A. O. AUSTIN.

SANDED INSULATOR AND METHOD OF MAKING THE SAME.

APPLICATION FILED MAY 29, 1916.

1,284,975.

Patented Nov. 19, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

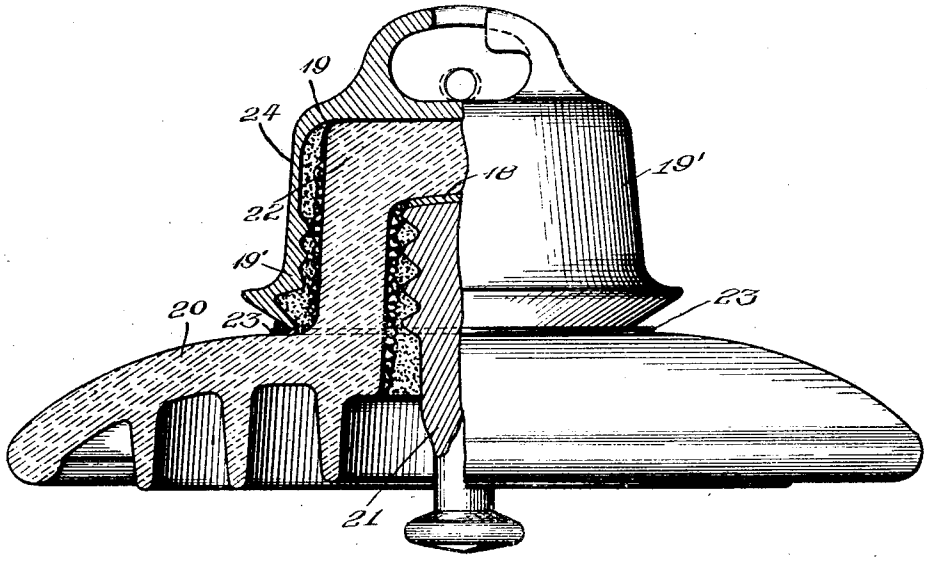


Fig. 5.

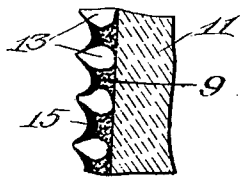


Fig. 3.

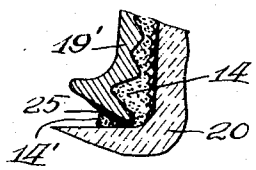


Fig. 2.

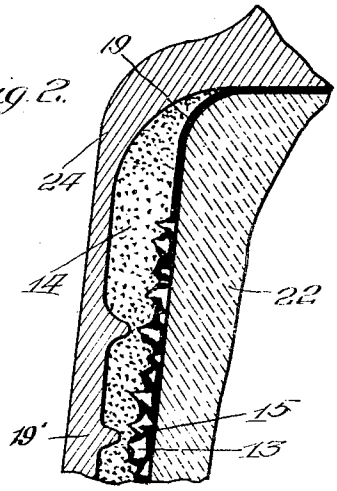


Fig. 6.

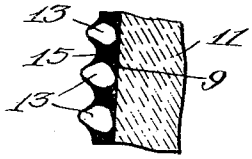
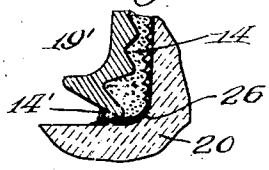


Fig. 4.



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2 SHEETS—SHEET 2.

Fig. 7.

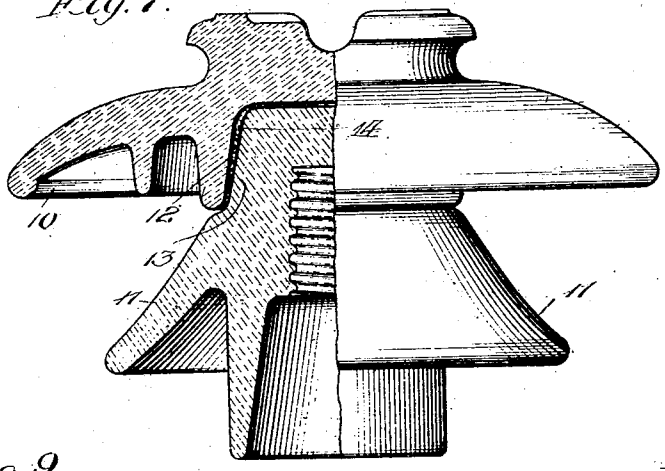
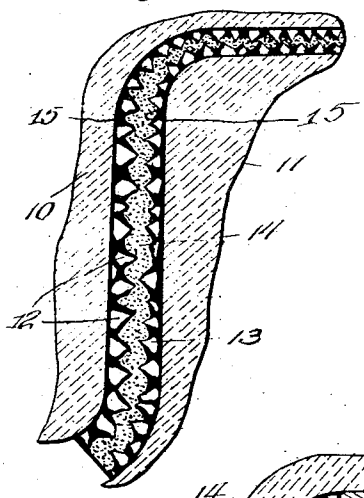


Fig. 9.



