution B.
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$ + Solution C.
$Na_2CO_3.1H_2O$ + NaCl + Solution D.

The above isothermals are plotted against temperature in the form of the conventional space-model in fig. 3. Na_2CO_3 is plotted vertically, NaCl horizontally, and temperature inwards, from the plane of the paper.

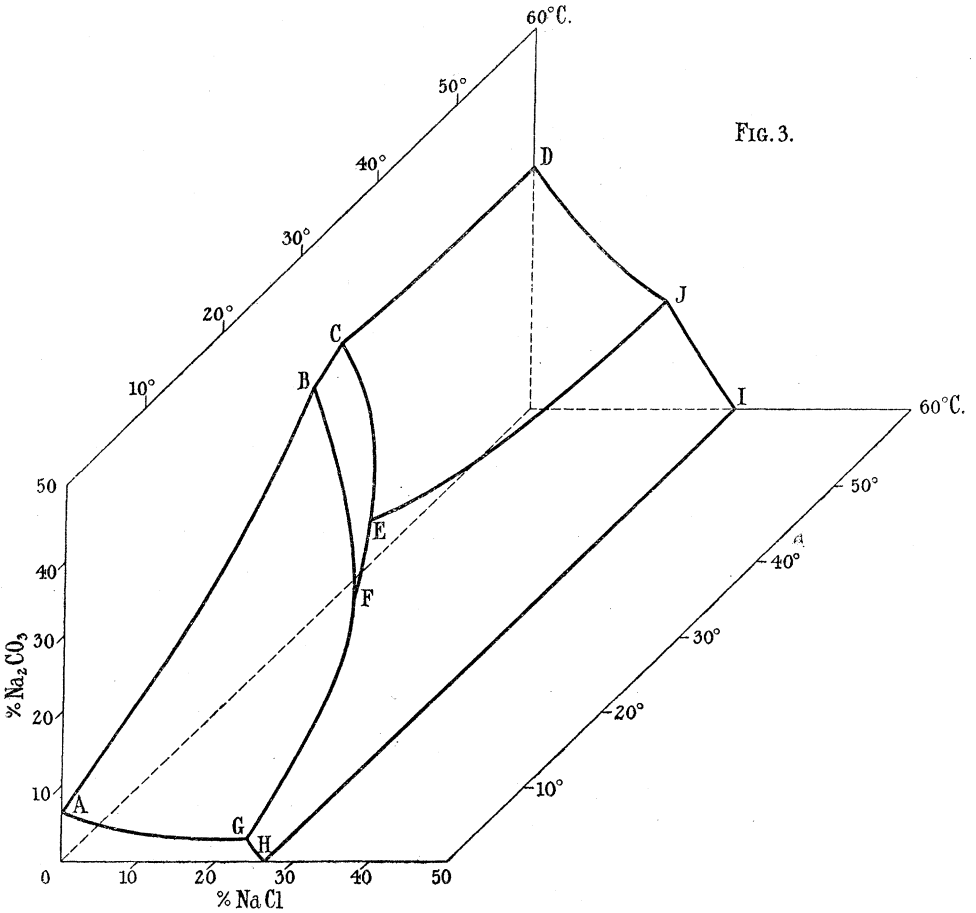


FIG. 3.

The resulting irregular-shaped solid block gives the composition of all unsaturated solutions, and its surfaces those clear solutions which are in equilibrium with the various solid phases, namely :—

ABFG	$Na_2CO_3.10H_2O$.
BCEF	$Na_2CO_3.7H_2O$.
CDJE	$Na_2CO_3.1H_2O$.
HGFEJI	NaCl.

The volumes representing complexes of solid + saturated solution are shown in fig. 4. As the same letters are used as in fig. 3, these can be readily identified.

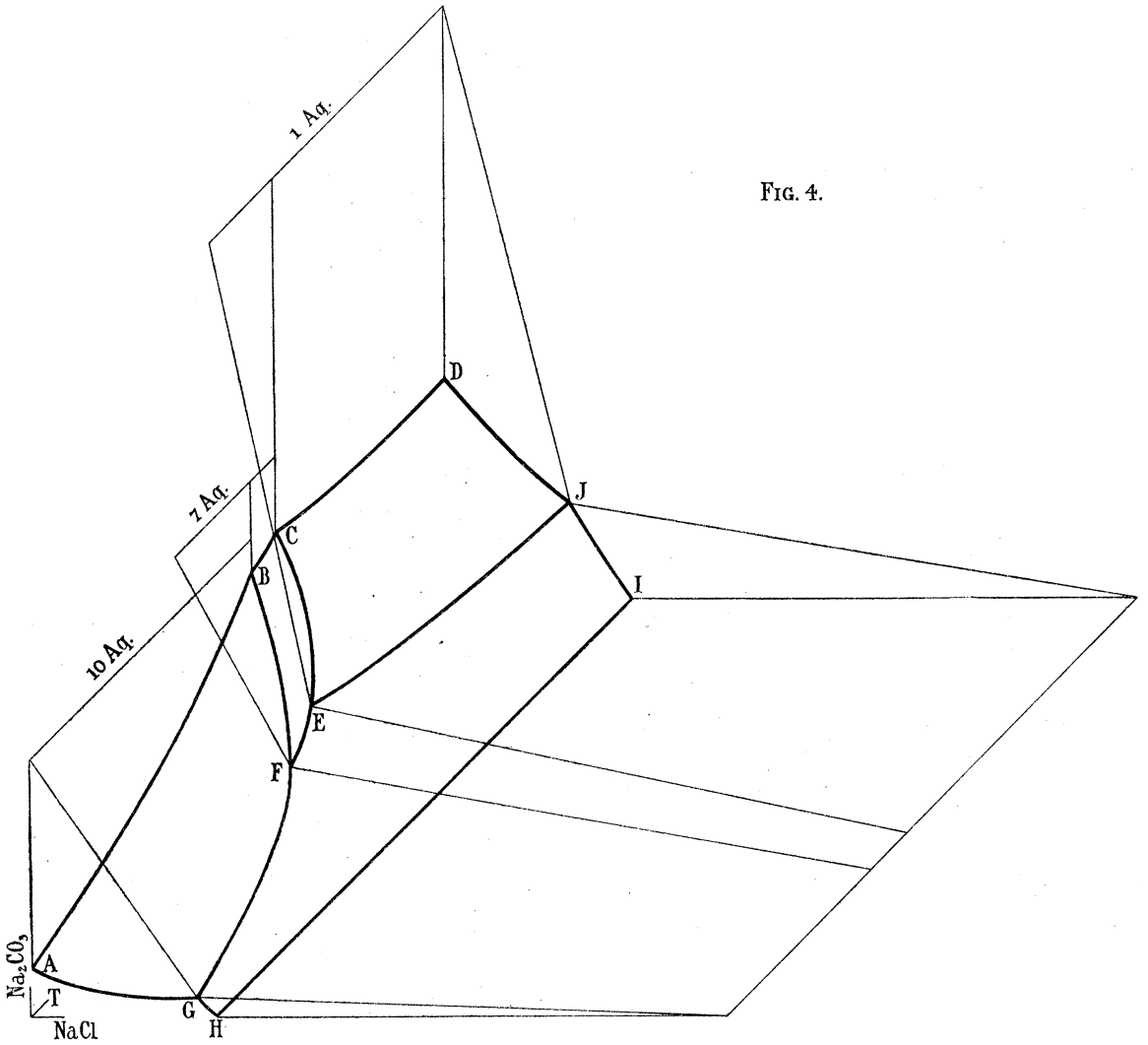


FIG. 4.

The volumes representing saturation with respect to two solid phases and solution

are shown in fig. 5. There will be no difficulty in distinguishing these if it is remembered that each volume has one "dry" side, which is a rectangle bounded by the

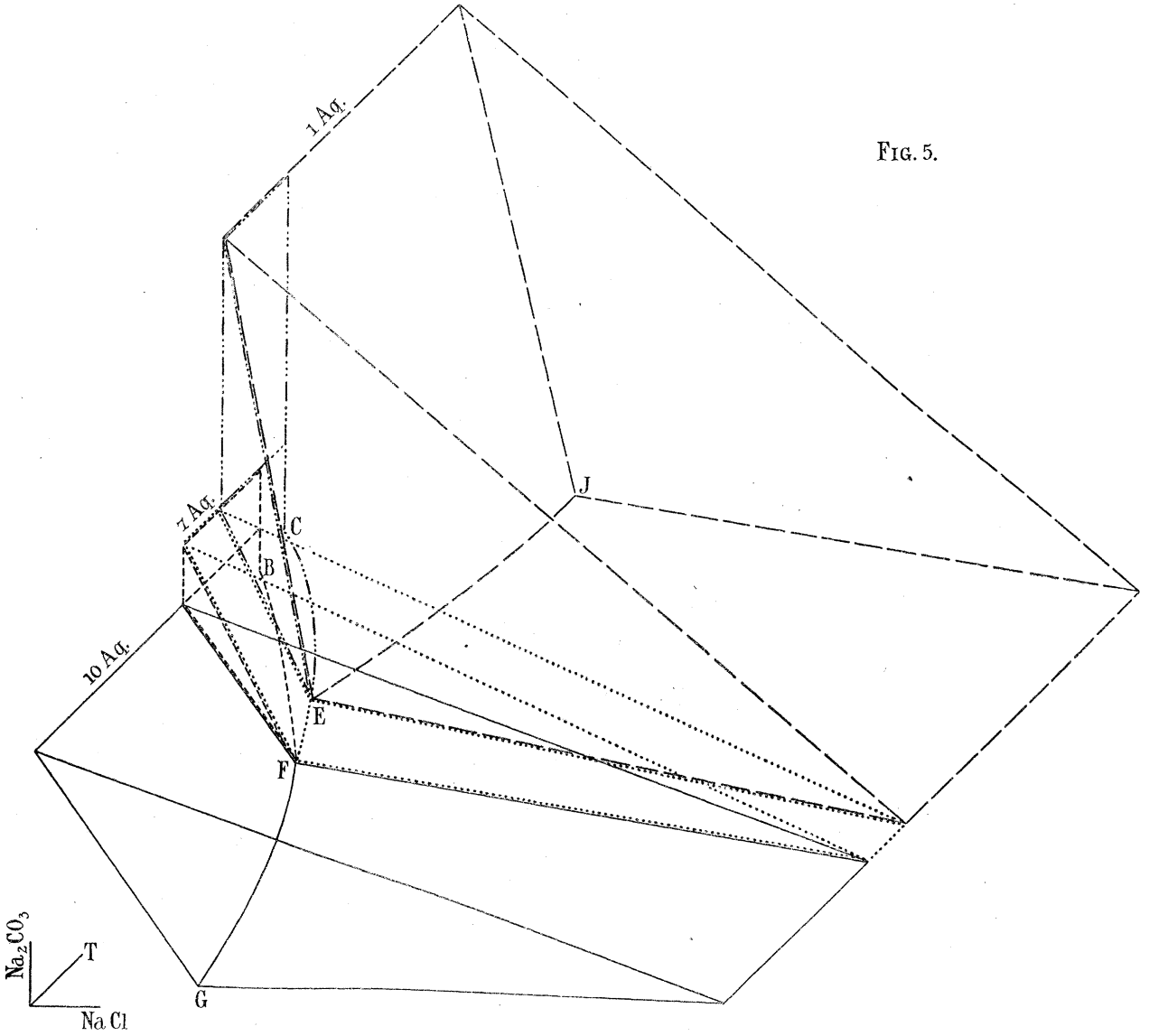


FIG. 5.

compositions of the solid phases and the limits of temperature, and that the corresponding points are joined to the curve representing saturation with respect to two solid phases.

