FACTORY GLAZES

FOR CERAMIC ENGINEERS

SECTION A

LEADLESS SANITARY GLAZES

PRACTICALLY SIMPLE AND CHEAP

FACTORY GLAZES

FOR CERAMIC ENGINEERS

ARRANGED (ON AN EXHAUSTIVE METHOD) FOR THE HEAT OF THE SOFT PORCELAIN KILN

AND INCLUDING

The Glazes employed in Actual Manufactory by the foremost manufacturers of the finest products, with Improvements thereon and additions thereto, resulting from twenty years of research and commercially possible, and never before put into writing

A. OF THE SERIES

LEADLESS SANITARY GLAZES

FOR HARD WEATHERPROOF GLAZED BRICK AND STONE FACTORY; FOR PORCELAIN ENAMELLED FIRECLAY SANITARY WARE FACTORY; FOR SOFT PORCELAIN FACTORY; FOR STRONG CLAYWARE FACTORY

BY Henry Albert Rum Bellow

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CONTENTS.

FACTORY GLAZES.

KEY

A = Carlsbad Felspar
(*Spar*)

E = Cornwall Stone
(*Soft Stone*—on no account use any adulterated with free Soda, or a salt of Soda)

B = Best White China Clay
(*The Strong Siliceous C.C.*)

C = Best Paris White
(*Whiting*)

D = Best Ground Flour of Silica
(*Pure Flint, or Diatom Earth, or Lynn Sand*)

F = Carbonate of Baryta
(NOT *Barytes*)

G = Pure Oxide of Zinc
(NOT *the Carbonate*—If mixed with Carbonate of Zinc, the supposed oxide must be employed in greater quantity and the glaze mellowed longer after it is mixed before using it)

UCTORY NOTE.

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In fact this book is especially designed for the use of such men.

He who realises, apprehends, and applies the grounds covered ; or learns what may be acquired by giving the charts and notes his careful thought and earnest study will be rewarded—expert though he be—by both what they give and what they suggest.

The conciseness of the whole is noteworthy.

FACTORY GLAZES.

INTRODUCTORY NOTE.

THESE glazes are for use, by the practical man, in actual factory ; or for pioneer work co-ordinated with factory for market.

For that reason, the less they are obscured, or thrown into perspective, by explanations and comments, the more they will serve their purpose in the workman's hand. And the aim of the method, herein outlined, is to proceed without any explanatory matter except such as is absolutely necessary. All else muddles the workman and delays, the getting of results.

Why the admixtures—each of which ultimately fuses into a glaze—are arranged in charts on the squares of a chessboard, will appear in the "Definition of the Charts" and at all points.

They represent, in the concisest form possible, twenty years of enthusiastic scientific research by the Author in the synthetic and elective affinities of the earths and the most recent practical applications of the complex but constant laws so learned in the shops and in the yards of the foremost factories in actual manufactory for to-day's markets ; adding to and confirming the physical and chemical work of the laboratory.

The glazes used by the best manufacturers are herein contained in their correctest and most perfect forms. Some better than those in actual use are given and indicated, and can be compounded by any workman of intelligence even if he know nothing of science.

In fact this book is especially designed for the use of such men.

He who realises, apprehends, and applies the grounds covered ; or learns what may be acquired by giving the charts and notes his careful thought and earnest study will be rewarded—expert though he be—by both what they give and what they suggest.

The conciseness of the whole is noteworthy.

will probably mean that your clay shrinkage will as often be altered with them. Consequently you will only complicate your initial difficulties more and more and create others *ad infinitum.*

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3. Now, having realised—probably at great cost and tardily so—that the works and the factory conditions and the natural claybed cannot be spirited into agreement with an ewe lamb, still somebody has such a glaze which he should know how to modify into agreement with the claybed, and the factory conditions, and the works.

And because he does not know how and therefore fails to do this, all sorts of things are wrong with the clay, or something else, or everything else except the ewe lamb.

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4. Stick to your guns!—your clays, I mean—and your other materials, and keep your fixed quantities intact! And if the finishing heat of the fired products in your kilns is to be approximately that of the soft porcelain kiln, or a bit lower than that, use these charts as they are meant to be used—with a systematic, methodical, and exhaustive thoroughness!

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5. If you already manufacture such products, and already possess such a glaze as you should, of proved fitness, you will find the proportions of your own glaze somewhere on one of the charts in the same, or cheaper, materials in the plain quantities and figures as weighed up in the mixing-house (or in some multiple or sub-multiple of the same). Or it may be one obviously indicated as having its proper place between, as the mean of, two or three others so expressed in their proper places in the scale. Or it may be one which is not correctly enough, or exactly enough, compounded to have its place there.

But there will, in any case, be some modification or correct form of it expressed in these correct compositions, or the scale places between each, in relation to other similar and better compositions of its own type and other types.

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6. Suppose that the shrinkage of your wares be the "normal" shrinkage—that is, the amount of ordinary contraction, say, of a Leeds fireclay, or other strong clay, or composition paste, of a good type, during its cooling off, and especially below the point of rigid solidification of the glaze, after both have been fired to the heat of the finishing kiln and left to gradually cool off above this point and below it.

In that case you will start by weighing up as customarily and properly preparing as usual, and using in the ordinary way a composition (or compositions) or admixture (of the materials commonly employed) whose types converge towards the E. and S. and S.E. of the charts.

See Chart N and Notes to Chart N, etc.

7. Should your own, or some other glaze which you know, possess some characteristic qualities which you wish retained and intensified (or lessened), you will choose a composition of the type which most nearly corresponds to it (as to the materials employed and the relative quantities thereof in its composition) and make that your starting point.

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8. If, during the course of your investigations, you wish to intensify or eliminate or introduce some particular characteristic, you will note in which line of direction of the squares that quality diminishes or increases, disappears or becomes apparent. You will work along that horizontal, or vertical, or diagonal direction, N. or S. or E. or W. or N.W. or N.E. or S.W. or S.E., as far as other considerations weighing with you, or imposed upon you by conditions which modify your desired result, will allow you to go in that direction.

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9. After you have fired and cooled off your products, under the usual conditions of factory for market, or as nearly these as it is possible or economical for you to employ for your test purposes, or your experiments or your pioneer work, you cannot too carefully examine or too critically estimate your results.

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10. If now your glaze, in respect of the characteristic quality—say, its co-efficient (contraction)—differ but slightly from what you wish to obtain, take a composition towards, say, the top of the same column of squares only a square or two further up!

If it differ considerably, move several squares up, and, if necessary, move into another chart: See notes to charts and the charts! Or it may be that your results indicate that you must move in the opposite direction.

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11. When you have located your line of direction, you will soon get what you want and be satisfied with it; if you follow up, in the direction indicated, with the compositions in the squares along that line of direction.

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12. To impart other desired characteristics such as brilliancy or deadness, transparency, clearness, opalescence, semi-opaqueness, density, elasticity, toughness, covering power, appearance, texture, shade, size, adherence, and a hundred others; you may then be disposed to follow up the various lines of directions on the various charts with certain success in the shortest time and on the shortest road thereto.

MEMORANDA TO BE NOTED:

COMMON TO ALL THE CHARTS.

1. Each of these squares represents an *admixture* of the materials named.

These earths, previously ground to fine flour, are to be employed in the *ratio* of the (charges or) quantities indicated by the *weights* expressed of *dry* materials. They are to be *intimately* mixed and blunged, or milled, and sieved; or otherwise *properly* prepared for use in the usual way.

2. Each admixture selects the *cheapest* and *simplest* materials possible for use in *factory* conditions and *commercial* economics; each produces an *ultimate* convolution (glaze) of *correct* combination (physically and chemically): that is to say, each has its "electrons" in a state of *exact* balance or equilibrium.

This will result as a consequence of soaking the intimate admixture (on the dipped or brushed wares) in heat (energies) of sufficient intensity to fuse it.

The product, after fusion, will be a convolution (glaze) of *uniform* nature throughout; having exactly poised affinities and no free (uncombined) elemental anions or kations in its composition: all such electrons having established a perfect equilibrium (combine) amongst themselves during the firing and cooling off in the kiln.

Only such products can properly resist the atmospheric conditions, corroding influences, and disintegrating forces which are ceaselessly acting upon them. And such do not lose their beauty, or rot off the clay, or absorb filth. Compositions (glazes) which are *not* so *correctly* and *exactly* balanced, when compounding them, fail as glazes on the finished products with obvious disaster; as may be seen in evidence in any factory and wheresoever such have been *in situ* or used for any time: see urinals, closets, bricks, pottery tiles, etc., etc., everywhere staring you in the face—unsightly, dirty, foul, rotten, insanitary, soaked with filth and germs, discoloured and stained.

3. Such characteristic qualities as transparency or semi-opaqueness; brilliant or matte or dead glaze; opalescence; density; tone; crazing; straining; shelling; stunting; lifting; rupture; blebbing; elasticity; peppering; crawling; shivering; and the numerous others of finished

glazes: and such factory troubles as covering capacity, crowfooting, rupture, shelling, lifting, shivering, etc., in shop or kiln: and the problems of factory before or during or after the burning of the wares; having their near or remote origin in the specific volume or the co-efficient of expansion of the materials or ultimate compositions thereof employed and fired: and the many phenomena of disagreement, or otherwise, between the clay-wares and the glaze, may, *each in its turn,* be increased, or diminished, intensified, or lessened, introduced or eliminated by moving along the several "lines of direction" of the squares, e.g. the diagonal direction of N.W. to S.E., or S.E. to N.W., or horizontally from W. to E., or E. to W., or vertically from N. to S. or S. to N., and from the square of one chart to the corresponding square of another. (See note on the "Definition of the Charts" and note on "How to Use the Charts"!)

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4. All the glazes on these seven Charts have a common finishing heat, which is that of the soft porcelain kiln.

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5. The substitution of F. material for its equivalent (*in flux power*) of C. material makes any glaze *smaller* (contract *more* in the cooling-off kiln).

The substitution of G. material for its equivalent (*in flux power*) of F. + C. materials makes any glaze *bigger* (contract *less* in the cooling off kiln).

For Examples of glazes so modified see Charts BA, BZ, and CZ.

6.
7.
8.
9. } Read carefully Sections from 1 *to* 9 inclusive of the "Notes on the Construction of your Glaze," pages 8 and 9.

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10. See pages following above.

NOTE

(THAT)

THE CONSTRUCTION OF YOUR GLAZE

(HAS)

ITS SCIENCE AND A METHOD.

These, translated into plain factory use in these charts and notes, may (as to their chief points) be briefly summarised * as follows :—

1. The "*kat-an*" is the backbone of every glaze process, and of its method, and of the *resultant*—the glaze.

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2. Let the symbol "*n*" represent the *number* of "*charges*" of the "*kat.-an.*" put into the glaze mill !

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3. In actual factory work the "*charge*" † is best regarded as being (or being contained in) a given *weight* of a given material.

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4. The *cooling-off* shrinkage and the other distinctive *qualities* and *characteristics* of your finished glaze will all be modified more or less by the *proportions* which its "*kat.-an*" *charges* bear to the "*an.*" charges of its *refractory acid* constituents and to the "*kat.*" charges of its *basic fluxing* constituents.

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5. These proportions for *ultimate glazes* finishing in the heat of the soft porcelain kiln may be concisely expressed and represented by the *empirical ratio* of—

$$13n. \;:\; n. \;:\; 6n.$$

or $11\frac{1}{2}n. \;:\; n. \;:\; 5\frac{1}{2}n.$

or $10n. \;:\; n. \;:\; 5n.$

or $8\frac{1}{2}n. \;:\; n. \;:\; 4\frac{1}{2}n.$, etc.