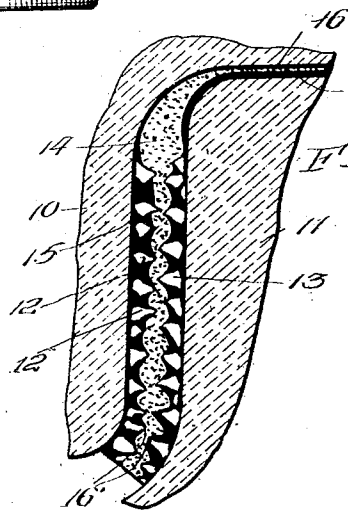


Fig. 8.

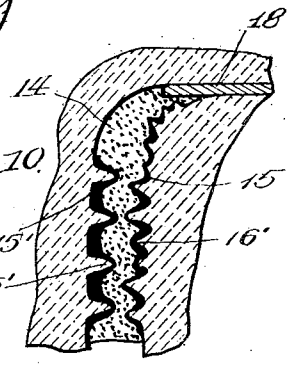


Fig. 10.

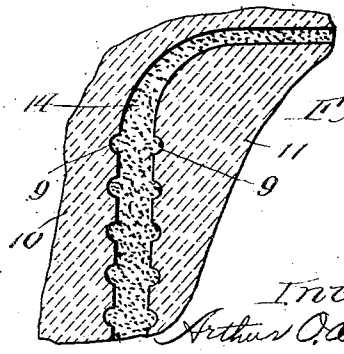


Fig. 11.

Witness:
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UNITED STATES PATENT OFFICE.

ARTHUR O. AUSTIN, OF BARBERTON, OHIO, ASSIGNOR TO THE OHIO BRASS COMPANY, OF MANSFIELD, OHIO, A CORPORATION OF NEW JERSEY.

SANDED INSULATOR AND METHOD OF MAKING THE SAME.

1,284,975. Specification of Letters Patent. Patented Nov. 19, 1918.

Application filed May 29, 1916. Serial No. 100,481.

To all whom it may concern:

Be it known that I, ARTHUR O. AUSTIN, a citizen of the United States, residing at Barberton, in the county of Summit and State of Ohio, have invented certain new and useful Improvements in Sanded Insulators and Methods of Making the Same, of which the following is a specification.

This invention relates to insulators in which one or more of the parts have connected surfaces which are roughened or sanded to provide means for cementing the parts together and at the same time permitting greater resilience between them, and to the method of uniting or connecting such insulator parts so constructed. The invention consists in the novel method employed in connecting the parts and forming the insulators, and in the novel contruction, combination and arrangement of the several parts.

In the drawings, Figure 1 is a view, partly in section, of an insulator constructed in accordance with the principles of this invention; Fig. 2 is an enlarged detail of a portion of the construction shown by Fig. 1; Fig. 3 is a detail showing the edge of the metallic shell coated with yielding material; Fig. 4 shows the adjacent portion of the insulating member so coated; Figs. 5 and 6 are detail views showing projecting particles attached to the insulating member; Fig. 7 is a view, partly in section, of a different form embracing the method and construction of my invention; Fig. 8 is an enlarged view of a portion of the construction shown in Fig. 7; Fig. 9 is an enlarged detail similar to Fig. 8, in which the sanded surfaces are continued between the parts; Fig. 10 is an enlarged detail similar to Fig. 8 with an elastic substance interposed between the insulator elements, and Fig. 11 is a detail view similar to Fig. 8 embodying a previously used method and construction.