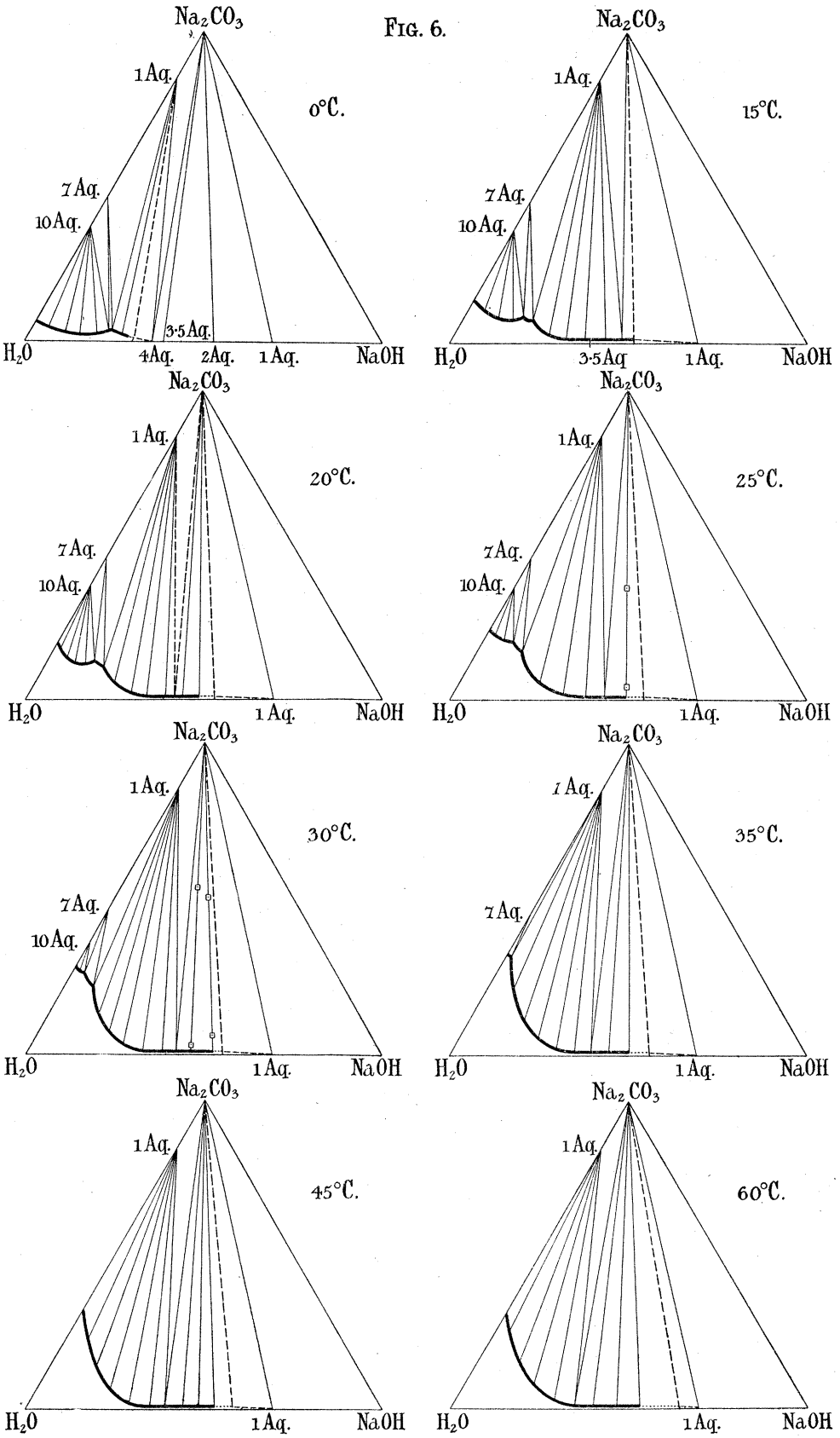
The solid prisms in which three solid phases coexist are not shown.

(2) *The System:* Na_2CO_3—NaOH—H_2O.

The isotherms obtained in this system are shown in fig. 6, and the numerical results are given in Tables IX. to XVI.

A considerable amount of difficulty was experienced in strong sodium hydrate solutions,

FIG. 6.



on account of the tendency of $Na_2CO_3.1H_2O$, and to a far greater extent of Na_2CO_3 to form non-settling suspensions. Since the amount of Na_2CO_3 which will dissolve in such solutions is, however, very small, it is possible to gain an accurate idea of the extent of the two- and three-phase areas by analysing the milky solution and the extremely wet solid; points obtained in this manner are indicated by small squares.

After 15° C. no new three-phase areas appear. Fig. 7 shows the results plotted against temperature, including the solid-liquid volumes. The form in which the results are presented in strong NaOH solution is frankly diagrammatic, but is justifiable on the following grounds.

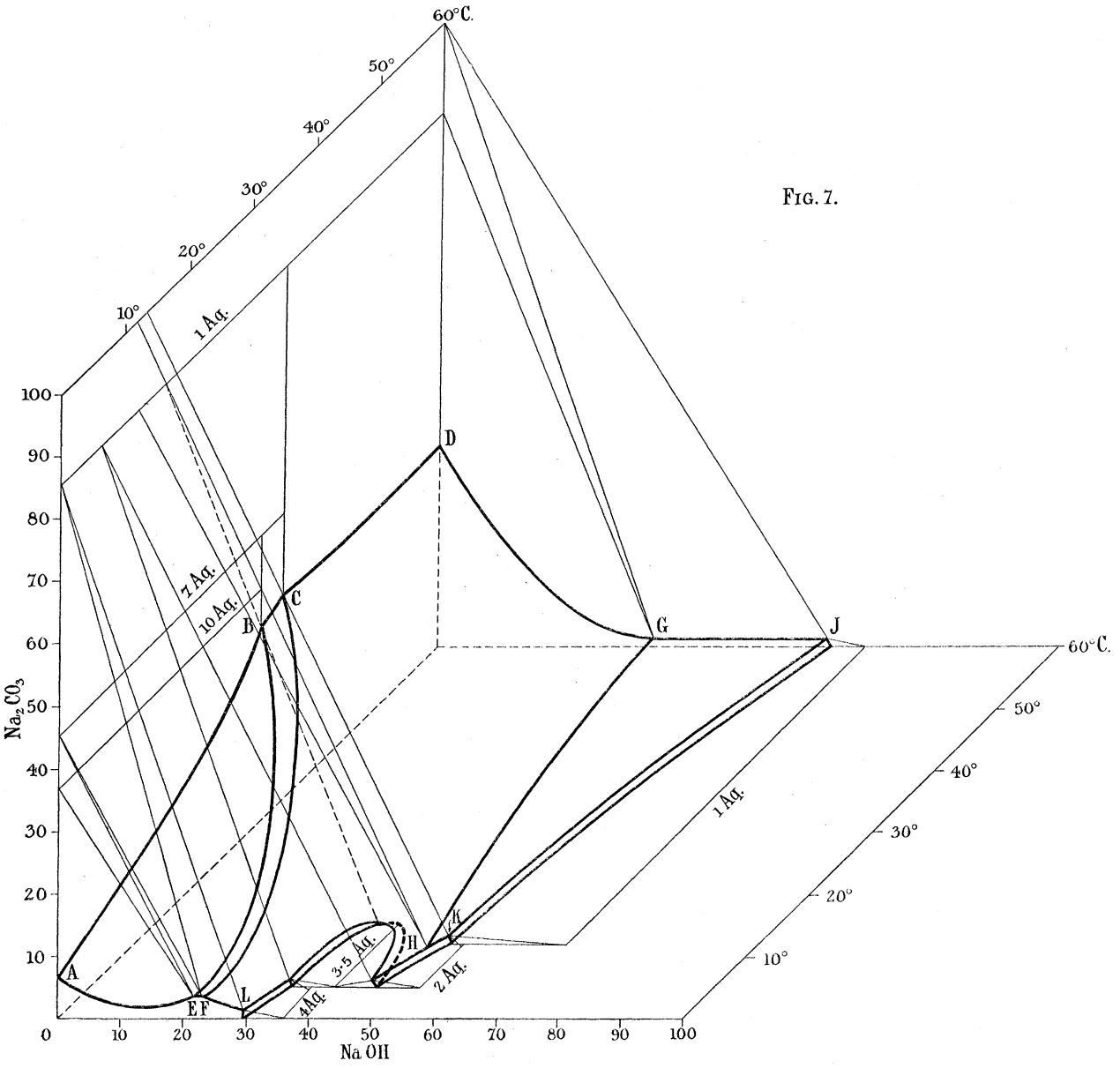


FIG. 7.

Since the amount of Na_2CO_3 which can dissolve in any really concentrated solution of NaOH is very small, the areas representing the surfaces of saturation with respect to the various phases of NaOH in the three-component system will necessarily take the form of a narrow strip as indicated.

In fig. 7 we have the following surfaces, representing solutions saturated with respect to solid phases :—

ABE	$Na_2CO_3.10H_2O$.
BCEF	$Na_2CO_3.7H_2O$.
CFLHGD	$Na_2CO_3.1H_2O$.
GJKH	Na_2CO_3.

The solid phases of NaOH are in equilibrium with solution very little different in composition from those of the two-component system on the base of the model.

The solid-liquid volumes are plainly shown in the diagram: the two-solid liquid volumes have been omitted for the sake of clearness, as well as the complexes consisting of solids only.

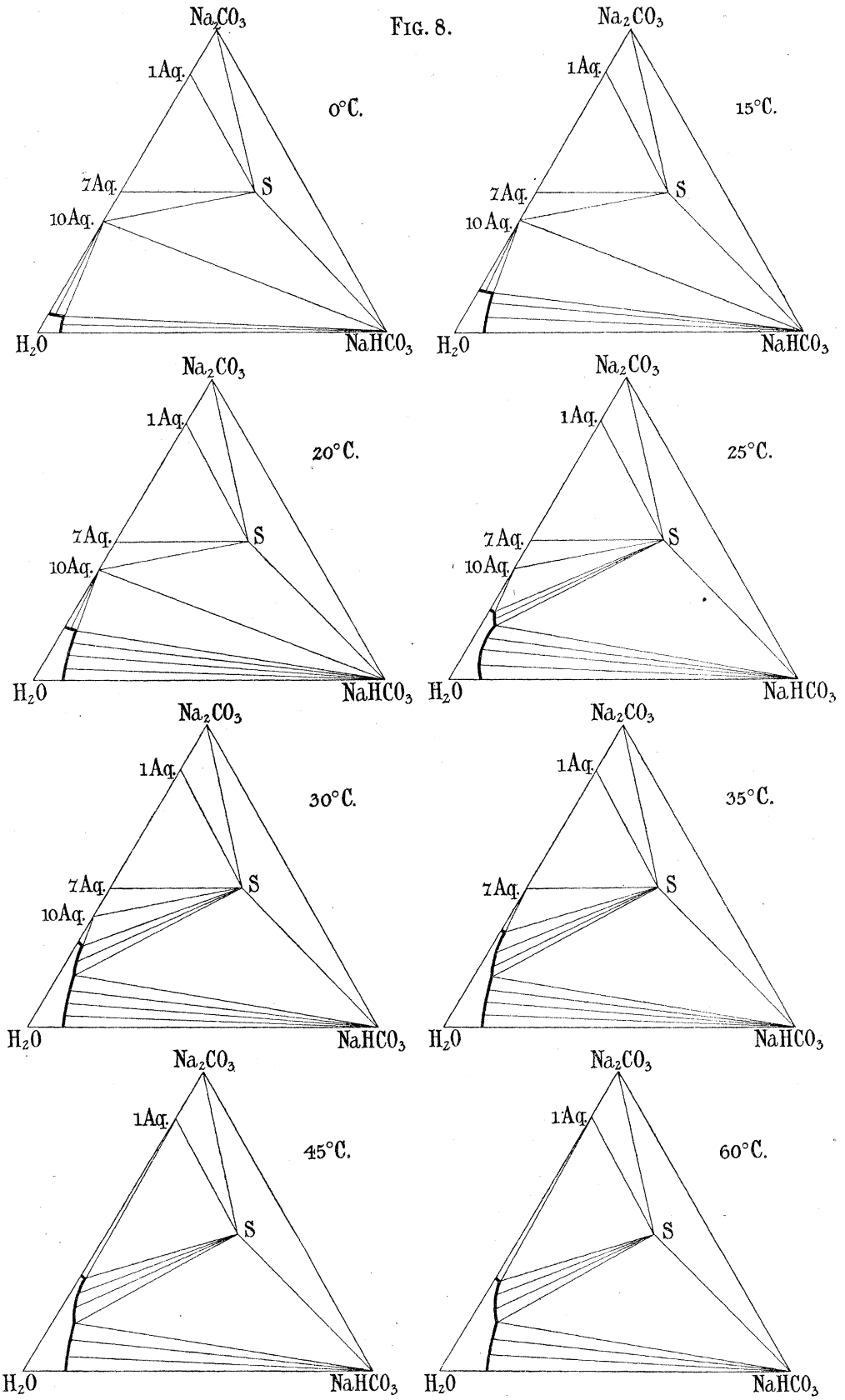
(3) *The System :* Na_2CO_3—$NaHCO_3$—H_2O.