These *empirics* represent *ratios* between the constituent "*charges*" of *admixtures* which are of *like fusibility* but *form glazes* which are *not* of *like coefficient of expansion* (shrinkage

* The reader who wishes to further pursue the purely theoretical study of glaze-building is referred to other works by the same author, shortly to be published, entitled, "Empirics for the Ceramic Engineer," etc.

† Although loading the mill is commonly spoken of as charging it, the "charge" here meant is that of the *electrical energy* (stored or latent in the materials always employed) which takes, in the fired glaze, the form of *flux power* or *refractory power*, etc.

in the cooling-off kiln) *and* which *differ also* as to some of their *distinctive qualities* and *characteristics.*

---

6. The *ultimate glazes* formed may be *empirically* expressed as *convolutions* of *elemental charges* having these charges convoluted but grouped as—

$13\,n\,(an.)\,.\,n\,(kat.\text{-}an.)\,.\,6\,n\,(kat.)$.

or $11\frac{1}{2}\,n\,(an.)\,.\,n\,(kat.\text{-}an.)\,.\,5\frac{1}{2}\,n\,(kat.)$.

or $10\,n\,(an.)\,.\,n\,(kat.\text{-}an.)\,.\,5\,n\,(kat.)$.

or $8\frac{1}{2}\,n\,(an\,)\,.\,n\,(kat.\text{-}an.)\,.\,4\frac{1}{2}\,n\,(kat.)$. etc.

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7. Now, to mix, for factory use, an ultimate glaze which shall contain 20 "kat.-an." charges,

if n represent 20,

	$13\,n\,(an.)$.	$n\,(kat.\text{-}an.)$.	$6\,n\,(kat.)$.
represents	260 an. .	20 kat.-an .	120 kat.
and	$11\frac{1}{2}\,n\,(an.)$.	$n\,(kat.\text{-}an.)$.	$5\frac{1}{2}\,n\,(kat.)$.
represents	230 an. .	20 kat.-an. .	110 kat.
and	$10\,n\,(an.)$.	$n\,(kat.\text{-}an.)$.	$5\,n\,(kat.)$.
represents	200 an. .	20 kat.-an. .	100 kat.
and	$8\frac{1}{2}\,n\,(an.)$.	$n\,(kat.\text{-}an.)$.	$4\frac{1}{2}\,n\,(kat.)$.
represents	170 an. .	20 kat.-an. .	90 kat.

and so on.

Say that you decide to mix the first convolution. Then your ultimate glaze is to contain—

260 "charges" of its refractory acid energy and 20 "charges" of its "kat.-an" energy, and 120 "charges" of its basic fluxing energy.

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8. The "charge," or "ion," or "electron" of *refractory acid energy*, is represented in these glazes by "*an.*"

In other words, "*an*" represents, relatively and empirically, the *unit* of refractory *power*; or actually a given (constant) *weight*, x, of x matter or material (which contains this unit of refractory power, or a multiple or sub-multiple of it); or *the equivalent* (*in refractory power*) *of* x in whatsoever form contained in any earth (or material) elemental or compound (a convolution) introduced into the glaze composition.

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9. The "charge" or "ion" or "electron" of *basic flux energy* is represented in these glazes by "*kat.*"

In other words, "*kat.*" represents, relatively and empirically, the *unit* of flux *power*; or actually a fixed (constant) *weight*, y, of y matter or material (which contains this unit of flux power, or a multiple or sub-multiple of it); or *the equivalent* (*in basic flux power*) *of* y in whatsoever form contained in any earth (or agent) elemental or compound (a convolution), introduced into the glaze admixture.

9. The "*kat.-an.*" contains both "an." and kat." charges, and its function is sometimes that of the anion, sometimes that of the kation, sometimes (as always in these glazes) that of the combined "*kat.-an.*," which represents, relatively and empirically, its own *unit of power*, viz. the "*resultant*" of these powers; or actually a certain (constant) *weight*, $\frac{xy}{x}$, of material containing this resultant (or a multiple or sub-multiple of it), in whatsoever form introduced into the glaze.

$$y = \frac{5}{3} x \text{ in Ws.}$$

"*resultant*" = 5 *an.* in energy.

---

10. It follows that "ions" or "electrons" are to the practical workman "*charges*" or "*weights*" (= pounds, or hundredweights, or grammes and so on) of *flux* (*energies*) or *refractory* (*energies or*) *material.*

The "ion," "electron," "anion," or "kation" may be regarded by him *as being simply a relative "charge" contained in a given weight* of stone, flint, or other material put into the hopper when charging the blunger or mill.

The total weight of a material used will be a *multiple* or *sub-multiple* of the *sum*, or *difference*, or *total* of the "charge" or "charges" of the *flux kations*, *refractory anions*, etc., which that material contains.

---

11. The *ratio* of the refractory energy (of the combined "an." and "katan" charges) to the resultant of flux energy (of the sum of the "kat.-an." and "kations") is, *in each of these ultimate "convolutions"* (glazes) of any of these seven charts, *the same as it is in each and every glaze represented thereon.* Consequently their melting heat, or flowing heat, or finishing heat is *common to all the compositions*; and that of *each composition is approximately that of every composition.*

That is to say, every admixture fuses at a like kiln heat.

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12. A composition may be read, as, e.g.—

3565 of A	. . .	Bin No.	6
2480 of E	. . .	,,	5
4800 of B	. . .	,,	7
3333 of C	. . .	,,	1
6495 of F	. . .	,,	2
7920 of D	. . .	,,	4

and weighed up in grammes, or in hundredweights, or in any other denominational quantity, or unit of weight.

Or the composition may be read as, e.g.—

356 5 A	or	35 65 A
248 0 E	or	24 80 E
480 0 B	or	48 00 B
333 3 C	or	33 33 C
649 5 F	or	64 95 F
792 0 D	or	79 20 D

and weighed up in hundredweights, or in grammes, or in any other denomination, or unit, of weight.

DEFINITION OF THE CHARTS.

THEIR NATURE AND OBJECT.

a. Each chart has a series of squares on it like a chessboard.

b. Each square contains an exact (admixture or) composition so correctly compounded that, if properly prepared and fired under proper conditions, it will fuse to the most perfect and durable glaze, which it is possible for any inventor to compound, *applicable to its particular place* in its scale.

c. Every composition on the chart differs from every other composition on it. But the *fluxing point* of every composition *is the same one flux point and common to each and every composition.* And every composition will flow into glass at that common flux heat, and generally, *if properly fired on* in a *soaking, slowly gathering, open heat,* should have a face like silk or sunlit water at about + 40° C. *to* + 60° C. *above it*; and a velvety matte, or a less glossed face, if properly *soaked and held* in a heat *a little below, or around, or above the flux heat.*

d. The arrangement of the compositions on the squares *is such that, if you proceed from a given square in any direct line of direction along the squares,* some characteristic *quality,* or *function,* or *appearance* common to the greater number of the compositions is *diminished* or *increased* in degree or intensity *by graduated steps,* as you substitute *composition for composition.*

e. Suppose, for example, that you are *troubled by the difficulties of factory,* caused by what is *scientifically called the co-efficient of expansion.* Your object is to put the *contraction of the glaze into proper agreement with the shrinkage of the glazed clay-wares while both are cooling off in the "finished" kiln, especially below the setting point of the glaze.* Moving from E. to W., or from W. to E., or diagonally N.W. to S.E., or S.E. to N.W. across or along any and every *line of direction* of the squares, the glazes on the squares are *a shade bigger* in the one direction—the *co-efficient of expansion becomes less, and therefore the glaze shrinks less.* But if you move along the opposite line of direction, you will find them conversely as *constant square by square and as gradually so.*

f. The other difficulties of factory and characteristics of quality or appearance can be worked out in the same simple and automatically sure way, step by step; while the interest in your work and the revelation of it, the thought and reasoning awakened and put in motion, and the pleasure in it all so created, will become absorbingly recreative as well as remunerative.

g. The materials used may be the "Commercial" materials as commonly supplied in a finely ground state by the potters' merchants and generally used by manufacturers. They must be weighed up in a perfectly dry condition. The china clays, stones, spars, etc., supplied by the various merchants and even by the same merchant are not in all cases identical. A letter to the Author, c/o the Publishers, will ascertain the most desirable consignment of each to order from the merchant dealt with.

MEMORANDA TO BE NOTED:

PARTICULAR TO CHART BA.

1. Each of these ultimate glazes (convolutions) represented in these squares of Chart BA may be empirically expressed by

$$13\,n\,(an.)\;.\;n\,(kat.\text{-}an.)\;.\;6\,n\,(kat.).$$

2. The ratio of the "kat.-an." to the "an." in each glaze (convolution) of Chart BA is the same as it is in the glazes of Chart A. But the introduction of the ions contained in F amongst the kations, displacing their own equivalent of the C flux energies, make any glaze of Chart BA smaller than the glaze which is represented in the corresponding square of Chart A. That is to say, the ions of F increase the "co-efficient of expansion." In other words, a glaze which contains such "ions" (or which contains an earth or material containing such "ions") contracts more in the cooling off than a glaze of equal fusibility which does not contain such "electrons" (introduced into the composition of the glaze by an earth which contains them).

3. For glazes having a "normal" co-efficient of expansion, *see* Chart N.

4. Any of these ultimate glazes (convolutions) of Chart BA may be softened--that is to say, the flux point may be lowered to a less kiln heat by reducing the quantity of D material used:—

12 00 **Ws** less of D softens the glaze 10° C.
24 00 **Ws** less of D softens the glaze 20° C.
36 00 **Ws** less of D softens the glaze 30° C.
48 00 **Ws** less of D softens the glaze 50° C.
60 00 **Ws** less of D softens the glaze 70° C. (seventy degrees).

This will make the glaze still smaller, and, in other respects, modify its character and behaviour. For fuller directions, *see* Note 3, Chart A. For examples of glazes so modified, *see* page 17.

5. To make these glazes yet smaller, substitute F material (for the C material still remaining). Compare Charts BA and A. For examples of glazes so modified, *see* page 17.

BA

***13 n* (*an.*) . *n* (*kat.-an.*) . *6 n* (*kat.*)**

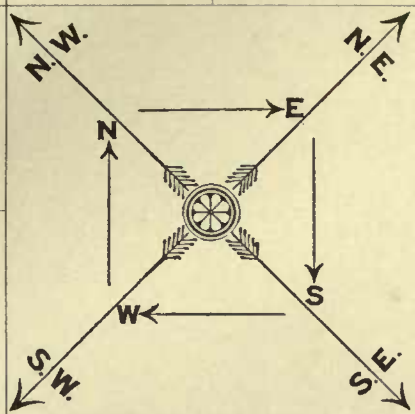
Note especially that—

Any multiple or sub-multiple of any composition, or the mean of any two or three compositions may be taken.