In insulators which consist of a number of parts, either of similar or different materials, it is customary to unite the several parts by means of cement. The surfaces which are so connected may be knurled or grooved for affording more anchoring surface for the cement and thereby connecting the parts more rigidly together, but if the parts are too rigidly connected they may be subjected to undue stresses and strains caused by the changes in temperature and other conditions which impair rather than improve the insulators. The unglazed surfaces provided with grooves, or plain, may give fairly satisfactory results but there are certain conditions which it is desirable to secure in insulators which can be better obtained if the surfaces are covered with glaze, not only where they are exposed to the weather but also where they are in contact with cement. Cement, however, does not adhere readily to a glazed surface on account of its extreme glassy condition, therefore to glaze the surface to be cemented still maintaining the grooves in the surface, as indicated in Fig. 11, would give desirable properties in the porcelain, namely, increased electrical resistance, but it would produce a joint mechanically weak which would soon break apart or loosen up on account of the cement not adhering to the surface.

To overcome this mechanical and physical weakness and to secure the properties which are desired in an insulator, it is found possible to coat the surfaces of insulating material to be connected before the insulating member is fired in the kiln with material which will produce a glazed surface, and while this coating is still wet to sprinkle thereon sand or crushed material of substantially the same substance as that of the insulating member, which has or has not been vitrified, but which will adhere to this coating on account of it being in a moist and sticky condition when first applied. Crushed unvitrified clay is preferable for the reason that if of the same composition as the body of the insulating member it will then have the same coefficient of expansion and contraction in firing as the insulating member itself since the two are vitrified at the same time, and therefore, there will be no tendency for the roughened sand or vitrified clay particles to chip or break after removal from the kiln.

When the insulating members are thus prepared and then placed in the kiln and vitrified it is found that the insulating member itself is practically covered with glaze, thus giving a surface which adds to the electrical resistance and prevents the absorption of moisture but leaves the points of the projection or particles projecting above the glaze and practically free of glaze at the outer ends, the bases and sides of the parti-

cles being held firmly in the glaze and substantially forming a continuation of the insulating member itself.

Before assembling the insulator parts which are so formed the roughened surfaces are coated with an elastic or yielding material which, due to the capillary attraction, is drawn away from the points or tips of the roughened particles and accumulated at the base of the projections. This leaves the end of the projections free to extend into the connecting cement practically free of the coating material so that they will engage the cement or binding material between the parts. Since these projections are of considerably smaller area than the main body of the insulating member a force or strain transmitted between the insulator parts or between a part and the cement will be concentrated in the projections. The projections being of elastic material and having a smaller section than the main body, the stress or strain tending toward disruption will be in inverse proportion to their cross sectional area and directly proportional to their length. It is evident then that if the projections are of sufficient length and of small enough cross section the internal strain or yielding stress between the main parts can be almost entirely taken up by these projections keeping down the stress in the main insulating members.

It is evident that there are a number of ways of obtaining this result, such as providing the members which are to be assembled together with ribs or a knurled or roughened surface. Where metal parts are assembled with an insulating member they may be prepared and treated the same way.

A substitute for producing a rough surface of insulating material, such as porcelain or cement, as above described, is to roughen the surface of the insulating member before firing by means of a proper tool, such as a knurling wheel, and as this surface is then glazed at the time of firing, the glaze produces a surface which is non-absorbent to moisture and has a higher resistance.

As before stated, it is found that when the insulator parts are cemented together through projections they offer a yielding grip upon the cement even though the projections may of themselves be very brittle. This yielding grip is quite an advantage on account of permitting expansion and contraction of the cemented joint, thereby assisting to reduce strains in the assembled insulators through contraction and expansion from temperature changes and it has been found that this yielding or elastic condition can be further increased by treating such nded or roughened surfaces with a semi-hard or elastic compound such as paraffin wax, or a quick drying elastic varnish, before the insulator parts are connected. This semi-hard or elastic material is applied to the sanded surfaces and partially fills the recesses between the small projections by capillary attraction on such surfaces, as indicated in some of the detail drawings. This partial filling of the spaces between the projections still leaves the points or tips of the projections extending beyond the semi-hard or elastic-filling material, as clearly shown in the drawings.

For example, a portion of an insulating member 11 in Fig. 5 is coated with a rather thick coating of glaze 9 in which particles 13 are placed before vitrifying, the glaze extending quite a distance up the sides of the particles, causing the particles to be quite rigidly held when the member so prepared, is vitrified. A coating of elastic or yielding material 15, such as wax, or paraffin, is then applied, the hollows between the points of the projections filling up, by capillary attraction, leaving the tips of the projection free, or at least thinly coated with the material, so that the tip will project into the connecting cement. If the glaze 9 is a thin coating, as shown in Fig. 6, the particles 13 will be less firmly held at the base, and will therefore be more resilient, the elastic coating 15 then filling the hollow between the projections as before. Quite a wide variation can be produced by changing the sizes of the particles, the thickness of the coating of glaze and the yielding material.