In fig. 8 are plotted the results obtained at the various constant temperatures. The experimental figures will be found in Tables XVII. to XXIV.

It will be noticed that the double salt: Na_2CO_3—$NaHCO_3$—$2H_2O$, or sodium sesquicarbonate, represented by point S, is not stable in contact with solution below 19/20° C., and that in no case is this salt in equilibrium with a solution containing the same ratio of sodium carbonate to sodium bicarbonate as itself. In consequence of this, any attempt to produce a saturated solution from this salt and water above 20° C. results in the formation of solid sodium bicarbonate before the three-phase area $NaHCO_3$—sesquicarbonate—solution is reached. As before, the effect of making any mixture of the components or their compounds can be immediately deduced from the diagrams.

The temperature concentration diagram is shown in fig. 9. There will be no difficulty in distinguishing the various surfaces and volume complexes in this figure.

FIG. 8.



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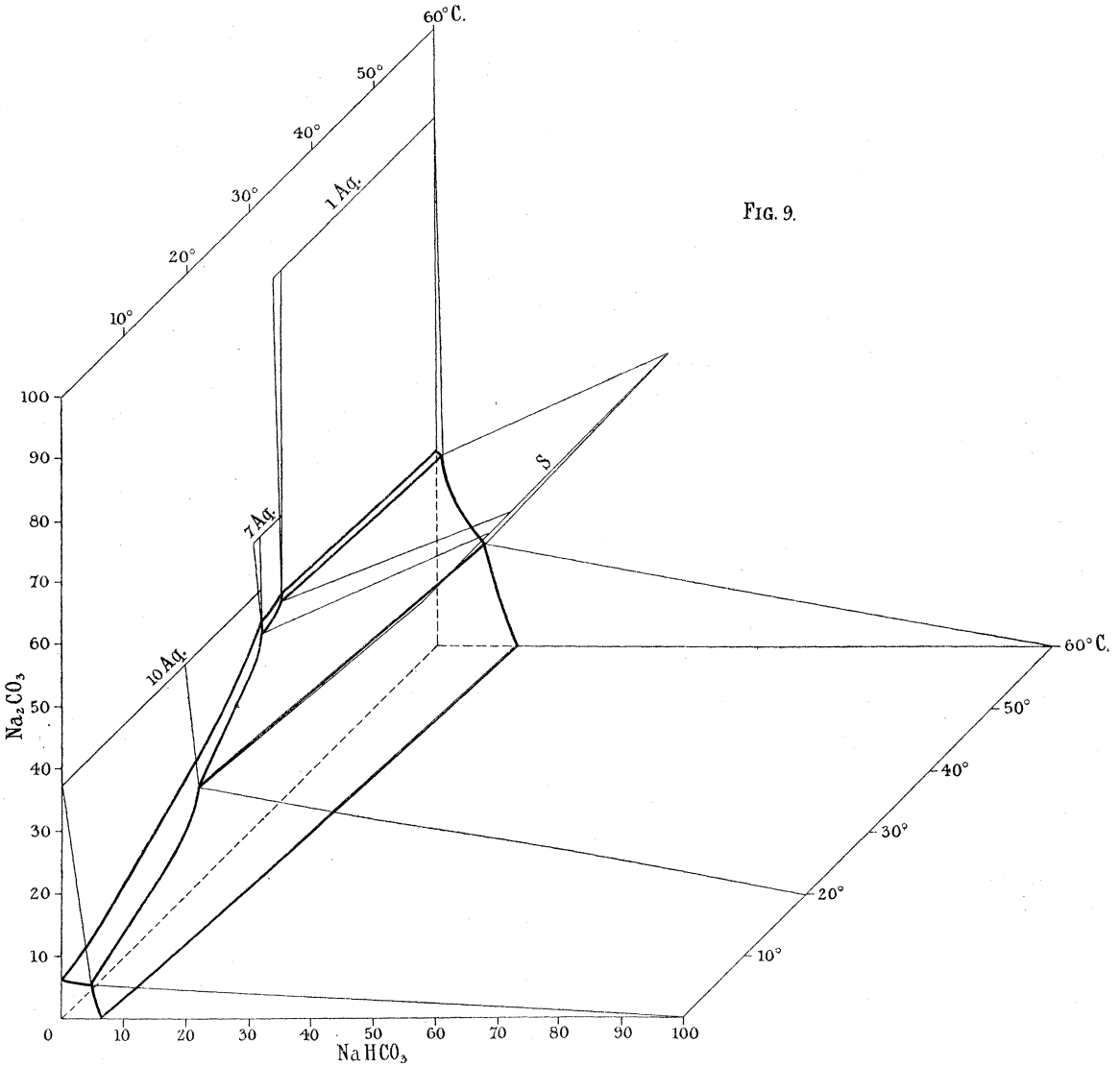


FIG. 9.

(4) *The System:* NaCl—NaOH—H_2O. (5) *The System:* $NaHCO_3$—NaCl—H_2O.

Typical isothermals of these systems which are of the simplest type are shown in fig. 10. The experimental results are given in Tables XXV. to XXXII. and XXXIII. to XL. respectively.

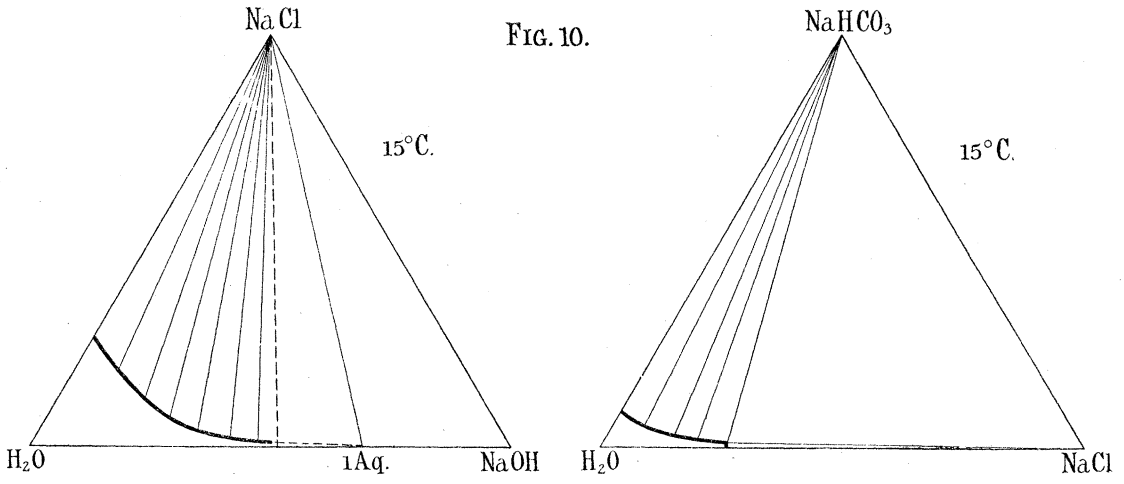


FIG. 10.

THE FOUR-COMPONENT SYSTEMS.—(*a*) THE SYSTEM: Na_2CO_3—NaOH—NaCl—H_2O.
(*b*) THE SYSTEM: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

The following abbreviations are used in discussing the four-component systems :—

$10 = Na_2CO_3.10H_2O$; $7 = Na_2CO_3.7H_2O$; $1 = Na_2CO_3.1H_2O$; $A = Na_2CO_3$;
$S = Na_2CO_3.NaHCO_3.2H_2O$.

(*a*) *The System :* Na_2CO_3—NaOH—NaCl—H_2O.

The tetrahedra which at constant temperatures represent the above four-component system have for their sides the four three-component systems which have already been discussed.

In fig. 11 will be found a representation of the irregular solids corresponding to unsaturated solutions whose upper surfaces correspond to saturation with solid phases, projected upon the Na_2CO_3—NaOH—NaCl face by the well-known formula—SCHREINEMAKERS, 'Zeit. Phys. Chem.,' vol. 65, p. 563.

The detailed discussion of one isothermal below will enable the reader to apply similar considerations to any of those drawn in fig. 11. The experimental results for fig. 11 will be found in Tables XLI.–XLVIII.

The Isothermal of 25° C.

A projection of the tetrahedron representing the results obtained at 25° C. on the Na_2CO_3—NaCl—NaOH face is shown in fig. 12.

This tetrahedron is built up of :—

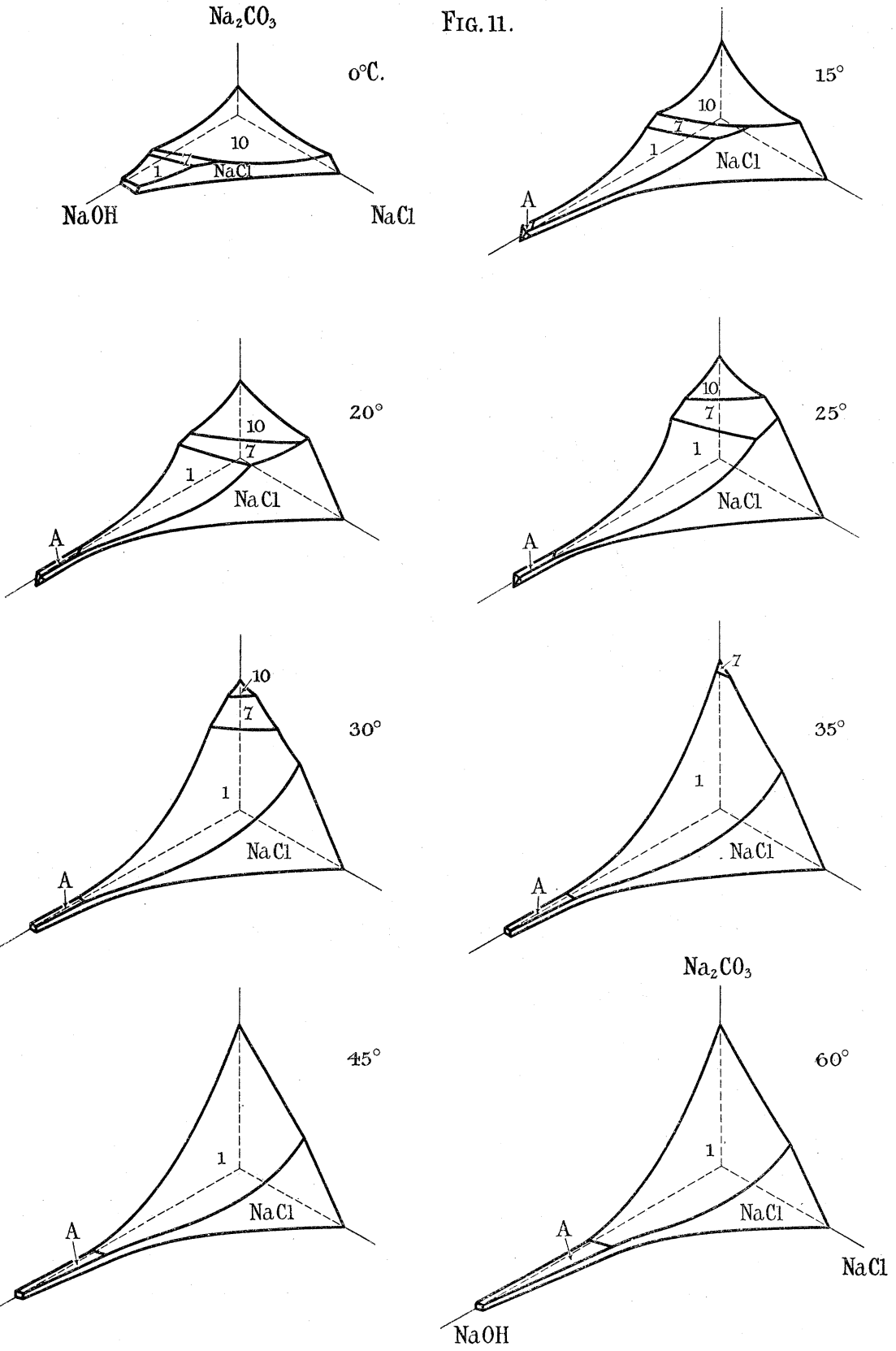
(1) Irregular tetrahedra representing four-phase complexes : in this case either four solid phases or three solid phases and saturated solution.
(2) Irregular tetrahedra with one curved edge, representing complexes of two solid phases and saturated solution.
(3) Volumes best defined by the bundle of rays from the point representing the composition of the one solid phase in question to the corresponding surface of saturation.
(4) The volume representing unsaturated solutions bounded by the three sides of the tetrahedron which terminate in the water angle and the surfaces of saturation.