CHAR

Ws* =	91 35 A 0 E 18 00 B 5 33 C 10 50 F 84 00 D	86 90 A 12 40 E 12 00 B 5 33 C 10 50 F 81 60 D	82 45 A 24 80 E 6 00 B 5 33 C 10 50 F 79 20 D	78 00 A 37 20 E 0 B 5 33 C 10 50 F 76 80 D	*Expressed
Ws* =	84 66 A 0 E 24 00 B 9 33 C 18 40 F 84 00 D	80 20 A 12 40 E 18 00 B 9 33 C 18 40 F 81 60 D	75 75 A 24 80 E 12 00 B 9 33 C 18 40 F 79 20 D	71 30 A 37 20 E 6 00 B 9 33 C 18 40 F 76 80 D	66 85 A 49 60 E 0 B 9 33 C 18 40 F 74 40 D
Ws* =	78 00 A 0 E 30 00 B 13 33 C 26 25 F 84 00 D	73 50 A 12 40 E 24 00 B 13 33 C 26 25 F 81 60 D	69 05 A 24 80 E 18 00 B 13 33 C 26 25 F 79 20 D	64 60 A 37 20 E 12 00 B 13 33 C 26 25 F 76 80 D	60 15 A 49 60 E 6 00 B 13 33 C 26 25 F 74 40 D
Ws* =	71 25 A 0 E 36 00 B 17 33 C 34 15 F 84 00 D	66 80 A 12 40 E 30 00 B 17 33 C 34 15 F 81 60 D	62 35 A 24 80 E 24 00 B 17 33 C 34 15 F 79 20 D	57 90 A 37 20 E 18 00 B 17 33 C 34 15 F 76 80 D	53 45 A 49 60 E 12 00 B 17 33 C 34 15 F 74 40 D
Ws* =	64 60 A 0 E 42 00 B 21 33 C 42 00 F 84 00 D	60 15 A 12 40 E 36 00 B 21 33 C 42 00 F 81 60 D	55 70 A 24 80 E 30 00 B 21 33 C 42 00 F 79 20 D	51 25 A 37 20 E 24 00 B 21 33 C 42 00 F 76 80 D	46 80 A 49 60 E 18 00 B 21 33 C 42 00 F 74 40 D
Ws* =	57 90 A 0 E 48 00 B 25 33 C 50 00 F 84 00 D	53 45 A 12 40 E 42 00 B 25 33 C 50 00 F 81 60 D	49 00 A 24 80 E 36 00 B 25 33 C 50 00 F 79 20 D	44 55 A 37 20 E 30 00 B 25 33 C 50 00 F 76 80 D	40 10 A 49 60 E 24 00 B 25 33 C 50 00 F 74 40 D
Ws* =	51 20 A 0 E 54 00 B 29 33 C 57 90 F 84 00 D	46 75 A 12 40 E 48 00 B 29 33 C 57 90 F 81 60 D	42 30 A 24 80 E 42 00 B 29 33 C 57 90 F 79 20 D	37 85 A 37 20 E 36 00 B 29 33 C 57 90 F 76 80 D	33 40 A 49 60 E 30 00 B 29 33 C 57 90 F 74 40 D
Ws* =	44 55 A 0 E 60 00 B 33 33 C 64 95 F 84 00 D	40 10 A 12 40 E 54 00 B 33 33 C 64 95 F 81 60 D	35 65 A 24 80 E 48 00 B 33 33 C 64 95 F 79 20 D	31 20 A 37 20 E 42 00 B 33 33 C 64 95 F 76 80 D	26 75 A 49 60 E 36 00 B 33 33 C 64 95 F 74 40 D
Designation number by which the vertical line of direction of the squares is indicated.	↑ **1** ↓	↑ **2** ↓	↑ **3** ↓	↑ **4** ↓	↑ **5** ↓

* FOOTNOTE.—**Ws** means " weights of " : that is to say, you must weigh up the *whole* composit which you may prefer. (*See*

T	**BA**				Designation number by which the horizontal line of direction of the squares is indicated
's (weights of)	—*see footnote.*				←2→
= **Ws*** (weights of)	A Bin No. E Bin No. B Bin No. C Bin No. F Bin No. D Bin No.				←3→
55 70 A 62 00 E 0 B 13 33 C 26 25 F 72 00 D					←4→
49 00 A 62 00 E 6 00 B 17 33 C 34 15 F 72 00 D	44 55 A 74 40 E 0 B 17 33 C 34 15 F 69 60 D				←5→
42 33 A 62 00 E 12 00 B 21 33 C 42 00 F 72 00 D	37 88 A 74 40 E 6 00 B 21 33 C 42 00 F 69 60 D	33 42 A 86 80 E 0 B 21 33 C 42 00 F 67 20 D			←6→
35 65 A 62 00 E 18 00 B 25 33 C 50 00 F 72 00 D	31 20 A 74 40 E 12 00 B 25 33 C 50 00 F 69 60 D	26 75 A 86 80 E 6 00 B 25 33 C 50 00 F 67 20 D	22 30 A 99 20 E 0 B 25 33 C 50 00 F 64 80 D		←7→
28 95 A 62 00 E 24 00 B 29 33 C 57 90 F 72 00 D	24 50 A 74 40 E 18 00 B 29 33 C 57 90 F 69 60 D	20 05 A 86 80 E 12 00 B 29 33 C 57 90 F 67 20 D	15 60 A 99 20 E 6 00 B 29 33 C 57 90 F 64 80 D	11 15 A 111 60 E 0 B 29 33 C 57 90 F 62 40 D	←8→
22 30 A 62 00 E 30 00 B 33 33 C 64 95 F 72 00 D	17 90 A 74 40 E 24 00 B 33 33 C 64 95 F 69 60 D	13 35 A 86 80 E 18 00 B 33 33 C 64 95 F 67 20 D	8 90 A 99 20 E 12 00 B 33 33 C 64 95 F 64 80 D	4 45 A 111 60 E 6 00 B 33 33 C 64 95 F 62 40 D	0 A 124 00 E 0 B 33 33 C 64 95 F 60 00 D
					←10→
↑6↓	↑7↓	↑8↓	↑9↓	↑10↓	↑11↓

n hundredweights, or in pounds, or in ounces, or in grammes, or in any other unit of weight
12, page 10, and especial note on page 55.)

EXAMPLES TO ILLUSTRATE NOTES 4 & 5
OF THE
MEMORANDA TO CHART BA.

SECTION OF THE CHART.

Column **4** *of the Chart* BA.	*Column* **5** *of the Chart* BA.	*Column* **6** *of the Chart* BA.	*Column* **7** *of the Chart* BA.	*Flux point* **50° C.** *lower and Glaze smaller.*	*Glaze small r still*	Line of direction of the horizontal squares.
78 00 A 37 20 E 0 B 5 33 C 10 50 F 76 80 D				78 00 A 37 20 E 0 B 5 33 C 10 50 F 28 80 D	78 00 A 37 20 E 0 B 0 C 21 00 F 28 80 D	←2→
71 30 A 37 20 E 6 00 B 9 33 C 18 40 F 76 80 D				71 30 A 37 20 E 6 00 B 9 33 C 18 40 F 28 80 D	71 30 A 37 20 E 6 00 B 0 C 36 80 F 28 80 D	←3→
	60 15 A 49 60 E 6 00 B 13 33 C 26 25 F 74 40 D			60 15 A 49 60 E 6 00 B 13 33 C 26 25 F 26 40 D	60 15 A 49 60 E 6 00 B 0 C 52 50 F 26 40 D	←4→
		55 70 A 62 00 E 0 B 13 33 C 26 25 F 72 00 D		55 70 A 62 00 E 0 B 13 33 C 26 25 F 24 00 D	55 70 A 62 00 E 0 B 0 C 52 50 F 24 00 D	←4→
			44 55 A 74 40 E 0 B 17 33 C 34 15 F 69 60 D	44 55 A 74 40 E 0 B 17 33 C 34 15 F 21 60 D	44 55 A 74 40 E 0 B 0 C 68 30 F 21 60 D	←5→
			37 88 A 74 40 E 6 00 B 21 33 C 42 00 F 69 60 D	37 88 A 74 40 E 6 00 B 21 33 C 42 00 F 21 60 D	37 88 A 74 40 E 6 00 B 0 C 84 00 F 21 60 D	←6→

MEMORANDA TO BE NOTED:

PARTICULAR TO CHART A.

1. Each of these admixtures (compositions) of earths (materials) will form, after fluxing, an ultimate "*convolution*" (glaze) which may be *empirically* expressed as

13 n(an.) . n(kat-an.) . 6 n(kat.).

---

2. The *ratio* of the "*kat-an.*" to the "*an.*" in each *ultimate* (glaze) of Chart A is *less* than it is in the glaze which is represented in the *corresponding* square of Chart N.

Therefore the glaze of Chart A is the *smaller* (contracts more in the cooling off).

For glazes of "*normal*" *co-efficient of expansion* (shrinkage in cooling off) at this soft porcelain kiln heat, see Chart N.

---

3. Any of these ultimate *convolutions* (glazes) of Chart A may be *softened*—that is to say, the *flux point* may be lowered to a less kiln heat—by *reducing* the quantity of D used as follows :—

If, when weighing up (the charges of) your materials for the (mixing-house blunger or mill) hopper, you use

12 00 **Ws** less of D	you will *lower*	the *flux point*		by 10° C.	(Ten degrees)
or 24 00 **Ws** less of D	,,	,,	,,	by 20° C.	
or 36 00 **Ws** less of D	,,	,,	,,	by 30° C.	
or 48 00 **Ws** less of D	,,	,,	,,	by 50° C.	
or 60 00 **Ws** less of D	,,	,,	,,	by 70° C.	

But do not forget that these alterations will also *increase* the *co-efficient of expansion* of the resulting glaze—that is to say, will make it *smaller on the finished cooled off* wares.

They will, moreover, *decrease* the *specific volume* (at the same dipping weight) of the *slip-glaze* in the drying off shed : in other words, they may *cure shelling off on the stove* or *set up crowfooting before* setting in kiln or *after*.

For examples of glazes so softened, see page 23.

---

4. For "Normal" glazes see Chart N.

A

***13 n** (**an.**) . **n** (**kat-an.**) . **6 n** (**kat.**)*

Note especially that—

Any multiple or sub-multiple of any composition, or the mean of any two or three compositions may be taken.

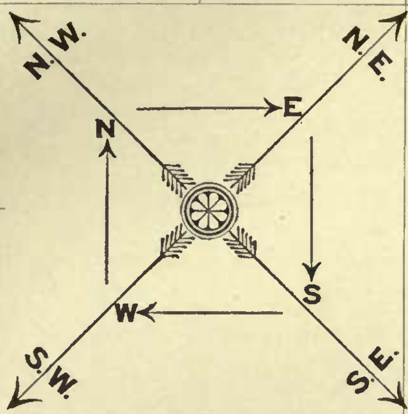
CHA

Ws*= *see footnote*	91 35 A 0 E 18 00 B 10 66 C 84 00 D	86 90 A 12 40 E 12 00 B 10 66 C 81 60 D	82 45 A 24 80 E 6 00 B 10 66 C 79 20 D	78 00 A 37 20 E 0 B 10 66 C 76 80 D	= **Ws*** (weights of) *see footnote*
Ws*=	84 66 A 0 E 24 00 B 18 66 C 84 00 D	80 20 A 12 40 E 18 00 B 18 66 C 81 60 D	75 75 A 24 80 E 12 00 B 18 66 C 79 20 D	71 30 A 37 20 E 6 00 B 18 66 C 76 80 D	66 85 A 49 60 E 0 B 18 66 C 74 40 D
Ws*=	77 95 A 0 E 30 00 B 26 66 C 84 00 D	73 50 A 12 40 E 24 00 B 26 66 C 81 60 D	69 05 A 24 80 E 18 00 B 26 66 C 79 20 D	64 60 A 37 20 E 12 00 B 26 66 C 76 80 D	60 15 A 49 60 E 6 00 B 26 66 C 74 40 D
Ws*=	71 30 A 0 E 36 00 B 34 66 C 84 00 D	66 85 A 12 40 E 30 00 B 34 66 C 81 60 D	62 40 A 24 80 E 24 00 B 34 66 C 79 20 D	57 95 A 37 20 E 18 00 B 34 66 C 76 80 D	53 50 A 49 60 E 12 00 B 34 66 C 74 40 D
Ws*=	64 60 A 0 E 42 00 B 42 66 C 84 00 D	60 15 A 12 40 E 36 00 B 42 66 C 81 60 D	55 70 A 24 80 E 30 00 B 42 66 C 79 20 D	51 25 A 37 20 E 24 00 B 42 66 C 76 80 D	46 80 A 49 60 E 18 00 B 42 66 C 74 40 D
Ws*=	57 90 A 0 E 48 00 B 50 66 C 84 00 D	53 45 A 12 40 E 42 00 B 50 66 C 81 60 D	49 00 A 24 80 E 36 00 B 50 66 C 79 20 D	44 55 A 37 20 E 30 00 B 50 66 C 76 80 D	40 10 A 49 60 E 24 00 B 50 66 C 74 40 D
Ws*=	51 25 A 0 E 54 00 B 58 66 C 84 00 D	46 80 A 12 40 E 48 00 B 58 66 C 81 60 D	42 30 A 24 80 E 42 00 B 58 66 C 79 20 D	37 85 A 37 20 E 36 00 B 58 66 C 76 80 D	33 40 A 49 60 E 30 00 B 58 66 C 74 40 D
Ws*=	44 55 A 0 E 60 00 B 66 66 C 84 00 D	40 10 A 12 40 E 54 00 B 66 66 C 81 60 D	35 65 A 24 80 E 48 00 B 66 66 C 79 20 D	31 20 A 37 20 E 42 00 B 66 66 C 76 80 D	26 75 A 49 60 E 36 00 B 66 66 C 74 40 D
Designation number by which the vertical line of direction of the squares is indicated.	↑ **1** ↓	↑ **2** ↓	↑ **3** ↓	↑ **4** ↓	↑ **5** ↓