Some of these volumes are shown in fig. 12 : the remainder can be readily visualised from the following :—

In fig. 12 we have : One four-solid-phase complex :

Na_2CO_3—NaOH—NaOH.1Aq—NaCl.

FIG. 11.



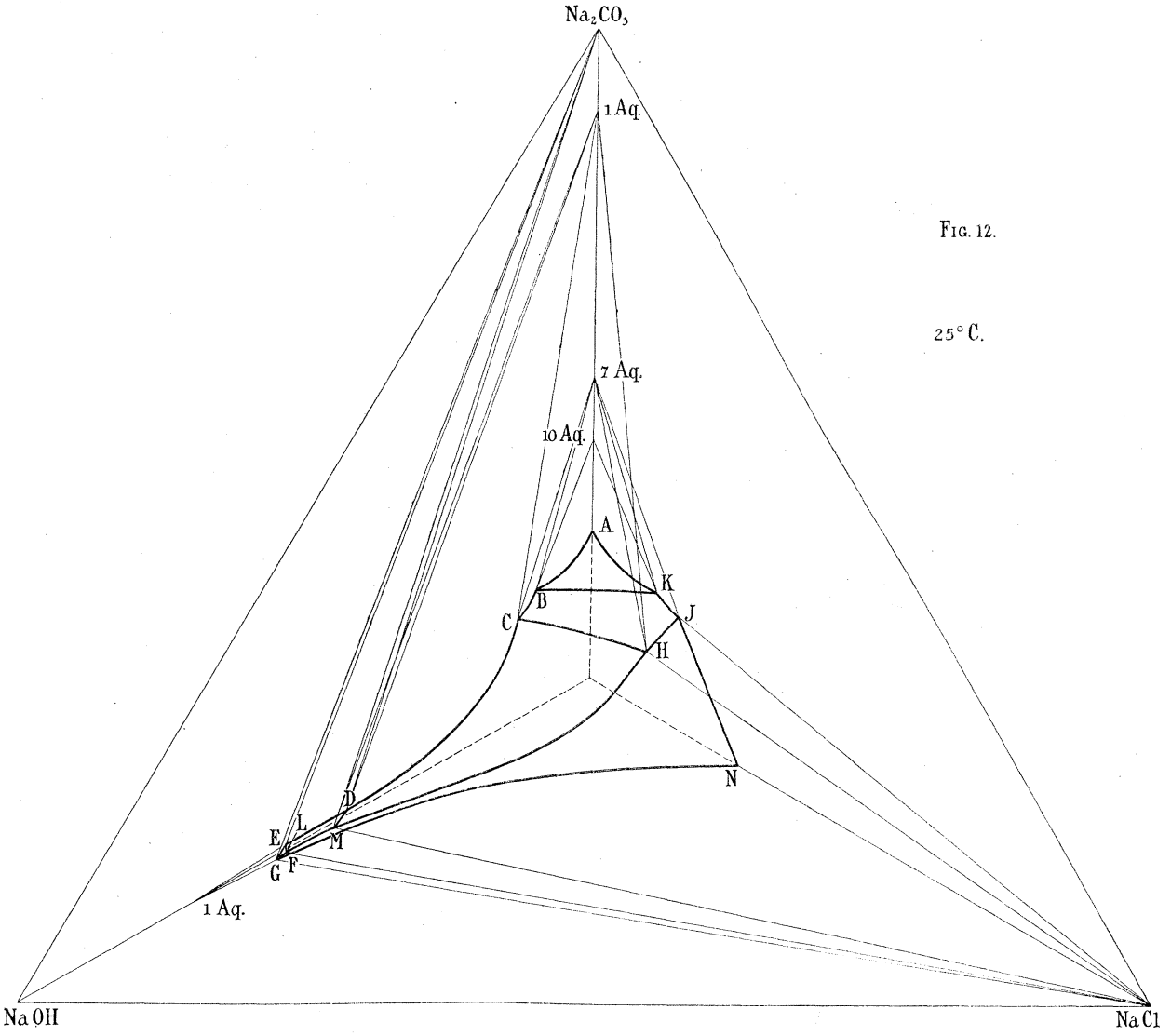


FIG. 12.

25° C.

Three complexes of solution plus three solid phases :—

NaOH + A + NaCl + Sol. G.
NaCl + 1 + A + Sol. M.
7 + 1 + NaCl + Sol. H.

Eight complexes of two solids plus saturated solution :—

1 + NaCl	line HJ.
10 + 7	line BK.
7 + 1	line CH.
1 + NaCl	line MH.

A + NaCl	line MG.
NaOH.1Aq + NaCl	line FG.
A + NaOH.1Aq	line GE.
A + 1	line DM.

The above tetrahedra will be clearly defined if it is remembered that the line joining the compositions of the two solid phases and the named curved line do not cut each other.

The complexes of one solid and a liquid phase are clearly shown in the diagram. The unsaturated solutions have already been dealt with.

We are now in a position to determine the quantities and compositions of the stable phases into which any composition of the components represented by a point (*a*) in the above tetrahedron will break up.

If the point (*a*) in question is situated in a four-phase volume, the quantities of the phases will be such that would make the point (*a*) the centre of gravity of the tetrahedron were the quantities of phases present represented by weights at the angles.

If the point (*a*) is situated in a two solid plus liquid volume, the quantities of total solid and liquid present are found by the following construction. A plane is drawn through the points representing the composition of the solid phases and the point (*a*). This plane will cut the curved line representing the saturated solution in a point which is the composition of the saturated solution which it is desired to find.

If we now join the composition of this saturated solution with that of the original point (*a*) and produce the line till it intersects the line representing mixtures of the two solid phases, in, say, point (*b*), the quantities of total and liquid present are inversely as the distance of point (*a*) from the ends of the above line.

The relative quantities of the dry solids are inversely as the distance of point (*b*) from the composition of the solid phases.

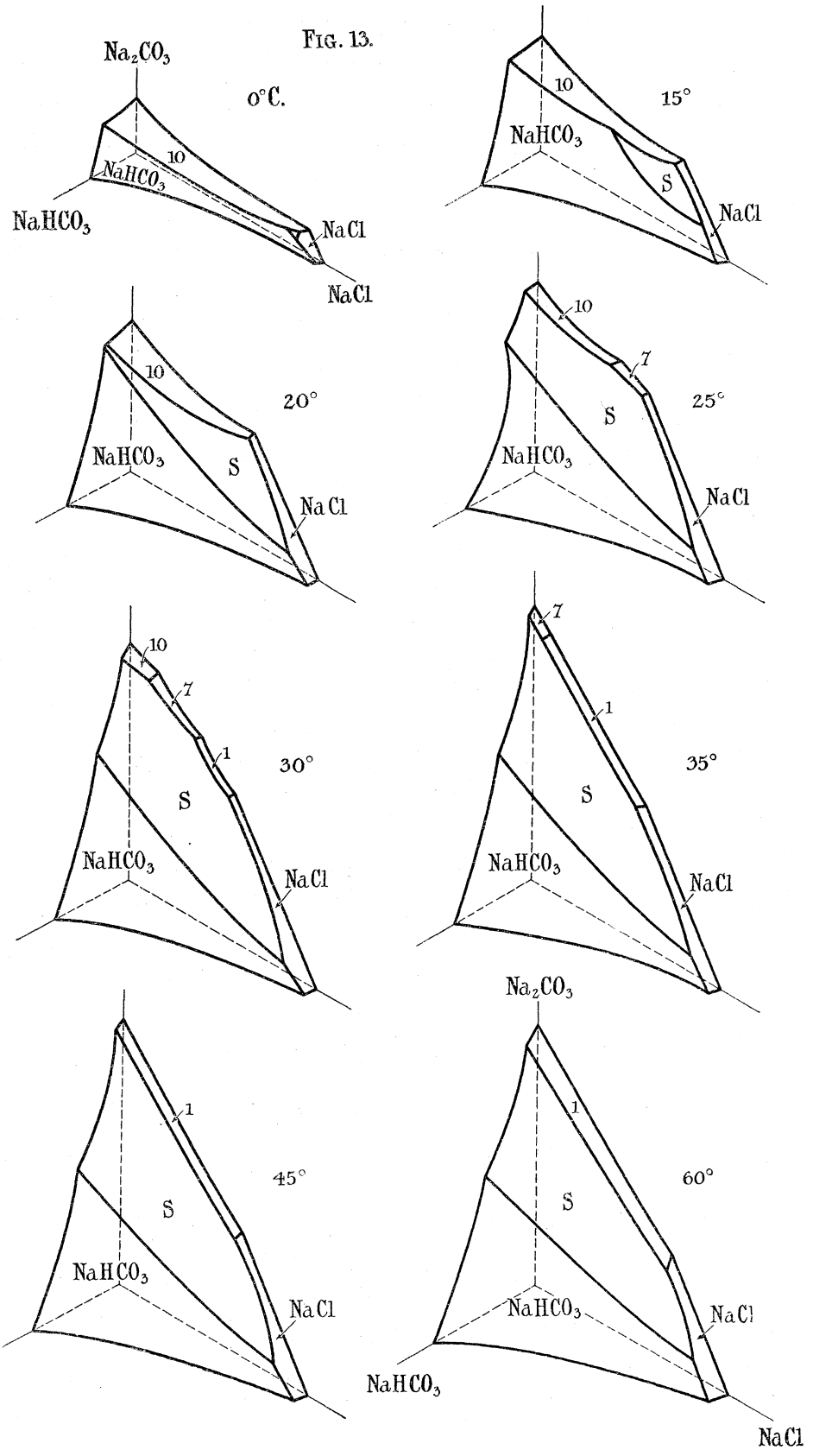
If point (*a*) is situated in a solid-liquid volume, the quantities present are inversely as the distance of point (*a*) on the appropriate ray of the bundle from the surface of saturation and the composition of the solid phase.

In considering this system, it must be remembered that the experimental difficulties are responsible for the slight distortion of the surfaces in the neighbourhood of saturation with respect to NaOH.1Aq, etc.

(*b*) *The System :* Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

In fig. 13 will be found the projection of the surfaces of saturation and unsaturated solutions for the various isothermals on the Na_2CO_3—$NaHCO_3$—NaCl face of the tetrahedron: it will be noticed that sodium sesquicarbonate can exist at 0° C. in contact with saturated solution, but only over a small area of concentration.

Fig. 13.



The complete tetrahedron for 25° C. shown in fig. 14 is built up of the following volumes: numerous lines are omitted for the sake of clearness.

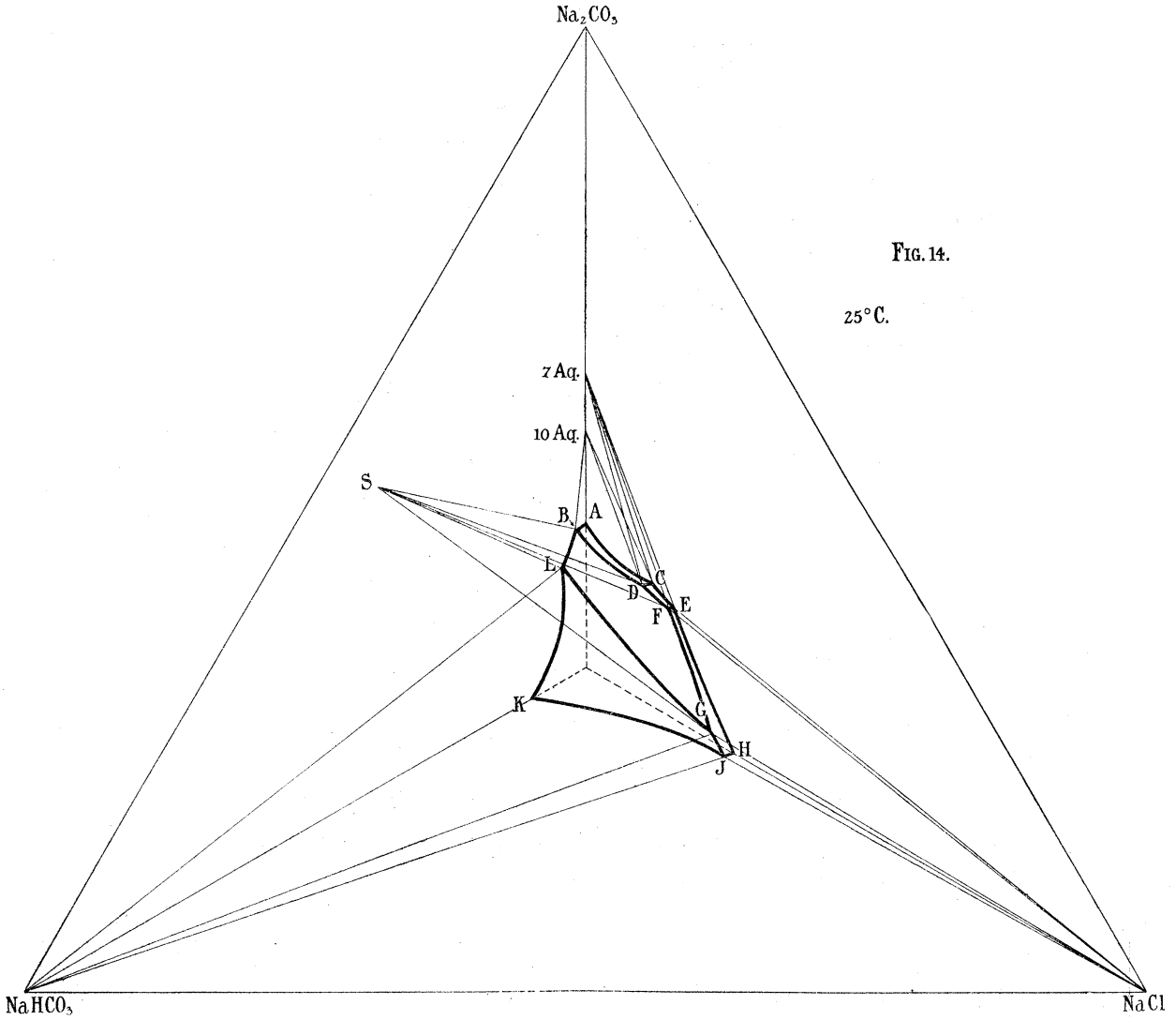


FIG. 14.

25° C.

Complexes of four solid phases:—

S + 7 + 1 + NaCl; S + 1 + A + NaCl; S + A + $NaHCO_3$ + NaCl.

Three solid phases and saturated solution:—

10 + 7 + S + Sol. D; 7 + S + NaCl + Sol. F; S + $NaHCO_3$ + NaCl + Sol. B.

Two solid phases and saturated solution:—

10 + S	line BD.
10 + 7	line CD.
7 + S	line DF.

7 + NaCl . . . . . line EF.
S + NaCl . . . . . line FG.
S + $NaHCO_3$ . . . . . line LG.
$NaHCO_3$ + NaCl . . . . . line GJ.

The solid-liquid volumes are plainly shown in the diagram. The experimental figures are given in Tables XLIX. to LVI.

The considerations previously given apply to the quantities of phases formed from any mixture of the components.

Summary.

Experimental figures and diagrams are given from which can be deduced the quantities and composition of the stable phases which will be formed from any mixture of the components at 0°, 10°, 15°, 20°, 25°, 30°, 35°, 45°, and 60° C.

Index to the Tables.

Table I.—The System: Na_2CO_3—NaCl—H_2O.

Temperature: 0° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.10H_2O$	6·6	—	93·4	—	—	—
	4·3	4·5	91·2	12·0	3·2	84·8
	3·7	8·2	88·1	11·5	6·2	82·3
	3·1	12·3	84·6	11·2	9·1	79·7
	2·9	15·6	81·5	10·9	11·9	77·2
	2·8	20·4	76·8	10·4	15·7	73·9
NaCl + $Na_2CO_3.10H_2O$	2·8	24·2	73·0	9·9	19·4	70·7
NaCl	1·1	25·1	73·8	1·1	28·3	70·6
	—	26·3	73·7	—	—	—

TABLE II.—The System: Na_2CO_3—NaCl—H_2O.

Temperature: 15° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.10H_2O$	14·1	—	85·9	—	—	—
	9·9	8·9	81·2	34·0	0·8	65·2
	8·7	14·7	76·6	33·6	1·5	64·9
$Na_2CO_3.10H_2O$ + NaCl	9·2	20·2	70·6	23·4	27·1	49·5
NaCl	3·5	24·0	72·5	0·2	94·6	5·2
	—	26·3	73·7	—	—	—

TABLE III.—The System: Na_2CO_3—NaCl—H_2O.

Temperature: 20° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.10H_2O$	17·6	—	82·4	—	—	—
	15·5	4·0	80·5	—	—	—
	14·1	7·7	78·2	—	—	—
	12·9	12·8	74·3	—	—	—
$Na_2CO_3.10H_2O$ + NaCl	13·5	17·4	69·1	—	—	—
NaCl	6·9	22·0	71·1	—	—	—
	9·5	20·3	70·2	—	—	—
	11·5	18·9	69·6	—	—	—
	—	26·4	73·6	—	—	—

TABLE IV.—The System: Na_2CO_3—NaCl—H_2O.
Temperature: 25° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.10H_2O$	22·7	—	77·3	—	—	—
	19·6	5·6	74·8	34·0	0·9	65·1
	18·8	10·8	70·4	33·9	1·7	64·4
$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$	19·0	11·8	69·2	35·4	1·6	63·0
$Na_2CO_3.7H_2O$	18·4	13·0	68·6	41·1	1·8	57·1
$Na_2CO_3.7H_2O$ + NaCl	17·3	15·5	67·2	20·0	48·2	31·8
	17·2	15·4	67·4	39·5	5·7	54·8
NaCl	7·9	21·3	70·8	0·9	90·2	8·9
	—	26·4	73·6	—	—	—

TABLE V.—The System: Na_2CO_3—NaCl—H_2O.
Temperature: 30° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.10H_2O$	28·5	—	71·5	—	—	—
	27·0	3·7	69·3	35·3	0·4	64·3
$Na_2CO_3.7H_2O$	26·6	4·2	69·2	43·0	0·4	56·6
	24·6	7·2	68·2	41·9	1·2	56·9
	22·7	9·3	68·0	40·7	2·5	56·8
$Na_2CO_3.1H_2O$	21·9	10·4	67·7	75·7	1·6	22·7
	20·5	11·1	68·4	78·9	1·5	19·6
$Na_2CO_3.7H_2O$ + NaCl .*.	21·2	12·9	65·9	35·8	11·6	52·6
$Na_2CO_3.1H_2O$ + NaCl	17 7	15 0	67·3	61·1	13·6	25·3
NaCl	5·0	22·7	72·3	0·5	89·5	10·0
	—	26·5	73·5	—	—	—
$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$	26·9	3·9	69·2	—	—	—
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$	22·5	10·2	67·3	—	—	—

* Metastable.

TABLE VI.—The System: Na_2CO_3—NaCl—H_2O.

Temperature: 35° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.7H_2O$	32·9	—	67·1	—	—	—
	31·5	2·0	66·5	42·3	0·5	57·2
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$	31·0	2·5	66·5	51·9	0·8	47·3
$Na_2CO_3.1H_2O$	30·2	2·9	66·9	75·5	0·5	24·0
	25·5	7·1	67·4	65·0	2·5	32·5
$Na_2CO_3.1H_2O + NaCl$	16·8	16·1	67·1	43·7	32·9	23·4
NaCl	7·4	21·7	70·9	1·0	88·4	10·6
	4·0	24·0	72·0	0·8	84·5	14·7
	—	26·6	73·4	—	—	—

TABLE VII.—The System: Na_2CO_3—NaCl—H_2O.

Temperature: 45° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.1H_2O$	32·2	—	67 8	—	—	—
	28·2	3·9	67·9	—	—	—
	24·4	7·3	68·3	71·9	1·8	26·3
	20·7	11·1	68·2	66·4	3·3	30·3
	17·6	14·6	67·8	63·5	4·8	31·7
$Na_2CO_3.1H_2O + NaCl$	15·0	17·4	67·6	—	—	—
NaCl	10·3	20·2	69·5	0·7	93·5	5·8
	3·6	24·2	72·2	0·2	91·8	8·0
	—	26·7	73·3	—	—	—

TABLE VIII.—The System: Na_2CO_3—NaCl—H_2O.

Temperature: 60° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaCl	H_2O	Na_2CO_3	NaCl	H_2O
$Na_2CO_3.1H_2O$	31·8	—	68·2	—	—	—
	24·0	7·2	68·8	—	—	—
	20·2	10·9	68·9	—	—	—
	16·6	14·5	68·9	—	—	—
$Na_2CO_3.1H_2O$ + NaCl	13·9	17·8	68·3	—	—	—
NaCl	—	27·0	73·0	—	—	—

TABLE IX.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 0° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.10H_2O$	6·4	—	93·6	—	—	—
	2·6	8·1	89·3	28·9	2·1	69·0
	2·2	18·4	79·4	24·3	6·3	69·4
	2·7	20·9	76·4	22·2	8·8	69·0
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$	3·1	22·3	74·6	20·2	11·2	68·6
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$	3·1	23·0	73·9	39·5	5·3	55·2
$Na_2CO_3.H_2O$	1·2	28·9	69·9	50·3	11·9	37·8
$NaOH.4H_2O$	—	29·6	70·4	—	—	—

TABLE X.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 15° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.10H_2O$	14·1	—	85·9	—	—	—
	10·1	4·8	85·1	35·2	0·1	64·7
	7·5	13·8	78·7	33·2	1·6	65·2
$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$	8·9	17·0	74·1	35·6	4·3	60·1
$Na_2CO_3.7H_2O$	7·7	19·3	73·0	38·8	3·4	57 8
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$	7·9	19·4	72·7	65·5	3·5	31·0
$Na_2CO_3.1H_2O$	6·3	20·8	72·9	66·5	4·5	29·0
	4·1	23·9	72·0	61·2	6·7	32·1
	1·2	30·6	68·2	—	—	—
	0·2	44·9	54·9	42·9	22·5	34·6
$Na_2CO_3.1H_2O + Na_2CO_3$	0·6	47·3	52·1	39·0	28·0	33·0
Na_2CO_3	0·7	49·8	49·5	—	—	—
$NaOH.1H_2O$	—	51·2	48·8	—	—	—
$NaOH.3·5H_2O$, L and B	—	37·5	62·5	—	—	—
	—	41·5	58·5	—	—	—

TABLE XI.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 20° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.10H_2O$	18·0	—	82·0	—	—	—
	12·9	6·3	80·8	36·9	0·3	62·8
	11·6	12·7	75·7	32·6	2·3	65·1
$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$	12·4	13·4	74·2	42·2	1·2	56·6
$Na_2CO_3.7H_2O$	11·7	14·7	73·6	42·7	1·1	56·2
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$	11·1	16·2	72·7	50·1	2·7	47·2
$Na_2CO_3.1H_2O$	5·2	22·0	72·8	61·9	6·3	31·8
	1·1	29·7	69·2	48·6	12·8	38·6
	0·3	39·8	59·9	51·2	16·3	32·5
$Na_2CO_3.1H_2O + Na_2CO_3$	0·3	41·5	58·2	—	—	—
Na_2CO_3	*5·4	43·9	50·7	30·9	32·2	36·9
	*9·6	43·8	46·6	19·9	38·8	41·3
$NaOH.1H_2O$	—	52·1	47·9	—	—	—

* This solution was *not* clear.