* Footnote.—**Ws** means "weights of": that is to say, you must weigh up the *whole* compositi
which you may prefer. (*See* sect. 12

T A

						Designation number by which the horizontal line of direction of the squares is indicated.
Bin No. Bin No. Bin No. Bin No. Bin No.						←2→
						←3→
55 70 A 62 00 E 0 B 26 66 C 72 00 D						←4→
49 00 A 62 00 E 6 00 B 34 66 C 72 00 D	44 55 A 74 40 E 0 B 34 66 C 69 60 D					←5→
42 35 A 62 00 E 12 00 B 42 66 C 72 00 D	37 88 A 74 40 E 6 00 B 42 66 C 69 60 D	33 40 A 86 80 E 0 B 42 66 C 67 20 D				←6→
35 65 A 62 00 E 18 00 B 50 66 C 72 00 D	31 20 A 74 40 E 12 00 B 50 66 C 69 60 D	26 75 A 86 80 E 6 00 B 50 66 C 67 20 D	22 30 A 99 20 E 0 B 50 66 C 64 80 D			←7→
28 95 A 62 00 E 24 00 B 58 66 C 72 00 D	24 50 A 74 40 E 18 00 B 58 66 C 69 60 D	20 05 A 86 80 E 12 00 B 58 66 C 67 20 D	15 60 A 99 20 E 6 00 B 58 66 C 64 80 D	11 15 A 111 60 E 0 B 58 66 C 62 40 D		←8→
22 30 A 62 00 E 30 00 B 66 66 C 72 00 D	17 90 A 74 40 E 24 00 B 66 66 C 69 60 D	13 45 A 86 80 E 18 00 B 66 66 C 67 20 D	8 90 A 99 20 E 12 00 B 66 66 C 64 80 D	4 45 A 111 60 E 6 00 B 66 66 C 62 40 D	0 A 124 00 E 0 B 66 66 C 60 00 D	←9→
						←10→
↑ 6 ↓	↑ 7 ↓	↑ 8 ↓	↑ 9 ↓	↑ 10 ↓	↑ 11 ↓	



hundredweights, or in pounds, or in ounces, or in grammes, or in any other unit of weight
ge 10, and especial note on page 55.)

EXAMPLES TO ILLUSTRATE NOTE 3
OF THE
MEMORANDA TO CHART A.

SECTION OF THE CHART.

		Column **6** *of the Chart* A.	*Column* **7** *of the Chart* A.	*Flux point* **30° C.** *lower.*	*Flux point* **50° C.** *lower.*	← 2 →
						← 3 →
	Ws =	55 70 A 62 00 E 0 B 26 66 C 72 00 D		55 70 A 62 00 E 0 B 26 66 C 36 00 D	55 70 A 62 00 E 0 B 26 66 C 24 00 D	**Line of direction** **← 4 →** **of the horizontal squares.**
	Ws =		44 55 A 74 40 E 0 B 34 66 C 69 60 D	44 55 A 74 40 E 0 B 34 66 C 33 60 D	44 55 A 74 40 E 0 B 34 66 C 21 60 D	**Line of direction** **← 5 →** **of the horizontal squares.**
	Ws =		37 88 A 74 40 E 6 00 B 42 66 C 69 60 D	37 88 A 74 40 E 6 00 B 12 66 C 59 10 F 33 60 D	37 88 A 74 40 E 6 00 B 12 66 C 12 15 G 21 60 D	**Line of direction** **← 6 →** **of the horizontal squares.**
						← 7 →
↑ **4** ↓	↑ **5** ↓	↑ **6** ↓	↑ **7** ↓	↑ **6** **7** **7** ↓	↑ **6** **7** **7** ↓	← 8 →

MEMORANDA TO BE NOTED:

PARTICULAR TO CHART N.

1. Each of the *ultimate* glazes which are represented on the squares of Chart N may be regarded as a *convolution* having the *formula*:—

$$11 \cdot 5\, n(an.)\ n(kat.\text{-}an.).5 \cdot 5\, n(kat.)$$

2. The *ratio* of the "*kat.-an*" to the "*an.*" in each glaze of Chart N is *greater* than it is in the glaze which is represented on the *corresponding square* of Chart A and *smaller* than it is in the *corresponding* glaze of Chart B.

But the glazes are *all* of a *like fusibility*; each having the *sum* of its refractory energies equal to *that* of each of the others *and* the *total* energy of its flux kations *also* equal to *that* of each of the others.

Consequently the N glazes are *greater* than the A glazes but *smaller* than the B glazes.

In other words, the A glaze is *smaller* than the *corresponding* N glaze and the N glaze is *smaller* than the *corresponding* B glaze.

Or, conversely, the B glaze is *greater* than the *corresponding* N glaze and the N glaze is *greater* than the *corresponding* A glaze.

3. Any one of the compositions on the squares of Chart N may have its *flux point lowered*—in other words, may be *softened* so as to finish in a lower kiln heat—by employing *less* of D in it.

18 00 **Ws**	less of D	will soften	the glaze by	15° C.
30 00 **Ws**	,,	,,	,,	35° C.
42 00 **Ws**	,,	,,	,,	55° C.

Examples are given on page 29 to illustrate this note. Compare also the notes and examples on other charts with these!

4. The substitution of F for its *equivalent* (in flux energies) of C makes a glaze *smaller* (contract *more* in the cooling-off kiln).

The substitution of G for its *equivalent* (in flux power) of C or F makes a glaze *bigger* (contract *less* in the cooling-off kiln).

Examples are given on page 29 to illustrate this note. Compare also the notes and examples on other charts with these!

5. A glaze of this Chart N—if common to column 5 or 6 or 7 and to the diagonal of 2 N.W. to 11 S.E. and to line 4 or 5 or 6 or 7 of the horizontal direction of the squares, is of "normal" co-efficient.

See note on "How to use the Charts."

N

11·5 n (***an.***) . ***n*** (***kat-an.***) . ***5·5 n*** (***kat.***)

Note especially that—

Any multiple or sub-multiple of any composition, or the mean of any two or three compositions may be taken.
See especial note, page 55.

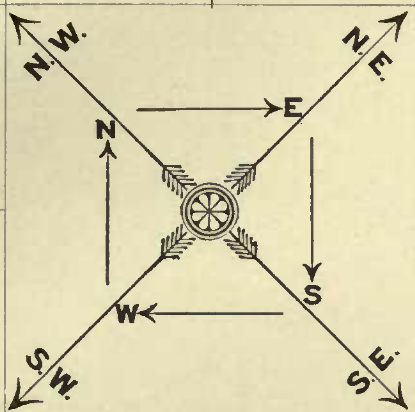
CHA

		2			
Ws* = *see footnote*	84 66 A 0 E 24 00 B 8 66 C 66 00 D	80 20 A 12 40 E 18 00 B 8 66 C 63 60 D	75 75 A 24 80 E 12 00 B 8 66 C 61 20 D	71 30 A 37 20 E 6 00 B 8 66 C 58 80 D	66 85 A 49 60 E 0 B 8 66 C 56 40 D
Ws* =	78 00 A 0 E 30 00 B 16 66 C 66 00 D	73 50 A 12 40 E 24 00 B 16 66 C 63 60 D	69 05 A 24 80 E 18 00 B 16 66 C 61 20 D	64 60 A 37 20 E 12 00 B 16 66 C 58 80 D	60 15 A 49 60 E 6 00 B 16 66 C 56 40 D
Ws* =	71 30 A 0 E 36 00 B 24 66 C 66 00 D	66 85 A 12 40 E 30 00 B 24 66 C 63 60 D	62 40 A 24 80 E 24 00 B 24 66 C 61 20 D	57 95 A 37 20 E 18 00 B 24 66 C 58 80 D	53 50 A 49 60 E 12 00 B 24 66 C 56 40 D
Ws* =	64 60 A 0 E 42 00 B 32 66 C 66 00 D	60 15 A 12 40 E 36 00 B 32 66 C 63 60 D	55 70 A 24 80 E 30 00 B 32 66 C 61 20 D	51 25 A 37 20 E 24 00 B 32 66 C 58 80 D	46 80 A 49 60 E 18 00 B 32 66 C 56 40 D
Ws* =	57 90 A 0 E 48 00 B 40 66 C 66 00 D	53 45 A 12 40 E 42 00 B 40 66 C 63 60 D	49 00 A 24 80 E 36 00 B 40 66 C 61 20 D	44 55 A 37 20 E 30 00 B 40 66 C 58 80 D	40 10 A 49 60 E 24 00 B 40 66 C 56 40 D
Ws* =	51 25 A 0 E 54 00 B 48 66 C 66 00 D	46 80 A 12 40 E 48 00 B 48 66 C 63 60 D	42 30 A 24 80 E 42 00 B 48 66 C 61 20 D	37 85 A 37 20 E 36 00 B 48 66 C 58 80 D	33 40 A 49 60 E 30 00 B 48 66 C 56 40 D
Ws* =	44 55 A 0 E 60 00 B 56 66 C 66 00 D	40 10 A 12 40 E 54 00 B 56 66 C 63 60 D	35 65 A 24 80 E 48 00 B 56 66 C 61 20 D	31 20 A 37 20 E 42 00 B 56 66 C 58 80 D	26 75 A 49 60 E 36 00 B 56 66 C 56 40 D
Designation number by which the vertical line of direction of the squares is indicated.	↑ **1** ↓	↑ **2** ↓	↑ **3** ↓	↑ **4** ↓	↑ **5** ↓

* Footnote.—**Ws** means "weights of": that is to say, you must weigh up the *whole* compo[…] which you may prefer. (*See* sect. 1[…]

T N

	6	7	8	9	10	11
Designation number by which the horizontal line of direction of the squares is indicated.						
2						
3						
4	55 70 A 62 00 E 0 B 16 66 C 54 00 D					
5	49 00 A 62 00 E 6 00 B 24 66 C 54 00 D	44 55 A 74 40 E 0 B 24 66 C 51 60 D				
6	42 35 A 62 00 E 12 00 B 32 66 C 54 00 D	37 88 A 74 40 E 6 00 B 32 66 C 51 60 D	33 40 A 86 80 E 0 B 32 66 C 49 20 D			
7	35 65 A 62 00 E 18 00 B 40 66 C 54 00 D	31 20 A 74 40 E 12 00 B 40 66 C 51 60 D	26 75 A 86 80 E 6 00 B 40 66 C 49 20 D	22 30 A 99 20 E 0 B 40 66 C 46 80 D		
8	28 95 A 62 00 E 24 00 B 48 66 C 54 00 D	24 50 A 74 40 E 18 00 B 48 66 C 51 60 D	20 05 A 86 80 E 12 00 B 48 66 C 49 20 D	15 60 A 99 20 E 6 00 B 48 66 C 46 80 D	11 15 A 111 60 E 0 B 48 66 C 44 40 D	
	22 30 A 62 00 E 30 00 B 56 66 C 54 00 D	17 90 A 74 40 E 24 00 B 56 66 C 51 60 D	13 40 A 86 80 E 18 00 B 56 66 C 49 20 D	8 90 A 99 20 E 12 00 B 56 66 C 46 80 D	4 45 A 111 60 E 6 00 B 56 66 C 44 40 D	0 A 124 00 E 0 B 56 66 C 42 00 D
10						



...n hundredweights, or in pounds, or in ounces, or in grammes, or in any other unit of weight
...e 10, and especial note on page 55.)