TABLE XII.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 25° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.10H_2O$	22·7	—	77·3	—	—	—
	18·2	5·4	76·4	36·1	0·7	63·2
	18·1	7·0	74·9	35·4	0·6	64·0
$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$	18·0	9·3	72·7	—	—	—
$Na_2CO_3.7H_2O$	*21·0	5·8	73·2	37·6	1·6	60·8
	17·6	9·7	72·7	41·4	1·5	57·1
	16·7	10·7	72·6	43·2	1·0	55·8
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$	15·4	12·7	71·9	36·9	4·7	58·4
$Na_2CO_3.1H_2O$	1·2	30·6	68·2	49·1	13·3	37·6
	0·5	37·5	62·0	49·6	16·0	34·4
$Na_2CO_3.1H_2O + Na_2CO_3$ . . .	0·5	42·4	57·1	60·9	16·2	22·9
Na_2CO_3	†4·5	47·1	48·4	36·4	31·4	32·2
$NaOH + 1H_2O$	—	53·3	46·7	—	—	—

* Supersaturated solution.

† This solution was *not* clear.

TABLE XIII.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 30° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.10H_2O$	28·4	—	71·6	—	—	—
	26·5	3·1	70·4	35·8	0·4	63·8
$Na_2CO_3.10H_2O + Na_2CO_3.7H_2O$	26·7	3·5	69·8	—	—	—
$Na_2CO_3.7H_2O$	25·7	4·0	70·3	43·8	0·2	56·0
	24·3	5·5	70·2	42·2	1·1	56·7
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$	21·9	7·9	70·2	40·2	2·1	57·7
$Na_2CO_3.1H_2O$	19·0	9·8	71·2	79·0	0·8	20·2
	13·7	13·8	72·5	71·5	2·7	25·8
	0·9	31·2	67·9	52·2	12·4	35·4
$Na_2CO_3.1H_2O + Na_2CO_3$ . . .	*15·1	35·0	49·9	56·5	14·6	28·9
	0·5	41·6	57·9	—	—	—
Na_2CO_3	*2·5	44·5	53·0	54·2	20·9	24·9
	*6·1	49·1	44·8	51·6	25·6	22·8
$NaOH.1H_2O$	—	54·3	45·7	—	—	—

* The solution was *not* clear.

TABLE XIV.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 35° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.7H_2O$	32·9	—	67·1	—	—	—
$Na_2CO_3.7H_2O + Na_2CO_3.1H_2O$	32·0	0·6	67·4	63·8	—	36·2
$Na_2CO_3.1H_2O$	25·3	4·9	69·8	73·7	0·8	25·5
	15·2	11·9	72·9	69·9	2·6	27·5
	7·5	18·7	73·8	69·4	3·4	27·2
	1·9	27·5	70·6	65·5	6·6	27·9
	0·5	34·2	65·3	66·0	7·7	26·3
$Na_2CO_3.1H_2O + Na_2CO_3$ . . .	0·5	39·2	60·3	66·7	9·2	24·1
Na_2CO_3	0·2	39·5	60·3	57·3	16·6	26·1
	0·2	44·8	55·0	—	—	—
	0·2	50·2	49·6	—	—	—
$NaOH.1H_2O$	—	55·4	44·6	—	—	—

TABLE XV.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 45° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.1H_2O$	32·2	—	67·8	—	—	—
	14·5	12·1	73·4	67·9	2·7	29·4
	1·4	28·1	70·5	65·8	6·2	28·0
	0·5	37·8	61·7	57·8	12·4	29·8
$Na_2CO_3.1H_2O + Na_2CO_3$ . . .	0·5	38·3	61·2	50·1	19·0	30·9
Na_2CO_3	0·5	47·0	52·5	45·8	25·1	29·1
	0·2	52·4	47·4	39·3	31·9	28·8
$NaOH.1H_2O$	—	57·8	42·2	—	—	—

TABLE XVI.—The System: Na_2CO_3—NaOH—H_2O.

Temperature: 60° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	NaOH	H_2O	Na_2CO_3	NaOH	H_2O
$Na_2CO_3.1H_2O$	31·8	—	68·2	—	—	—
	22·5	6·1	71·4	—	—	—
	14·2	12·2	73·6	66·3	3·2	30·5
	6·9	19·4	73·7	56·2	7·0	36·7
	1·1	32·6	66·3	62·7	8·6	28·7
$Na_2CO_3.1H_2O + Na_2CO_3$ . . .	0·8	34·4	64·8	59·3	12·0	28·7
Na_2CO_3	0·7	35·4	63·9	61·8	13·7	24·5
	0·3	42·3	57·4	64·3	14·9	20·8
	0·3	52·2	47·5	48·6	27·1	24·3
$NaOH.1H_2O$	—	63·5	36·5	—	—	—

TABLE XVII.—The System: Na_2CO_3—$NaHCO_3$—H_2O.

Temperature 0° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	6·5	93·5	—	—	—
	4·0	5·1	90·9	1·1	82·5	16·4
$NaHCO_3 + Na_2CO_3.10H_2O$ . .	5·6	4·6	89·8	24·7	24·6	50·7
$Na_2CO_3.10H_2O$	5·9	1·4	92·6	33·5	0·3	66·2
	6·4	—	93·6	—	—	—

TABLE XVIII.—The System : Na_2CO_3—$NaHCO_3$—H_2O.

Temperature 15° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	8·1	91·9	—	—	—
	6·0	6·0	88·0	1·2	81·5	17·3
$NaHCO_3 + Na_2CO_3.10H_2O$ . .	13·3	4·3	82·3	27·0	16·2	56·8
$Na_2CO_3.10H_2O$	13·8	1·8	84·4	28·7	0·5	70·8
	14·1	—	85·9	—	—	—

TABLE XIX.—The System : Na_2CO_3—$NaHCO_3$—H_2O.

Temperature : 20° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	8·7	91·2	—	—	—
	3·5	7·2	89·2	0·4	87·9	11·7
	6·3	6·5	87·2	0·1	89·2	10·6
$Na_2CO_3.10H_2O + NaHCO_3$ . .	17·1	4·0	78·9	21·2	37·6	41·1
	17·0	4·0	78·9	26·0	24·3	49·6
$Na_2CO_3.10H_2O$	17·3	2·9	79·8	34·2	0·6	65·1
	18·0	—	82·0	—	—	—

TABLE XX.—The System: Na_2CO_3—$NaHCO_3$—H_2O.

Temperature: 25° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	9·3	90·6	—	—	—
	6·1	4·9	88·9	—	—	—
	10·0	3·9	86·1	—	—	—
	16·7	3·3	80·0	—	—	—
$NaHCO_3 + Na_2CO_3.NaHCO_3.2H_2O$	17·8	4·1	78·1	27·8	21·7	50·4
$NaHCO_3 + Na_2CO_3.NaHCO_3.2H_2O$	18·0	4·0	78·0	22·9	33·5	43·5
$Na_2CO_3.NaHCO_3.2H_2O$	20·8	2·5	76·7	31·7	16·2	52·0
$Na_2CO_3.NaHCO_3.2H_2O + Na_2CO_3.10H_2O$	22·6	1·5	75·9	34·0	6·9	59·0
$Na_2CO_3.10H_2O$	22·7	—	77·3	—	—	—

TABLE XXI.—The System: Na_2CO_3—$NaHCO_3$—H_2O.

Temperature: 30° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	9·9	90·0	—	—	—
	0·8	9·1	90·1	—	—	—
	9·7	6·3	83·9	2·6	84·1	13·3
	17·5	4·6	77·8	3·5	80·2	16·3
$NaHCO_3 + Na_2CO_3.NaHCO_3.2H_2O$	17·6	4·3	78·1	27·1	35·7	37·1
$Na_2CO_3.NaHCO_3.2H_2O$	18·3	3·8	77·8	29·6	16·8	53·6
	26·1	1·2	72·7	33·6	13·3	53·1
	26·5	1·1	72·3	34·5	14·2	51·2
$Na_2CO_3.NaHCO_3.2H_2O + Na_2CO_3.10H_2O$	27·1	1·3	71·6	—	—	—
$Na_2CO_3.10H_2O$	27·5	0·8	71·6	35·5	0·4	64·0
	28·45	—	71·5	—	—	—

TABLE XXII.—The System: Na_2CO_3—$NaHCO_3$—H_2O.

Temperature: 35° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	10·6	89·4	—	—	—
	9·7	6·9	83·3	4·0	84·0	13·9
$NaHCO_3 + Na_2CO_3.NaHCO_3.2H_2O$	17·3	4·7	77·9	17·9	48·2	33·9
$Na_2CO_3.NaHCO_3.2H_2O$	23·7	2·0	74·3	36·0	20·1	43·9
	28.7	0·9	70·4	34·0	12·2	53·7
$Na_2CO_3.NaHCO_3.2H_2O + Na_2CO_3.7H_2O$	32·5	0·6	67·0	—	—	—
$Na_2CO_3.7H_2O$	32·8	0·3	66·9	—	—	—
	32·9	—	67·1	—	—	—

TABLE XXIII.—The System: Na_2CO_3—$NaHCO_3$—H_2O.

Temperature: 45° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	12·0	88·0	—	—	—
	0·8	11·3	87·9	—	—	—
	8·7	8·0	83·3	1·9	83·1	15·0
$NaHCO_3$ + Sesqui	16·9	5·9	77·2	24·8	39·3	35·9
Sesqui	21·4	3·0	75·6	38·7	25·4	35·8
	27·3	1·3	71·3	32·6	11·7	55·7
Sesqui + $Na_2CO_3.1H_2O$	31·7	0·9	67·4	55·6	14·9	29·5
$Na_2CO_3.1H_2O$	32·2	—	67·8	—	—	—

TABLE XXIV.—The System: Na_2CO_3—$NaHCO_3$—H_2O.

Temperature: 60° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	Na_2CO_3	$NaHCO_3$	H_2O	Na_2CO_3	$NaHCO_3$	H_2O
$NaHCO_3$	—	—	—	—	—	—
	1·4	12·9	85·7	—	—	—
	8·5	10·1	81·5	3·4	66·1	30·5
$NaHCO_3$ + Sesqui	16·9	7·4	75·8	22·9	29·2	47·9
Sesqui	25·8	2·4	71·8	29·9	9·2	60·8
Sesqui + $Na_2CO_3.1H_2O$	30·7	1·3	68·0	50·4	13·0	36·6
$Na_2CO_3.1H_2O$	31·8	—	68·2	—	—	—

TABLE XXV.—The System: NaOH—NaCl—H_2O.

Temperature: 0° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	26·3	73·7	—	—	—
	7·4	19·8	72·8	0·8	90·8	8·4
	17·2	12·2	70·6	2·6	86·7	10·7
	29·4	4·6	66·0	5·5	81·9	12·6
	*39·4	1·5	59·1	10·9	72·7	16·4
NaCl + $NaOH.4H_2O$	30·3	4·2	65·5	34·2	5·2	60·6
$NaOH.4H_2O$	29·6	—	70·4	—	—	—

* Supersaturated solution.

TABLE XXVI.—The System: NaOH—NaCl—H_2O.

Temperature: 15° C.

Solid phase.	Composition of solution.			Composition of rest.		
	Grammes per 100 gr.			Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	26·3	73·7	—	—	—
	12·8	15·7	71·5	1·4	90·3	8·3
	23·1	8·3	68·6	3·3	86·0	10·7
	40·3	1·7	58·0	10·1	74·7	15·2
	49·9	0·8	49·3	11·4	76·4	12·2
$NaOH.1H_2O$	51·2	—	48·8	—	—	—

TABLE XXVII.—The System: NaOH—NaCl—H_2O.

Temperature: 20° C.

Solid phase.	Composition of solution.			Composition of rest.		
	Grammes per 100 gr.			Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	26·4	73·6	—	—	—
	14·0	14·9	71·1	1·4	90·5	8·1
	26·1	6·6	67·3	4·0	84·9	11·1
	35·4	2·7	61·9	6·4	81·8	11·8
	42·5	1·3	56·2	13·2	69·2	17·6
$NaOH.1H_2O$	52·2	—	47·8	—	—	—

TABLE XXVIII.—The System: NaOH—NaCl—H_2O.