EXAMPLES TO ILLUSTRATE NOTES 3 & 4
OF THE
MEMORANDA TO CHART N.

SECTION OF THE CHART.

						← 2 →
To illustrate NOTE 3		*Column* **6** *of the Chart* N.	*Column* **7** *of the Chart* N.	*Flux point* **15° C.** *lower.*	*Flux point* **50° C.** *lower.*	← 3 →
		55 70 A 62 00 E 0 B 16 66 C 54 00 D		55 70 A 62 00 E 0 B 16 66 C 36 00 D	55 70 A 62 00 E 0 B 16 66 C 15 00 D	**Line of direction** ← **4** → **of the horizontal squares**
			44 55 A 74 40 E 0 B 24 66 C 51 60 D	44 55 A 74 40 E 0 B 24 66 C 33 60 D	44 55 A 74 40 E 0 B 24 66 C 12 60 D	**Line of direction** ← **5** → **of the horizontal squares**
			37 88 A 74 40 E 6 00 B 32 66 C 51 60 D	37 88 A 74 40 E 6 00 B 32 66 C 33 60 D	37 88 A 74 40 E 6 00 B 32 66 C 12 60 D	**Line of direction** ← **6** → **of the horizontal squares**
To illustrate NOTE 4		*Column* **6** *of Chart* N **55° C.** *lower*	*Column* **7** *of Chart* A **70° C.** *lower*	*Smaller*	*Larger*	← 3 →
		55 70 A 62 00 E 0 B 16 66 C 12 00 D		55 70 A 62 00 E 0 B 6 66 C 19 70 F 12 00 D	55 70 A 62 00 E 0 B 6 66 C 4 05 G 12 00 D	← 4 →
			44 55 A 74 40 E 0 B 34 66 C 9 60 D	44 55 A 74 40 E 0 B 10 66 C 47 28 F 9 60 D	44 55 A 74 40 E 0 B 10 66 C 9 72 G 9 60 D	← 5 →
			37 88 A 74 40 E 6 00 B 42 66 C 9 60 D	37 88 A 74 40 E 6 00 B 12 66 C 59 10 F 9 60 D	37 88 A 74 40 E 6 00 B 12 66 C 12 15 G 9 60 D	← 6 →

MEMORANDA TO BE NOTED:

PARTICULAR TO CHART B.

1. The glazes which are represented in these squares of Chart B may each be *empirically* expressed as a *convolution* having the *formula*:—

$$10n(an.).n(kat\text{-}an).5n(kat.)$$

2. The *ratio* of the *refractory sum* of the "*an.*" and "*kat-an.*" *charges* to the *total flux energy* of the *kations* is the same in each and every glaze of this Chart B as it is in each and every glaze on all seven charts. Consequently each *fuses* at the *like* kiln heat, which is that of the soft porcelain kiln.

3. But the *ratio* of the "*kat-an.*" to the "*an.*" in each glaze of Chart B is *greater* than it is in the glaze which is represented on the *corresponding* square of Chart N.

Therefore the glaze of Chart B is the *greater* of the two (*contracts less* than its *corresponding* glaze of Chart N in the cooling off kiln).

A glaze of the Chart N—if common to column 5 or 6 or 7 and to the diagonal of 2 N.W. to 11 S.E. and to line 4 or 5 or 6 or 7 of the horizontal direction of the squares, is of "*normal*" co-efficient.

See Note on "How to use the Charts."

4. Any of the ultimate glazes represented on the squares of this Chart B may be made *softer*—that is to say, made to flux, and therefore flow and finish in a lower kiln heat—by using *less* of D in the composition:—

Using 1200 **Ws** less will soften the glaze 20° C.

Using 1800 **Ws** less will soften the glaze 30° C.

Using 3600 **Ws** less will soften the glaze 60° C.

Compare Note 3 to Chart BA, and also Note 3 to Chart N, and also Note 3 to Chart A, with this note *very carefully*!!

B

***10 n* (*an.*) . *n* (*kat-an.*) . *5 n* (*kat.*)**

Note especially that—

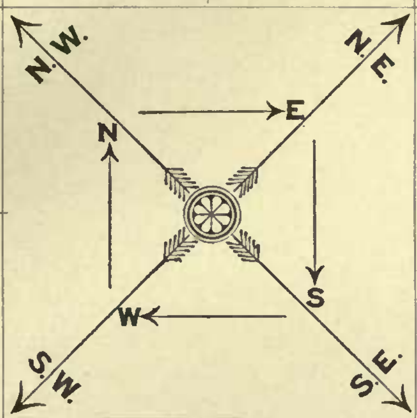
Any multiple or sub-multiple of any composition, or the mean of any two or three compositions may be taken.

CHA

		2			
Ws* =	78 00 A 0 E 30 00 B 6 66 C 48 00 D	73 50 A 12 40 E 24 00 B 6 66 C 45 60 D	69 05 A 24 80 E 18 00 B 6 66 C 43 20 D	64 60 A 37 20 E 12 00 B 6 66 C 40 80 D	60 15 A 49 60 E 6 00 B 6 66 C 38 40 D
Ws* =	71 30 A 0 E 36 00 B 14 66 C 48 00 D	66 85 A 12 40 E 30 00 B 14 66 C 45 60 D	62 40 A 24 80 E 24 00 B 14 66 C 43 20 D	57 95 A 37 20 E 18 00 B 14 66 C 40 80 D	53 50 A 49 60 E 12 00 B 14 66 C 38 40 D
Ws* =	64 60 A 0 E 42 00 B 22 66 C 48 00 D	60 15 A 12 40 E 36 00 B 22 66 C 45 60 D	55 70 A 24 80 E 30 00 B 22 66 C 43 20 D	51 25 A 37 20 E 24 00 B 22 66 C 40 80 D	46 80 A 49 60 E 18 00 B 22 66 C 38 40 D
Ws* =	57 90 A 0 E 48 00 B 30 66 C 48 00 D	53 45 A 12 40 E 42 00 B 30 66 C 45 60 D	49 00 A 24 80 E 36 00 B 30 66 C 43 20 D	44 55 A 37 20 E 30 00 B 30 66 C 40 80 D	40 10 A 49 60 E 24 00 B 30 66 C 38 40 D
Ws* =	51 25 A 0 E 54 00 B 38 66 C 48 00 D	46 78 A 12 40 E 48 00 B 38 66 C 45 60 D	42 30 A 24 80 E 42 00 B 38 66 C 43 20 D	37 85 A 37 20 E 36 00 B 38 66 C 40 80 D	33 40 A 49 60 E 30 00 B 38 66 C 38 40 D
Ws* =	44 55 A 0 E 60 00 B 46 66 C 48 00 D	40 10 A 12 40 E 54 00 B 46 66 C 45 60 D	35 65 A 24 80 E 48 00 B 46 66 C 43 20 D	31 20 A 37 20 E 42 00 B 46 66 C 40 80 D	26 75 A 49 60 E 36 00 B 46 66 C 38 40 D
Designation number by which the vertical line of direction of the squares is indicated.	↑ 1 ↓	↑ 2 ↓	↑ 3 ↓	↑ 4 ↓	↑ 5 ↓

* Footnote.—**Ws** means "weights of": that is to say, you must weigh up the *whole* composit
which you may prefer. (*See* sect. 12.

T B

						Designation number by which the horizontal line of direction of the squares is indicated.
						←2→
						←3→
5 70 A 2 00 E 0 B 6 66 C 6 00 D						←4→
9 00 A 2 00 E 6 00 B 4 66 C 36 00 D	44 55 A 74 40 E 0 B 14 66 C 33 60 D					←5→
2 35 A 2 00 E 12 00 B 2 66 C 36 00 D	37 88 A 74 40 E 6 00 B 22 66 C 33 60 D	33 40 A 86 80 E 0 B 22 66 C 31 20 D				←6→
5 65 A 2 00 E 18 00 B 30 66 C 36 00 D	31 20 A 74 40 E 12 00 B 30 66 C 33 60 D	26 75 A 86 80 E 6 00 B 30 66 C 31 20 D	22 30 A 99 20 E 0 B 30 66 C 28 80 D			←7→
28 95 A 2 00 E 24 00 B 38 66 C 36 00 D	24 50 A 74 40 E 18 00 B 38 66 C 33 60 D	20 05 A 86 80 E 12 00 B 38 66 C 31 20 D	15 60 A 99 20 E 6 00 B 38 66 C 28 80 D	11 15 A 111 60 E 0 B 38 66 C 26 40 D		←8→
22 30 A 2 00 E 30 00 E 46 66 C 36 00 D	17 90 A 74 40 E 24 00 B 46 66 C 33 60 D	13 45 A 86 80 E 18 00 B 46 66 C 31 20 D	8 90 A 99 20 E 12 00 B 46 66 C 28 80 D	4 45 A 111 60 E 6 00 B 46 66 C 26 40 D	0 A 124 00 E 0 B 46 66 C 24·00 D	
						←10→
↑6↓	↑7↓	↑8↓	↑9↓	↑10↓	↑11↓	

i hundredweights, or in pounds, or in ounces, or in grammes, or in any other unit of weight
;10, and especial note on page 55.)

EXAMPLES TO ILLUSTRATE NOTE
OF THE
MEMORANDA TO CHART B.

SECTION OF THE CHART.

Column **6** *of the Chart* B	*Column* **7** *of the Chart* B	*Flux point* **15° C.** *lower*	*Flux point* **30° C.** *lower*	*Flux point* **40° C.** *lower*	*Flux point* **50° C.** *lower*	**Line of direction of the horizontal squares**
55 70 A 62 00 E 0 B 6 66 C 36 00 D		55 70 A 62 00 E 0 B 6 66 C 27 00 D	55 70 A 62 00 E 0 B 6 66 C 18 00 D	55 70 A 62 00 E 0 B 6 66 C 12 00 D	55 70 A 62 00 E 0 B 6 66 C 6 00 D	←**4**→
49 00 A 62 00 E 6 00 B 14 66 C 36 00 D		49 00 A 62 00 E 6 00 B 14 66 C 27 00 D	49 00 A 62 00 E 6 00 B 14 66 C 18 00 D	49 00 A 62 00 E 6 00 B 14 66 C 12 00 D	49 00 A 62 00 E 6 00 B 14 66 C 6 00 D	←**5**→
42 35 A 62 00 E 12 00 B 22 66 C 36 00 D		42 35 A 62 00 E 12 00 B 22 66 C 27 00 D	42 35 A 62 00 E 12 00 B 22 66 C 18 00 D	42 35 A 62 00 E 12 00 B 22 66 C 12 00 D	42 35 A 62 00 E 12 00 B 22 66 C 6 00 D	←**6**→
	44 55 A 74 40 E 0 B 14 66 C 33 60 D	44 55 A 74 40 E 0 B 14 66 C 24 60 D	44 55 A 74 40 E 0 B 14 66 C 15 60 D	44 55 A 74 40 E 0 B 14 66 C 9 60 D	44 55 A 74 40 E 0 B 14 66 C 3 60 D	←**5**→
	37 88 A 74 40 E 6 00 B 22 66 C 33 60 D	37 88 A 74 40 E 6 00 B 22 66 C 24 60 D	37 88 A 74 40 E 6 00 B 22 66 C 15 60 D	37 88 A 74 40 E 6 00 B 22 66 C 9 60 D	37 88 A 74 40 E 6 00 B 22 66 C 3 60 D	←**6**→
↑ **6** ↓	↑ **7** ↓	↑ **6** **6** **6** **7** **7** ↓	↑ **6** **6** **6** **7** **7** ↓	↑ **6** **6** **6** **7** **7** ↓	↑ **6** **6** **6** **7** **7** ↓	↑ **6** **6** **6** **7** **7** ↓

MEMORANDA TO BE NOTED:

PARTICULAR TO CHART BZ.