Temperature: 25° C.

Solid Phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	26·4	73·6	—	—	—
	14·2	14·7	71·1	2·1	87·1	10·8
	26·6	6·5	66·9	4·6	83·6	11·8
	40·6	1·7	57·7	7·5	81·8	10·7
	49·9	1·0	49·1	9·7	80·4	9·9
$NaOH.1H_2O$	53·3	—	46·7	—	—	—

TABLE XXIX.—The System: NaOH—NaCl—H_2O.

Temperature: 30° C.

Solid Phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	26·5	73·5	—	—	—
	14·4	14·7	70·9	1·6	90·8	7·6
	26·9	6·4	66·7	4·6	84·1	11·3
	39·2	2·0	58·8	6·3	83·5	10·2
	48·0	1·1	50·9	11·6	76·0	12·4
$NaOH.1H_2O$	54·3	—	45·7	—	—	—

TABLE XXX.—The System: NaOH—NaCl—H_2O.

Temperature: 35° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	26·6	73·4	—	—	—
	14·6	14·6	70·8	1·4	91·8	6·8
	28·4	5·8	65·8	6·7	77·9	15·4
	41·9	1·7	56·4	6·5	84·4	9·1
	51·2	1·1	47·7	14·7	71·5	13·8
$NaOH.1H_2O$	55·4	—	44·6	—	—	—

TABLE XXXI.—The System: NaOH—NaCl—H_2O.

Temperature: 45° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	26·7	73·3	—	—	—
	14·0	15·2	70·8	1·3	92·0	6·7
	28·7	5·9	65·4	4·0	87·4	8·6
	41·6	2·0	56·4	5·0	88·0	7·0
	53·9	1·3	44·8	9·5	82·6	7·9
$NaOH.1H_2O$	57·8	—	42·2	—	—	—

TABLE XXXII.—The System: NaOH—NaCl—H_2O.

Temperature: 60° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	NaOH	NaCl	H_2O	NaOH	NaCl	H_2O
NaCl	—	27·0	73·0	—	—	—
	15·8	14·2	70·0	1·4	92·5	6·1
	28·3	6·6	65·1	3·5	88·3	8·2
	41·3	2·5	56·2	6·6	84·2	9·2
	52·5	1·7	45·8	10·6	79·7	9·7
$NaOH.1H_2O$	63·5	—	36·5	—	—	—

TABLE XXXIII.—The System: $NaHCO_3$—NaCl—H_2O.

Temperature: 0° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	6·5	—	93·5	—	—	—
	2·7	8·8	88·5	92·2	1·1	6·7
	1·1	19·8	79·1	87·3	2·6	10·1
$NaHCO_3$ + NaCl	0·6	25·9	73·5	29·9	59·7	10·4
NaCl	—	26·3	73·7	—	—	—

TABLE XXXIV.—The System : $NaHCO_3$—NaCl—H_2O.

Temperature : 15° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	8·1	—	91·9	—	—	—
	3·8	8·6	87·6	86·7	1·2	12·1
	2·0	16·4	81·6	82·6	2·9	14·5
$NaHCO_3$ + NaCl	0·9	26·1	73·0	52·1	36·2	11·7
NaCl	—	26·3	73·7	—	—	—

TABLE XXXV.—The System : $NaHCO_3$—NaCl—H_2O.

Temperature : 20° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	8·7	—	91·3	—	—	—
	4·2	8·5	87·3	88·4	0·8	10·8
	1·7	19·5	78·8	—	—	—
$NaHCO_3$ + NaCl	1·0	26·1	72·9	53·9	36·3	9·8
NaCl	—	26·4	73·6	—	—	—

TABLE XXXVI.—The System: $NaHCO_3$—NaCl—H_2O.

Temperature: 25° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	9·3	—	90·7	—	—	—
	3·2	12·7	84·1	85·0	2·0	13·0
	1·8	19·7	78·5	88·4	2·2	9·4
$NaHCO_3$ + NaCl	1·2	26·0	72·8	57·3	35·2	7·5
NaCl	—	26·4	73·6	—	—	—

TABLE XXXVII.—The System: $NaHCO_3$—NaCl—H_2O.

Temperature: 30° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	9·9	—	90·1	—	—	—
	4·9	8·8	86·3	89·9	0·9	9·2
	1·9	19·5	78·6	88·0	2·4	9·6
$NaHCO_3$ + NaCl	1·2	26·1	72·7	53·5	39·5	7·0
NaCl	—	26·5	73·5	—	—	—

TABLE XXXVIII.—The System: $NaHCO_3$—NaCl—H_2O.

Temperature: 35° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	10·6	—	89·4	—	—	—
	4·7	10·3	85·0	91·9	1·0	7·1
	2·1	19·6	78·3	72·5	5·5	22·0
$NaHCO_3$ + NaCl	1·3	26·2	72·5	53·1	42·2	4·7
NaCl	—	26·6	73·4	—	—	—

TABLE XXXIX.—The System: $NaHCO_3$—NaCl—H_2O.

Temperature: 45° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	12·0	—	88·0	—	—	—
	5·8	10·5	83·7	89·5	1·2	9·3
	2·7	19·2	78·1	—	—	—
$NaHCO_3$ + NaCl	1·5	26·2	72·3	58·1	34·1	7·5
NaCl	—	26·7	73·3	—	—	—

TABLE XL.—The System: $NaHCO_3$—NaCl—H_2O.

Temperature: 60° C.

Solid phase.	Composition of solution. Grammes per 100 gr.			Composition of rest. Grammes per 100 gr.		
	$NaHCO_3$	NaCl	H_2O	$NaHCO_3$	NaCl	H_2O
$NaHCO_3$	14·1	—	85·9	—	—	—
	7·4	10·0	82·6	66·8	3·6	29·6
	3·7	19·1	77·2	68·6	6·3	25·1
$NaHCO_3$ + NaCl	2·2	26·4	71·4	52·0	28·1	19·9
NaCl	—	27·0	73·0	—	—	—

TABLE XLI.—The System: Na_2CO_3—NaOH—NaCl—H_2O.

Temperature: 0° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.10H_2O$ + NaCl	2·4	8·4	17·3	71·9	25·1	1·2	20·4	53·3
	2·4	14·3	12·7	70·6	21·9	3·0	25·1	50·0
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$ + NaCl	2·8	16·0	11·2	70·0	21·4	4·5	25·7	48·4
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$	2·9	20·5	4·2	72·4	31·8	3·4	0·7	64·1
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$ + NaCl	2·9	19·9	8·5	68·7	25·7	5·9	36·4	32·0
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$	3·4	22·1	4·2	70·3	35·6	6·6	1·2	56·6
$Na_2CO_3.1H_2O$ + NaCl	2·2	23·1	6·9	67·8	40·0	7·6	20·9	31·5
	1·9	24·0	6·5	67·6	25·3	9·3	34·6	30·8
	1·2	25·8	5·6	67·4	57·1	4·0	16·5	22·4
	0·6	29·2	4·3	65·9	39·3	9·5	20·9	30·3

TABLE XLII.—The System: Na_2CO_3—NaOH—NaCl—H_2O.

Temperature: 15° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.10Aq$ + NaCl . .	9·2	1·5	19·4	69·9	26·9	0·1	22·3	50·7
	8·4	5·8	16·2	69·6	—	—	—	—
$Na_2CO_3.10Aq$ + $Na_2CO_3.7Aq$ + NaCl	8·7	7·2	14·9	69·2	35·2	0·1	16·2	48·5
$Na_2CO_3.10Aq$ + $Na_2CO_3.7Aq$	7·9	10·4	10·5	71·2	36·1	1·8	2·2	59·9
	8·7	15·6	2·6	73·1	41·0	1·4	0·3	57·3
$Na_2CO_3.7Aq$ + NaCl . .	7·5	10·6	12·7	69·2	31·6	0·8	20·8	46·8
$Na_2CO_3.7Aq$ + $Na_2CO_3.1Aq$ + NaCl	7·2	12·5	11·7	68·6	41·4	2·5	19·3	36·8
$Na_2CO_3.7Aq$ + $Na_2CO_3.1Aq$	8·2	13·6	9·6	68·6	35·2	5·9	2·9	56·0
	7·9	17·7	3·1	71·3	64·3	4·3	0·9	30·5
$Na_2CO_3.1Aq$ + NaCl . .	1·9	23·1	7·4	67·6	37·3	9·7	19·6	33·4
	0·2	46·2	0·9	52·7	27·5	14·3	36·6	21·6

TABLE XLIII.—The System: Na_2CO_3—NaOH—NaCl—H_2O.

Temperature: 20° C.

Solid phase:	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$ + NaCl	12·8	1·7	16·9	68·6	37·3	0·1	12·8	49·8
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$	11·6	9·5	6·9	72·0	33·2	3·6	2·5	60·7
	11·8	12·8	1·5	73·9	39·3	0·5	0·3	59·9
$Na_2CO_3.7H_2O$ + NaCl	12·0	3·6	15·9	68·5	31·8	1·2	14·0	53·0
	9·6	8·5	13·4	68·5	28·7	2·5	19·5	49·3
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$ + NaCl	9·6	9·7	12·4	68·3	28·4	1·3	44·1	26·2
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$	10·1	12·4	7·5	70·0	40·0	4·6	2·4	53·0
	10·6	15·5	1·9	72·0	39·5	5·7	0·6	54·2
$Na_2CO_3.1H_2O$ + NaCl	7·0	12·3	11·9	68·8	—	—	—	—
	1·2	25·1	6·6	67·1	39·3	8·8	20·7	31·2
	1·7	46·7	0·9	50·7	20·2	29·2	14·3	36·3

TABLE XLIV.—The System : Na_2CO_3—NaOH—NaCl—H_2O.

Temperature : 25° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$	18·1	1·7	8·6	71·6	37·1	0·3	2·0	60·6
	18·3	6·3	3·3	72·1	33·4	1·2	0·7	64·7
$Na_2CO_3.7H_2O$ + NaCl . .	15·9	1·7	15·0	67·4	33·7	0·3	11·0	55·0
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$	14·9	8·6	6·4	70·1	42·2	3·9	3·0	50·9
	15·2	11·0	3·2	70·6	33·5	4·5	1·4	60·7
$Na_2CO_3.7H_2O$+ $Na_2CO_3.1H_2O$ + NaCl	13·5	4·4	14·1	68·0	50·8	1·8	11·5	35·9
$Na_2CO_3.1H_2O$ + NaCl . .	9·1	8·9	13·5	68·5	58·5	2·3	12·0	27·2
	3·1	18·5	9·9	68·5	47·0	5·0	17·2	29·9
	0·3	41·5	1·5	56·7	31·8	16·3	24·3	27·6
	0·3	44·0	1·3	54·4	32·2	15·9	26·5	25·4
$Na_2CO_3.1H_2O$ + Na_2CO_3 + NaCl	0·5	45·7	1·1	52·7	28·6	19·4	25·3	26·7
Na_2CO_3 + NaCl	0·2	49·9	1·0	48·9	15·2	31·1	21·8	31·9

TABLE XLV.—The System: Na_2CO_3—NaOH—NaCl—H_2O.

Temperature: 30° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$	26·7	2·2	1·2	69·9	39·3	0·6	0·4	59·7
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$	23·1	1·5	7·6	67·8	53·2	0·4	1·8	44·6
	22·4	5·2	2·9	69·5	59·0	0·8	0·8	39·4
$Na_2CO_3.1H_2O$ + NaCl . .	6·0	12·4	12·5	69·1	36·1	3·5	35·7	24·7
	0·2	34·6	3·0	62·2	27·7	10·1	37·6	24·6
$Na_2CO_3.1H_2O$ + Na_2CO_3 + NaCl	0·2	41·8	1·5	56·5	23·6	20·6	27·0	28·8
Na_2CO_3 + NaCl	0·2	51·3	1·0	47·5	11·1	26·7	37·2	25·0

TABLE XLVI.—The System: Na_2CO_3—NaOH—NaCl—H_2O.