1. Each of the glazes represented within the squares of this Chart BZ may be *empirically* expressed as a *convolution* of

$$10\, n(an.)\,.\,n(kat\text{-}an.)\,.\,5\, n(kat.)$$

---

2. But the introduction of G *energies* amongst the *kations*—displacing their own *equivalent* (*in flux power*) of C *energies*—makes any glaze of Chart BZ *larger* than the glaze which is represented on the *corresponding* square of Chart B. That is to say, the *ions* of G *decrease* the *co-efficient of expansion*. In other words, a glaze which contains G *charges* (with or without C *ions*) + x of the alkalies *contracts less* in the cooling-off kiln than a glaze of the same fusibility containing C *charges* (with or without F *energies*) + x of the alkalies but no G *ions*.

---

3. Any of the ultimate glazes represented on the squares of this Chart BZ may be made *softer*—that is to say, made to flux and therefore flow and finish in a lower kiln heat—by using *less* of D in the composition:—

The use of 1200 **Ws** less will soften the glaze 20° C.
The use of 1800 **Ws** less will soften the glaze 30° C.
The use of 3600 **Ws** less will soften the glaze 60° C.

Compare Note 3 to Chart BA, and also Note 3 to Chart N, and also Note 3 to Chart A, *very carefully with this note!*

BZ

***10 n** (an.) . **n** (kat-an.) . **5 n** (kat.)*

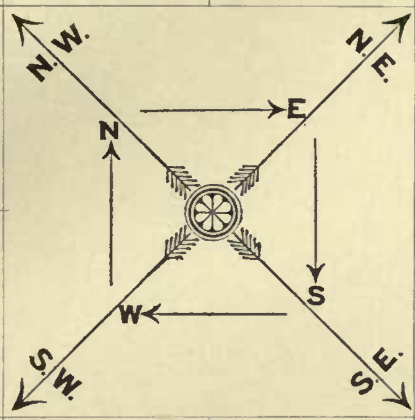
Note especially that—

Any multiple or sub-multiple of any composition, or the mean of any two or three compositions may be taken.

CHAP

		2			
Ws* =	78 00 A 0 E 30 00 B 3 33 C 1 35 G 48 00 D	73 52 A 12 40 E 24 00 B 3 33 C 1 35 G 45 60 D	69 05 A 24 80 E 18 00 B 3 33 C 1 35 G 43 20 D	64 60 A 37 20 E 12 00 B 3 33 C 1 35 G 40 80 D	60 15 A 49 60 E 6 00 B 3 33 C 1 35 G 38 40 D
Ws* =	71 30 A 0 E 36 00 B 7 33 C 2 95 G 48 00 D	66 85 A 12 40 E 30 00 B 7 33 C 2 95 G 45 60 D	62 40 A 24 80 E 24 00 B 7 33 C 2 95 G 43 20 D	57 95 A 37 20 E 18 00 B 7 33 C 2 95 G 40 80 D	53 50 A 49 60 E 12 00 B 7 33 C 2 95 G 38 40 D
Ws* =	64 60 A 0 E 42 00 B 11 33 C 4 60 G 48 00 D	60 15 A 12 40 E 36 00 B 11 33 C 4 60 G 45 60 D	55 70 A 24 80 E 30 00 B 11 33 C 4 60 G 43 20 D	51 25 A 37 20 E 24 00 B 11 33 C 4 60 G 40 80 D	46 80 A 49 60 E 18 00 B 11 33 C 4 60 G 38 40 D
Ws* =	57 90 A 0 E 48 00 B 15 33 C 6 20 G 48 00 D	53 45 A 12 40 E 42 00 B 15 33 C 6 20 G 45 60 D	49 00 A 24 80 E 36 00 B 15 33 C 6 20 G 43 20 D	44 55 A 37 20 E 30 00 B 15 33 C 6 20 G 40 80 D	40 10 A 49 60 E 24 00 B 15 33 C 6 20 G 38 40 D
Ws* =	51 25 A 0 E 54 00 B 19 33 C 7 85 G 48 00 D	46 77 A 12 40 E 48 00 B 19 33 C 7 85 G 45 60 D	42 30 A 24 80 E 42 00 B 19 33 C 7 85 G 43 20 D	37 35 A 37 20 E 36 00 B 19 33 C 7 85 G 40 80 D	33 40 A 49 60 E 30 00 B 19 33 C 7 85 G 38 40 D
Ws* =	44 55 A 0 E 60 00 B 23 33 C 9 45 G 48 00 D	40 10 A 12 40 E 54 00 B 23 33 C 9 45 G 45 60 D	35 65 A 24 80 E 48 00 B 23 33 C 9 45 G 43 20 D	31 20 A 37 20 E 42 00 B 23 33 C 9 45 G 40 80 D	26 75 A 49 60 E 36 00 B 23 33 C 9 45 G 38 40 D
Designation number by which the vertical line of direction of the squares is indicated.	**1**	**2**	**3**	**4**	**5**

* Footnote.—**Ws** means " weights of ": that is to say, you must weigh up the *whole* compo
which you may prefer. (*See* sect.

	BZ					Designation number by which the horizontal line of direction of the squares is indicated.
						←2→
						←3→
70 A 00 E 0 B 33 C 35 G 00 D						←4→
00 A 00 E 00 B 33 C 95 G 00 D	44 55 A 74 40 E 0 B 7 33 C 2 95 G 33 60 D					←5→
34 A 00 E 00 B 33 C 60 G 00 D	37 88 A 74 40 E 6 00 B 11 33 C 4 60 G 33 60 D	33 40 A 86 80 E 0 B 11 33 C 4 60 G 31 20 D				←6→
65 A 00 E 00 B 33 C 20 G 00 D	31 20 A 74 40 E 12 00 B 15 33 C 6 20 G 33 60 D	26 75 A 86 80 E 6 00 B 15 33 C 6 20 G 31 20 D	22 30 A 99 20 E 0 B 15 33 C 6 20 G 28 80 D			←7→
95 A 00 E 00 B 33 C 85 G 00 D	24 50 A 74 40 E 18 00 B 19 33 C 7 85 G 33 60 D	20 05 A 86 80 E 12 00 B 19 33 C 7 85 G 31 20 D	15 60 A 99 20 E 6 00 B 19 33 C 7 85 G 28 80 D	11 15 A 111 60 E 0 B 19 33 C 7 85 G 26 40 D		←8→
33 A 00 E 00 B 33 C 45 G 00 D	17 90 A 74 40 E 24 00 B 23 33 C 9 45 G 33 60 D	13 40 A 86 80 E 18 00 B 23 33 C 9 45 G 31 20 D	8 90 A 99 20 E 12 00 B 23 33 C 9 45 G 28 80 D	4 45 A 111 60 E 6 00 B 23 33 C 9 45 G 26 40 D	0 A 124 00 E 0 B 23 33 C 9 45 G 24 00 D	
						←10→
↑6↓	↑7↓	↑8↓	↑9↓	↑10↓	↑11↓	

undredweights, or in pounds, or in ounces, or in grammes, or in any other unit of weight
), and especial note on page 55.)

EXAMPLES TO ILLUSTRATE NOTE 3

OF THE

MEMORANDA TO CHART BZ.

SECTION OF THE CHART.

Column **6** *of the Chart* BZ.	*Column* **7** *of the Chart* BZ.	*Column* **8** *of the Chart* BZ.	*Flux point* **30° C.** *lower.*	*Flux point* **40° C.** *lower.*	*Flux point* **50° C.** *lower.*	**Line of direction of the horizontal squares.**
55 70 A 62 00 E 0 B 3 33 C 1 35 G 36 00 D			55 70 A 62 00 E 0 B 3 33 C 1 35 G 18 00 D	55 70 A 62 00 E 0 B 3 33 C 1 35 G 12 00 D	55 70 A 62 00 E 0 B 3 33 C 1 35 G 6 00 D	←**4**→
49 00 A 62 00 E 6 00 B 7 33 C 2 95 G 36 00 D			49 00 A 62 00 E 6 00 B 7 33 C 2 95 G 18 00 D	49 00 A 62 00 E 6 00 B 7 33 C 2 95 G 12 00 D	49 00 A 62 00 E 6 00 B 7 33 C 2 95 G 6 00 D	←**5**→
	44 55 A 74 40 E 0 B 7 33 C 2 95 G 33 60 D		44 55 A 74 40 E 0 B 7 33 C 2 95 G 15 60 D	44 55 A 74 40 E 0 B 7 33 C 2 95 G 9 60 D	44 55 A 74 40 E 0 B 7 33 C 2 95 G 3 60 D	←**5**→
	37 88 A 74 40 E 6 00 B 11 33 C 4 60 G 33 60 D		37 88 A 74 40 E 6 00 B 11 33 C 4 60 G 15 60 D	37 88 A 74 40 E 6 00 B 11 33 C 4 60 G 9 60 D	37 88 A 74 40 E 6 00 B 11 33 C 4 60 G 3 60 D	←**6**→
		33 40 A 86 80 E 0 B 11 33 C 4 60 G 31 20 D	33 40 A 86 80 E 0 B 11 33 C 4 60 G 13 20 D	33 40 A 86 80 E 0 B 11 33 C 4 60 G 7 20 D		←**6**→
		26 75 A 86 80 E 6 00 B 15 33 C 6 20 G 31 20 D	26 75 A 86 80 E 6 00 B 15 33 C 6 20 G 13 20 D	26 75 A 86 80 E 6 00 B 15 33 C 6 20 G 7 20 D		←**7**→

MEMORANDA TO BE NOTED:

PARTICULAR TO CHART C.

1. Each of the compositions contained within the squares of this Chart C will fuse into an ultimate glaze which may be *empirically* expressed as a *convolution* of

$$8\cdot 5\, n(an.)\,.\,n(kat\text{-}an.)\,.\,4\cdot 5\, n(kat.)$$

2. The *ratio* of the "*kat-an.*" to the "*an.*" in a glaze of Chart C is *greater* than it is in the glaze which is represented on the *corresponding* square of Chart B.

Therefore the glaze of Chart C is the *greater* of the two: that is to say, *it shrinks less* while cooling off in the kiln after having been fired and fused.

3. From what has previously been noted, it is plain that the above is not necessarily true under certain obvious conditions. It is not true of two glazes which—although they have the greater and less ratio above defined—*are not of equal fusibility* and *do not approximate* in the several *ratios* between the *ions* of the various *kations* which they contain.

4. See Note 3 to Chart BZ.

For examples, in this case, see page 47.

5. Any of the ultimate glazes represented on the squares of this Chart C may be made *softer*—that is to say, made to *flux,* and therefore flow and finish in a *lower kiln heat* —by using *more* of C in the composition:—

The use of 1000 **Ws** more will soften the glaze 30° C.

The use of 2000 **Ws** more will soften the glaze 45° C.

But do not forget that the *co-efficient of expansion* of the resulting glaze will so be *increased*—that is to say, the glaze will then be *smaller* on the finished cooled off wares.