Temperature: 35° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.1H_2O$ + NaCl . .	11·0	5·4	15·3	68·3	56·6	—	24·7	18·7
	4·6	14·7	11·8	68·9	48·9	1·7	30·0	19·4
	1·4	24·9	7·0	66·7	42·1	4·4	34·0	19·5
$Na_2CO_3.1H_2O$ + Na_2CO_3 + NaCl	0·3	40·8	1·8	57·1	42·4	14·6	19·6	23·4
Na_2CO_3 + NaCl	1·0	49·0	1·2	48·8	13·5	37·2	12·2	37·1

TABLE XLVII.—The System: Na_2CO_3—NaOH—NaCl—H_2O.

Temperature: 45° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.1H_2O$ + NaCl . .	9·2	6·1	16·0	68·7	49·1	1·0	28·6	21·3
	2·9	18·1	10·8	68·2	50·1	4·4	17·8	27·7
	0·4	33·4	3·8	62·4	43·6	8·6	23·8	24·0
$Na_2CO_3.1H_2O$ + Na_2CO_3 + NaCl	0·3	37·2	2·7	59·8	32·8	16·8	22·1	28·3
Na_2CO_3 + NaCl	0·3	38·8	2·4	58·5	17·8	19·6	33·3	29·3
	0·2	40·9	2·1	56·8	30·6	20·4	20·3	28·7
	0·5	54·1	1·3	44·1	21·4	28·4	26·6	23·6

TABLE XLVIII.—The System: Na_2CO_3—NaOH—NaCl—H_2O.

Temperature: 60° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	NaOH	NaCl	H_2O	Na_2CO_3	NaOH	NaCl	H_2O
$Na_2CO_3.1H_2O$ + NaCl . .	5·8	9·4	15·8	69·0	34·9	3·0	36·5	25·6
	2·6	18·1	11·3	68·0	35·5	5·5	31·1	27·9
	1·7	22·3	8·4	67·6	37·1	6·7	30·0	26·2
$Na_2CO_3.1H_2O$ + Na_2CO_3 + NaCl	0·5	33·2	4·3	62·0	38·8	12·5	21·5	27·2
Na_2CO_3 + NaCl	0·2	52·6	1·7	45·5	18·3	27·6	30·0	24·1

TABLE XLIX.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 0° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.10H_2O + NaHCO_3$	3·78	3·51	4·81	87·90	24·85	24·68	0·35	50·12
	2·89	2·83	9·53	84·75	25·35	22·65	0·82	51·18
	2·39	2·14	15·14	80·33	20·99	29·87	1·76	47·38
	2·63	0·92	21·32	75·13	23·09	25·94	2·66	48·31
$Na_2CO_3.10H_2O$ + $NaHCO_3$ + Sesqui	2·77	1·11	22·84	73·28	34·54	8·79	2·48	54·19
$Na_2CO_3.10H_2O$ + Sesqui + NaCl	2·99	0·73	23·86	72·42	28·92	7·33	17·68	46·07
$NaHCO_3$ + Sesqui + NaCl	2·72	0·96	23·88	72·44	5·47	54·24	21·70	18·59
	2·77	0·92	23·86	72·45	27·96	24·83	17·10	30·11
$NaHCO_3$ + NaCl . . .	1·30	0·73	25·05	72·92	1·34	50·58	24·29	23·79

TABLE L.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 15° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.10H_2O$ + $NaHCO_3$	11·42	4·05	3·06	81·47	24·56	20·74	0·62	54·08
	9·62	2·33	7·71	80·34	3·28	76·06	1·65	19·01
$Na_2CO_3.10H_2O$ + $NaHCO_3$ + $Na_2CO_3.NaHCO_3.2H_2O$	9·74	1·41	11·19	77·66	29·93	29·76	3·09	37·22
	9·33	2·06	11·58	77·03	26·82	23·95	1·68	47·55
$NaHCO_3$ + $Na_2CO_3.NaHCO_3.2H_2O$	4·80	1·91	18·52	74·77	7·98	60·28	5·77	25·97
$Na_2CO_3.10H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$	8·48	1·38	15·24	74·90	32·29	5·39	3·34	58·98
$Na_2CO_3.10H_2O$ + $Na_2CO_3.NaHCO_3.2H_2O$ + NaCl	9·11	0·19	20·49	70·21	25·88	15·81	33·48	24·83
$Na_2CO_3.NaHCO_3.2H_2O$ + NaCl	6·41	0·08	22·18	71·33	27·57	19·37	32·45	20·61
	4·70	0·31	23·22	71·77	24·80	16·96	36·39	21·85
$Na_2CO_3.NaHCO_3.2H_2O$ + $NaHCO_3$ + NaCl	3·25	0·61	23·93	72·21	12·27	45·04	27·72	14·97

TABLE LI.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 20° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.10H_2O$ + $NaHCO_3$ + Sesqui	16·17	3·40	2·22	78·21	27·55	19·33	0·58	52·54
$Na_2CO_3.10H_2O$ + Sesqui	13·40	2·60	7·90	76·10	34·22	9·86	1·58	54·34
	12·58	1·07	13·97	72·38	35·31	9·51	1·76	53·42
$Na_2CO_3.10H_2O$ + Sesqui + NaCl	13·40	0·61	17·54	68·45	29·43	8·44	18·85	43·28
Sesqui + NaCl	8·48	0·69	20·50	70·33	25·84	20·82	25·57	27·77
	5·35	0·84	22·38	71·43	27·02	20·32	23·85	28·81
$NaHCO_3$ + Sesqui	14·60	3·51	3·87	78·02	30·44	31·40	1·37	36·79
	12·70	3·09	6·03	78·18	32·46	29·45	2·04	36·05
	11·52	2·86	7·64	77·98	12·82	63·95	1·72	21·51
	6·99	2·83	13·43	76·75	13·76	60·55	3·12	22·57
$NaHCO_3$ + Sesqui + NaCl	2·60	1·53	23·74	72·13	13·04	51·76	15·37	19·83

TABLE LII.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 25° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.10H_2O$ + Sesqui .	19·84	1·34	5·01	73·81	34·15	9·47	1·36	55·02
	18·99	0·76	11·09	69·16	35·38	9·51	2·93	52·18
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$ + Sesqui	18·99	0·80	11·38	68·83	40·56	17·88	1·89	39·67
$Na_2CO_3.7H_2O$ + Sesqui .	18·36	0·53	12·84	68·27	39·43	14·33	2·97	43·27
$Na_2CO_3.7H_2O$ + Sesqui + NaCl	17·28	0·34	15·28	67·10	29·40	11·19	23·14	36·27
Sesqui + NaCl	13·28	0·61	17·72	68·39	23·35	18·57	36·75	21·33
	7·28	0·53	21·35	70·84	25·62	20·13	31·81	22·44
$NaHCO_3$ + Sesqui . . .	11·35	2·90	7·57	78·18	14·89	66·81	1·10	17·20
	6·65	1·95	15·04	76·36	16·39	63·49	2·22	17·90
$NaHCO_3$ + Sesqui + NaCl	2·55	1·38	23·97	72·10	12·00	43·17	22·72	22·11

TABLE LIII.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 30° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.10H_2O$ + $Na_2CO_3.7H_2O$ + Sesqui	26·61	0·99	3·65	68·75	39·09	13·26	0·72	46·93
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$ + Sesqui	22·63	0·61	9·88	66·88	40·46	12·68	2·91	43·95
$Na_2CO_3.1H_2O$ + Sesqui + NaCl	17·79	0·53	14·88	66·80	31·93	12·57	28·94	26·56
Sesqui + NaCl	13·20 7·33	0·99 0·96	17·69 21·30	68·12 70·41	23·50 —	17·04 —	31·98 —	27·48 —
$NaHCO_3$ + Sesqui . . .	11·21 6·70	3·32 2·25	7·70 14·96	77·77 76·09	21·67 21·86	52·37 51·07	1·73 3·28	24·23 23·79
$NaHCO_3$ + Sesqui + NaCl	25·3	1·68	24·01	71·78	14·56	47·33	17·86	20·25

TABLE LIV.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 35° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.1H_2O$ + Sesqui .	21·96	0·12	8·30	69·62	32·13	13·10	4·97	49·80
	18·46	0·11	12·08	69·35	33·43	17·27	6·22	43·08
$Na_2CO_3.7H_2O$ + $Na_2CO_3.1H_2O$ + Sesqui	30·27	0·57	1·97	67·19	43·62	23·76	0·59	32·03
$Na_2CO_3.1H_2O$ + Sesqui + NaCl	17·04	0·61	15·52	66·83	41·07	10·77	18·97	29·19
Sesqui + NaCl	13·23	0·57	17·85	68·35	25·31	15·62	36·88	22·19
	7·42	0·61	21·41	70·56	29·72	19·90	23·78	26·60
$NaHCO_3$ + Sesqui . . .	11·57	3·59	7·61	77·23	8·05	62·15	2·50	27·30
	6·72	2·56	14·85	75·87	11·66	60·85	3·59	23·90
	5·52	2·10	16·97	75·41	20·44	49·89	4·29	25·38
$NaHCO_3$ + Sesqui + NaCl	3·25	0·76	23·75	72·24	3·74	61·82	13·72	20·72
	3·01	1·34	23·92	71·73	21·64	26·85	23·11	28·40

TABLE LV.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 45° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.1H_2O$ + Sesqui .	23·35	1·03	7·84	67·78	53·90	8·17	3·04	34·89
	18·97	0·50	12·62	67·91	43·21	6·11	6·74	43·94
$Na_2CO_3.1H_2O$ + Sesqui + NaCl	14·34	0·61	17·40	67·65	43·09	6·80	12·79	37·32
Sesqui + NaCl	9·25	0·15	20·62	69·98	20·87	13·83	33·09	32·21
	6·84	0·50	21·98	70·68	22·85	18·53	24·17	34·45
	6·29	0·76	22·35	70·60	21·55	17·00	25·63	35·82
	4·29	1·11	23·43	71·17	—	—	—	—
$NaHCO_3$ + Sesqui . . .	12·44	5·08	5·38	77·10	20·22	53·86	1·44	24·48
	10·75	3·29	8·91	77·05	9·76	50·27	3·85	36·12
	6·94	2·52	14·70	75·84	10·80	42·59	7·19	39·42
$NaHCO_3$ + Sesqui + NaCl	3·04	1·99	23·91	71·06	8·07	58·25	11·29	22·39

TABLE LVI.—The System: Na_2CO_3—$NaHCO_3$—NaCl—H_2O.

Temperature: 60° C.

Solid phase.	Composition of solution. Grammes per 100 gr.				Composition of rest. Grammes per 100 gr.			
	Na_2CO_3	$NaHCO_3$	NaCl	H_2O	Na_2CO_3	$NaHCO_3$	NaCl	H_2O
$Na_2CO_3.1H_2O$ + Sesqui .	25·59	1·57	4·73	68·11	50·27	11·61	1·90	36·22
	18·87	0·80	11·94	68·39	42·66	16·73	4·91	35·70
$Na_2CO_3.1H_2O$ + Sesqui + NaCl	12·39	0·53	19·13	67·95	36·46	7·14	20·94	35·46
Sesqui + NaCl	10·75	0·73	20·06	68·46	25·40	17·34	25·02	32·24
$NaHCO_3$ + Sesqui . . .	14·00	6·11	3·73	76·16	6·89	65·02	1·26	26·83
	8·99	4·16	11·34	75·51	—	—	—	—
$NaHCO_3$ + Sesqui + NaCl	3·45	1·83	23·88	70·84	15·50	27·43	36·13	20·94
	3·11	2·56	24·37	69·96	13·01	47·98	18·75	20·26

FIXED POINTS.

Temperature, ° C.	
21	$Na_2CO_3.10Aq$ + NaCl + 7Aq + Solution.
26·2	$Na_2CO_3.7Aq$ + NaCl + 1Aq + Solution.
19·7	$Na_2CO_3.10Aq$ + $NaHCO_3$ + S + Solution.
31	$Na_2CO_3.10Aq$ + 7Aq + S + Solution.
34·5	Na_2CO_3. 7Aq + 1Aq + S + Solution.