20° C. is equal to a seger cone.

For examples of glazes so softened, see page 47.

C

***$8\frac{1}{2}$ n** (**an.**) . **n** (**kat-an.**) . **$4\frac{1}{2}$ n** (**kat.**)*

Note especially that—

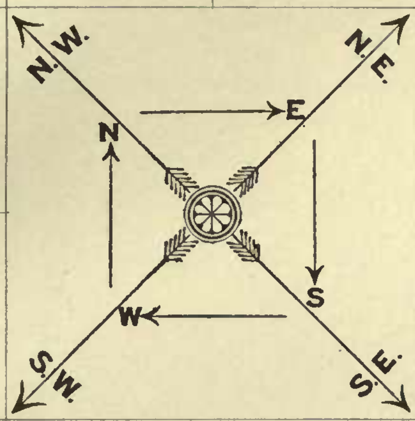
Any multiple or sub-multiple of any composition, or the mean of any two or three compositions may be taken.

CHA

		2			
Ws* =	71 30 A 0 E 36 00 B 4 66 C 30 00 D	66 85 A 12 40 E 30 00 B 4 66 C 27 60 D	62 40 A 24 80 E 24 00 B 4 66 C 25 20 D	57 95 A 37 20 E 18 00 B 4 66 C 22 80 D	53 50 A 49 60 E 12 00 B 4 66 C 20 40 D
Ws* =	64 60 A 0 E 42 00 B 12 66 C 30 00 D	60 15 A 12 40 E 36 00 B 12 66 C 27 60 D	55 70 A 24 80 E 30 00 B 12 66 C 25 20 D	51 25 A 37 20 E 24 00 B 12 66 C 22 80 D	46 80 A 49 60 E 18 00 B 12 66 C 20 40 D
Ws* =	57 90 A 0 E 48 00 B 20 66 C 30 00 D	53 45 A 12 40 E 42 00 B 20 66 C 27 60 D	49 00 A 24 80 E 36 00 B 20 66 C 25 20 D	44 55 A 37 20 E 30 00 B 20 66 C 22 80 D	40 10 A 49 60 E 24 00 B 20 66 C 20 40 D
Ws* =	51 25 A 0 E 54 00 B 28 66 C 30 00 D	46 77 A 12 40 E 48 00 B 28 66 C 27 60 D	42 30 A 24 80 E 42 00 B 28 66 C 25 20 D	37 85 A 37 20 E 36 00 B 28 66 C 22 80 D	33 40 A 49 60 E 30 00 B 28 66 C 20 40 D
Ws* =	44 55 A 0 E 60 00 B 36 66 C 30 00 D	40 10 A 12 40 E 54 00 B 36 66 C 27 60 D	35 65 A 24 80 E 48 00 B 36 66 C 25 20 D	31 20 A 37 20 E 42 00 B 36 66 C 22 80 D	26 75 A 49 60 E 36 00 B 36 66 C 20 40 D
Designation number by which the vertical line of direction of the squares is indicated.	↑ **1** ↓	↑ **2** ↓	↑ **3** ↓	↓ **4** ↓	↑ **5** ↓

* FOOTNOTE.—**Ws** means "weights of": that is to say, you must weigh up the *whole* compo
which you may prefer. (*See* sect. 1

RT C



					Designation number by which the horizontal line of direction of the squares is indicated.
					←2→
					←3→
					←4→
49 00 A 62 00 E 6 00 B 4 66 C 18 00 D	44 55 A 74 40 E 0 B 4 66 C 15 60 D				←5→
42 34 A 62 00 E 12 00 B 12 66 C 18 00 D	37 88 A 74 40 E 6 00 B 12 66 C 15 60 D	33 40 A 86 80 E 0 B 12 66 C 13 20 D			←6→
35 65 A 62 00 E 18 00 B 20 66 C 18 00 D	31 20 A 74 40 E 12 00 B 20 66 C 15 60 D	26 75 A 86 80 E 6 00 B 20 66 C 13 20 D	22 30 A 99 20 E 0 B 20 66 C 10 80 D		←7→
28 95 A 62 00 E 24 00 B 28 66 C 18 00 D	24 50 A 74 40 E 18 00 B 28 66 C 15 60 D	20 05 A 86 80 E 12 00 B 28 66 C 13 20 D	15 60 A 99 20 E 6 00 B 28 66 C 10 80 D	11 15 A 111 60 E 0 B 28 66 C 8 40 D	←8→
22 33 A 62 00 E 30 00 B 36 66 C 18 00 D	17 90 A 74 40 E 24 00 B 36 66 C 15 60 D	13 40 A 86 80 E 18 00 B 36 66 C 13 20 D	8 90 A 99 20 E 12 00 B 36 66 C 10 80 D	4 45 A 111 60 E 6 00 B 36 66 C 8 40 D	0 A 124 00 E 0 B 36 66 C 6 00 D
					←10→
↑6↓	↑7↓	↑8↓	↑9↓	↑10↓	↑11↓

in hundredweights, or in pounds, or in ounces, or in grammes, or in any other unit of weight
e 10, and especial note on page 55.)

EXAMPLES TO ILLUSTRATE NOTES 4 & 5
OF THE
MEMORANDA TO CHART C.

SECTION OF THE CHART.

Column **5** *of the Chart* C.			*Flux point* **20° C.** *lower.*	*Flux point* **40° C.** *lower.*	*Flux point* **60° C.** *lower.*	**Line of direction of the horizontal squares.**
53 50 A 49 60 E 12 00 B 4 66 C 20 40 D			53 50 A 49 60 E 12 00 B 4 66 C 8 40 D	53 50 A 49 60 E 12 00 B 21 33 C 20 40 D	53 50 A 49 60 E 12 00 B 21 33 C 8 40 D	←**5**→
	Column **6** *of the Chart* C.		*Flux point* **20° C.** *lower.*	*Flux point* **30° C.** *lower.*	*Flux point* **50° C.** *lower.*	
	42 34 A 62 00 E 12 00 B 12 66 C 18 00 D		42 34 A 62 00 E 12 00 B 12 66 C 6 00 D	42 34 A 62 00 E 12 00 B 22 66 C 18 00 D	42 34 A 62 00 E 12 00 B 22 66 C 6 00 D	←**6**→
		Column **7** *of the Chart* C.	*Flux point* **10° C.** *lower.*	*Flux point* **30° C.** *lower.*	*Flux point* **50° C.** *lower.*	
		44 55 A 74 40 E 0 B 4 66 C 15 60 D	44 55 A 74 40 E 0 B 4 66 C 9 60 D	44 55 A 74 40 E 0 B 14 66 C 15 60 D	44 55 A 74 40 E 0 B 21 33 C 9 60 D	←**5**→
		37 88 A 74 40 E 6 00 B 12 66 C 15 60 D	37 88 A 74 40 E 6 00 B 12 66 C 9 60 D	37 88 A 74 40 E 6 00 B 22 66 C 15 60 D	37 88 A 74 40 E 6 00 B 29 33 C 9 60 D	←**6**→

MEMORANDA TO BE NOTED:

PARTICULAR TO CHART CZ.

1. Each of the *ultimate* glazes on the squares of this Chart CZ may be expressed as a *convolution* having the *empirical formula* of—

$$8 \cdot 5\ n(an.) . n(kat\text{-}an.) . 4 \cdot 5\ n(kat.)$$

---

2. Some *basic ions* of G displace some of the *basic ions* of C *without disturbing* the *ratio* between the *sum* of the refractory energy (of the "an." plus the "kat.-an." ions) and the *total* flux energy (of the kations): that is to say, they do the work *of their own equivalent* (*in flux power*) of C energies *without altering the fusibility* of the mass.

Consequently any glaze of Chart CZ will be of *less* co-efficient than its *corresponding* glaze of Chart C.

That is to say that, of the two, *it will contract the less* in the cooling-off kiln and ultimately will be in better agreement (fit better) with or on a clay or ware of low shrinkage (after fire) in the heat of the soft porcelain kiln.

---

3. *See* Note 3 to Chart BZ.

---

4. Any of the ultimate glazes represented on the squares of this Chart CZ may be made *softer*—that is to say, made to *flux* in a *lower kiln heat*—by using *more* of G in the composition:—

The use of 04 05 **Ws** more will soften the glaze 30° C.

The use of 08 10 **Ws** more will soften the glaze 45° C.

For examples of glazes so softened *see* page 53.

But do not forget that the *co-efficient of expansion* of the glaze will *so* be *increased*—that is to say, the glaze will be *smaller* on the finished cooled-off wares:—having *contracted* (*shrunk*) *more* in the cooling-off kiln.

Also the *specific volume* of the *slip glaze* at the same dipping weight (or brushing on state) will so be *decreased*, and *crowfooting* may be set up in the dipping shed or the stove or after setting.

No glaze containing G should ever be used until it has had ample time to mellow; during which time it should be frequently (at least daily) agitated or blunged.

CZ

***8·5 n** (an.) . **n** (kat-an.) . **4·5 n** (kat.)*

Note especially that—

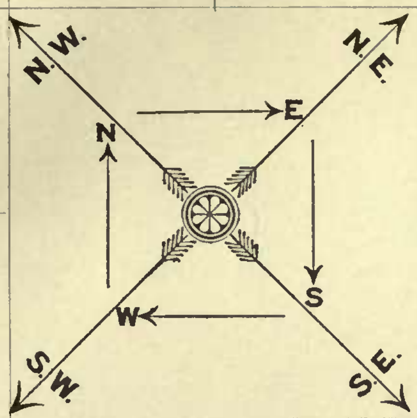
Any multiple or sub-multiple of any composition, or the mean of any two or three compositions may be taken.

CHA

		↖ 2 ↘			
Ws*=	71 30 A 0 E 36 00 B 2 33 C 95 G 30 00 D	66 85 A 12 40 E 30 00 B 2 33 C 95 G 27 60 D	62 40 A 24 80 E 24 00 B 2 33 C 95 G 25 20 D	57 95 A 37 20 E 18 00 B 2 33 C 95 G 22 80 D	53 50 A 49 60 E 12 00 B 2 33 C 95 G 20 40 D
Ws*=	64 60 A 0 E 42 00 B 6 33 C 2 55 G 30 00 D	60 15 A 12 40 E 36 00 B 6 33 C 2 55 G 27 60 D	55 70 A 24 80 E 30 00 B 6 33 C 2 55 G 25 20 D	51 25 A 37 20 E 24 00 B 6 33 C 2 55 G 22 80 D	46 80 A 49 60 E 18 00 B 6 33 C 2 55 G 20 40 D
Ws*=	57 90 A 0 E 48 00 B 10 33 C 4 20 G 30 00 D	53 45 A 12 40 E 42 00 B 10 33 C 4 20 G 27 60 D	49 00 A 24 80 E 36 00 B 10 33 C 4 20 G 25 20 D	44 55 A 37 20 E 30 00 B 10 33 C 4 20 G 22 80 D	40 10 A 49 60 E 24 00 B 10 33 C 4 20 G 20 40 D
Ws*=	51 25 A 0 E 54 00 B 14 33 C 5 80 G 30 00 D	46 77 A 12 40 E 48 00 B 14 33 C 5 80 G 27 60 D	42 30 A 24 80 E 42 00 B 14 33 C 5 80 G 25 20 D	37 85 A 37 20 E 36 00 B 14 33 C 5 80 G 22 80 D	33 40 A 49 60 E 30 00 B 14 33 C 5 80 G 20 40 D
Ws*=	44 55 A 0 E 60 00 B 18 33 C 7 45 G 30 00 D	40 10 A 12 40 E 54 00 B 18 33 C 7 45 G 27 60 D	35 65 A 24 80 E 48 00 B 18 33 C 7 45 G 25 20 D	31 20 A 37 20 E 42 00 B 18 33 C 7 45 G 22 80 D	26 75 A 49 60 E 36 00 B 18 33 C 7 45 G 20 40 D
Designation number by which the vertical line of direction of the squares is indicated.	↑ **1** ↓	↑ **2** ↓	↑ **3** ↓	↑ **4** ↓	↑ **5** ↓

* Footnote.—**Ws** means "weights of": that is to say, you must weigh up the whole comp
which you may prefer. (*See* sect.

T CZ



					Designation number by which the horizontal line of direction of the squares is indicated.
					←2→
					←3→
					←4→
49 00 A 62 00 E 6 00 B 2 33 C 95 G 18 00 D	44 55 A 74 40 E 0 B 2 33 C 95 G 15 60 D				←5→
42 34 A 62 00 E 12 00 B 6 33 C 2 55 G 18 00 D	37 88 A 74 40 E 6 00 B 6 33 C 2 55 G 15 60 D	33 40 A 86 80 E 0 B 6 33 C 2 55 G 13 20 D			←6→
35 65 A 62 00 E 18 00 B 10 33 C 4 20 G 18 00 D	31 20 A 74 40 E 12 00 B 10 33 C 4 20 G 15 60 D	26 75 A 86 80 E 6 00 B 10 33 C 4 20 G 13 20 D	22 30 A 99 20 E 0 B 10 33 C 4 20 G 10 80 D		←7→
28 95 A 62 00 E 24 00 B 14 33 C 5 80 G 18 00 D	24 50 A 74 40 E 18 00 B 14 33 C 5 80 G 15 60 D	20 05 A 86 80 E 12 00 B 14 33 C 5 80 G 13 20 D	15 60 A 99 20 E 6 00 B 14 33 C 5 80 G 10 80 D	11 15 A 111 60 E 0 B 14 33 C 5 80 G 8 40 D	←8→
22 33 A 62 00 E 30 00 B 18 33 C 7 45 G 18 00 D	17 90 A 74 40 E 24 00 B 18 33 C 7 45 G 15 60 D	13 40 A 86 80 E 18 00 B 18 33 C 7 45 G 13 20 D	8 90 A 99 20 E 12 00 B 18 33 C 7 45 G 10 80 D	4 45 A 111 60 E 6 00 B 18 33 C 7 45 G 8 40 D	0 A 124 00 E 0 B 18 33 C 7 45 G 6 00 D
					←10→
↑6↓	↑7↓	↑8↓	↑9↓	↑10↓	↑11↓

on in hundredweights, or in pounds, or in ounces, or in grammes, or in any other unit of weight
age 10, and especial note on page 55.)

EXAMPLES TO ILLUSTRATE NOTE 4
OF THE
MEMORANDA TO CHART CZ.

SECTION OF THE CHART.

Column **6** *of the Chart* CZ.	*Column* **7** *of the Chart* CZ.	*Column* **8** *of the Chart* CZ.	*Flux point* **30° C.** *lower.*	*Flux point* **50° C.** *lower.*	*Flux point* **60° C.** *lower.*	**Line of direction of the horizontal squares.**
49 00 A 62 00 E 6 00 B 2 33 C 95 G 18 00 D			49 00 A 62 00 E 6 00 B 2 33 C 5 00 G 18 00 D	49 00 A 62 00 E 6 00 B 2 33 C 10 40 G 18 00 D	49 00 A 62 00 E 6 00 B 2 33 C 13 10 G 18 00 D	←5→
42 34 A 62 00 E 12 00 B 6 33 C 2 55 G 18 00 D			42 34 A 62 00 E 12 00 B 6 33 C 6 60 G 18 00 D	42 34 A 62 00 E 12 00 B 6 33 C 12 00 G 18 00 D	42 34 A 62 00 E 12 00 B 6 33 C 14 70 G 18 00 D	←6→
	37 88 A 74 40 E 6 00 B 6 33 C 2 55 G 15 60 D		37 88 A 74 40 E 6 00 B 6 33 C 6 60 G 15 60 D	37 88 A 74 40 E 6 00 B 6 33 C 12 00 G 15 60 D	37 88 A 74 40 E 6 00 B 6 33 C 14 70 G 15 60 D	←6→
	31 20 A 74 40 E 12 00 B 10 33 C 4 20 G 15 60 D		31 20 A 74 40 E 12 00 B 10 33 C 8 25 G 15 60 D	31 20 A 74 40 E 12 00 B 10 33 C 13 65 G 15 60 D	31 20 A 74 40 E 12 00 B 10 33 C 16 35 G 15 60 D	←7→
		26 75 A 86 80 E 6 00 B 10 33 C 4 20 G 13 20 D	26 75 A 86 80 E 6 00 B 10 33 C 8 25 G 13 20 D	26 75 A 86 80 E 6 00 B 10 33 C 13 65 G 13 20 D	26 75 A 86 80 E 6 00 B 10 33 C 16 35 G 13 20 D	←7→
		20 05 A 86 80 E 12 00 B 14 33 C 5 80 G 13 20 D	20 05 A 86 80 E 12 00 B 14 33 C 9 85 G 13 20 D	20 05 A 86 80 E 12 00 B 14 33 C 15 25 G 13 20 D	20 05 A 86 80 E 12 00 B 14 33 C 17 95 G 13 20 D	←8→

GENERAL NOTES.

1. *On the Sulphates*—(1) *Plaster*; (2) *Barytes.*—The use of either is, for factory and physical and chemical reasons, not to be commended.

But if you wish to use such you may substitute

06·80 **Ws** of Plaster

or 11·65 **Ws** of Barytes

in place of 05·00 **Ws** of Paris white to every 100·00 **Ws** of the glaze admixture in dry materials.

Never employ a greater percentage!

The word "barytes" is sometimes used incorrectly for "baryta carbonate."

"Barytes" is the Sulphate of Baryta.

"Witherite" is the Carbonate of Baryta.

"Plaster" or plaster of Paris is Sulphate of Lime.

"Paris white" is whiting or Carbonate of Lime.

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2. *On Glazes of Lower Fusibility.*—Glazes of lower fusibility than those given on the Charts are not to be commended, and the Author does not advise their use in cases where length of life, and beauty, and other desirable qualities for competition with the best goods on the markets are the aim of the manufacturer.

But if the clay or paste be excessively tender or extremely liable to warp, the manufacturer is advised to make an appointment for consultation with the Author before making his own experiments at modifying the glazes given herein.

A letter should first be addressed to the Author, c/o the Publishers.

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3. *On the Comparing of two or more Glazes* (*of reduced fusibility*) *with one another.*

The glazes given on the CHARTS are all of equal fusibility AND MAY ALL be compared AS THEY STAND.

But, in order to compare a glaze of *reduced fusibility* with a corresponding glaze belonging to any other chart series, *the flux point of each and all of them must be reduced by the same number of degrees of heat.*

For example, you must not compare the glaze of Column 6, line 5, Chart C, reduced 65° C. lower with that of Column 6, line 5, of Chart B, reduced by 40° C.

Also the flux point of each must have been reduced in the same manner.

For example, you must not take D material from one and add C material to the other. You must take away D material from both and add C material to both if you wish to compare them with one another in respect to their co-efficient, or any characteristic or quality of either or both.

ESPECIAL NOTE

Common to all the Scales of and all the Charts and Notes and Examples throughout the Work and the Copyrights thereof.

The Mean or Average Composition of any Two or More of the Glazes (and the Means to any number thereof) expressed on any of the squares of the Charts is (and are) indicated and to be understood as occupying its proper place (and their consecutive order) thereon in each and every line of direction and between each and every two steps (glazes) expressed in the scale (and scales) represented thereon, therein, and thereby.

And the multiple (or sub-multiple) of the Mean and every Mean and of the glaze and every glaze expressed is indicated and is to be understood and may be taken if desired in preference to any of the other forms of any and every composition (glaze) whether expressed or understood or indicated in these Charts and Notes and Examples throughout the pages hereof.

For example, taking the particular scale of Chart N, of which two intervals or degrees or steps or graduations, are e.g. represented by the Glazes of Column 5 line 3, and of Column 6 line 4, some of the steps (glazes) indicated and to be understood as between these two given glazes are as follows :—

Chart **N**	*Column* 5, *line* 3.	*Column* 6, *line* 4.	*The Sum of Col.* 5, *line* 3, *and Col.* 6, *line* 4.	*The Mean between Col.* 5, *line* 3, *and Col.* 6, *line* 4.	*The Sum of the Mean and Col.* 6, *line* 4.	*The 2nd Mean between the Mean and Col.* 6, *line* 4.
	66 85 A 49 60 E 0 B 8 66 C 56 40 D	55 70 A 62 00 E 0 B 16 66 C 54 00 D	122 55 A 111 60 E 0 B 25 33 C 110 40 D	61 27 A 55 80 E 0 B 12 66 C 55 20 D	117 10 A 117 80 E 0 B 29 33 C 109 20 D	58 55 A 58 90 E 0 B 14 66 C 54 60 D

Or, taking them 50° C. softer, the above glazes (steps) in the scale are as follows :—

	66 85 A 49 60 E 0 B 8 66 C 17 40 D	55 70 A 62 00 E 0 B 16 66 C 15 00 D		61 27 A 55 80 E 0 B 12 66 C 16 20 D		58 55 A 58 90 E 0 B 14 66 C 15 60 D

Again, taking that particular scale of Chart N, of which two intervals or degrees or steps or graduations are e.g. expressed by the glazes of Column 7 line 5, and of Column 8 line 6, some of the steps (glazes) indicated and to be understood as on the Chart between these two given glazes (steps) in the same scale are as follows :—

Chart **N**	*Col.* 7, *line* 5, 50° C. *lower than expressed on Chart.*	*Col.* 8, *line* 6, 50° C. *lower than expressed on Chart.*	*The Sum of them.*	*The Mean between them.*	*The Sum of the Mean and Col.* 7, *line* 5.	*The 2nd Mean.*
	44 55 A	33 40 A	78 00 A	39 00 A	83 50 A	41 75 A
	74 40 E	86 80 E	157 20 E	78 60 E	153 00 E	76 50 E
	0 B	0 B	0 B	0 B	0 B	0 B
	24 66 C	32 66 C	57 33 C	28 66 C	53 33 C	26 66 C
	12 60 D	10 20 D	22 80 D	11 40 D	24 00 D	12 00 D

And so on to the 4th, 6th, 8th, etc. mean.

Again, taking that particular scale of Chart N, of which two intervals or degrees or steps or graduations are e.g. expressed by the glazes of Column 5 line 4, and of Column 6 line 4, some of the steps (glazes) indicated and to be understood as on the Chart between these two given glazes (steps) in the same scale are as follows :—

Chart **N**	*Col.* 5, *line* 4, 50° C. *lower than expressed on the Chart.*	*Col.* 6, *line* 4, 50° C. *lower than expressed on the Chart.*	*The Sum of them.*	*The Mean between them.*	*The Sum of the Mean and Col.* 6, *line* 4.	*The 3rd Mean.*
	60 15 A	55 70 A	115 85 A	57 90 A	113 60 A	56 80 A
	49 60 E	62 00 E	111 60 E	55 80 E	117 80 E	58 90 E
	6 00 B	0 B	6 00 B	3 00 B	3 00 B	1 50 B
	16 66 C	16 66 C	33 33 C	16 66 C	33 33 C	16 66 C
	17 40 D	15 00 D	32 40 D	16 20 D	31 20 D	15 60 D

And so on to the 5th, 7th, 9th, etc., mean.

Again, $\frac{1}{3}$, or any fractional part of the **Ws** (weights) expressed or indicated of any composition, or between any compositions, may be taken.

Again, 3 times, or any number of times, the **Ws** (weights) expressed or indicated of any composition, or between any compositions, may be taken.

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