A surface thus prepared adds to the electrical resistance, decreases the moisture absorbing property of the insulating material, distributes the strain between the parts uniformly over the prepared surface, and produces a contact surface which is elastic or yielding as compared with the old method of connecting insulator parts directly with cement, as indicated in Fig. 7.

If desired, this prepared surface with the sanded or roughened construction can be extended entirely over the surfaces in contact with the cement, as indicated in Fig. 9, but there is no particular advantage in having more than the vertical sides of the insulator surfaces thus prepared and to sand the portions indicated with the reference numerals 16 and 17 in Fig. 8 would not materially increase the holding effect between the two parts. Therefore, in order to preserve the elastic or yielding properties the semi-hard or elastic material is extended over those surfaces which have no substantial gripping effect but to omit the sanded or roughened condition therefrom.

Referring now to Figs. 7 and 8, an insulator composed of two insulating parts 10 and 11 is formed with particles 12 and 13 constituting sanded or roughened surfaces which have been vitrified on the surfaces of the insulating parts and are to all intents and purposes integral parts of the insulat-

ing members. These parts are secured together by cement 14 which engages the extremities of projections 12 and 13, as shown more clearly in Fig. 8. The semi-hard or elastic material which fills the space between the projections at their bases is designated by the reference numeral 17, and the sharp points of the particles which extend beyond the elastic filling material are indicated by the reference numeral 16′, for example in Figs. 8 and 10.

In some instances it is found advantageous to even increase the elastic condition between the surfaces which receive a radial strain under expansion and contraction of the parts such as indicated by the coated surfaces 16 and 17 in Fig. 8. This is done by inserting a disk 18 of yielding or elastic material, as shown in Fig. 10, or a heavy elastic coating 19 as shown in Figs. 1 and 2, the disk 18 being of yielding or elastic material such as felt, paper and the like.

This method of uniting insulator parts is not confined to use with insulators which consist only of insulating members but is equally applicable to a structure, as shown in Fig. 1, in which a metal cap 19′ is cemented to an insulating member 20 and the latter to a metal suspension pin 21. In this case the insulating member has a projecting boss 22 with a recess in which the pin 21 is inserted, the inner and outer side surfaces of the boss being formed with sanded projections, as previously described, and the metal cap and pin being formed with retaining grooves or depressions for anchoring the cement 14 thereto. Both of the cemented connections between the insulating member and the metallic members have the advantages of elasticity and resilience, as above set forth, to provide for the relative yielding due to expansion and contraction.

In addition, a ring 23 also of elastic material, such as felt, paper and the like, is interposed between the edge of the cap 19′ and the body or flange of the insulating member 20 for allowing the expansion and contraction which may take place between the lower edge of the metal cap and the adjacent insulating material, thereby making a yielding contact between them and preventing the surface of the insulating member from being checked or cracked due to the hardness of the metal, and also for spacing the edge of the cap and the flange apart.

Instead of providing a pad or gasket 23 the lower edge of the metal cap 19′, as shown in Fig. 3, may be provided with a coating 25 of yielding material which will effectually space the insulating member 20 and cap apart; or the adjacent surface of the insulating member may be painted or coated with elastic material 26, as shown in Fig. 4, which serves the same purpose. In either case, the formation of a bead or rim 14′ of cement on the outside of the edge of the cap, does not form a rigid strut between the cap and insulating member, as the yielding material 25 and 26 is also between them.

The metal cap 19′ may also be made thin at its upper portion 24 to provide a yieldable portion which will burst under pressure due to expansion or contraction, thus relieving the pressure, without entirely separating the insulating member from the metal cap and causing a mechanical break-down.

In Fig. 10 is shown a construction in which the insulator parts are formed with a roughened surface instead of sanding the glazed surfaces, as above explained. In this case the glaze may be left off of the roughened parts and merely an elastic coating 15 supplied, which as before set forth, collects at the bases of the roughened projections 16′ leaving the points free to engage the cement 14.

The advantage of insulators constructed in accordance with this invention is that the projections formed are more or less resilient which tends to relieve the main insulating members of stress which may be set up between them, the projections thus distributing the load or stress between the parts since these projecting points tend to act as small elastic struts or springs of reduced cross section thereby deflecting readily under stress and relieving the main insulating members of high stress at any particular part, the load being distributed by the yielding of the projecting points.

Stress set up due to expansion of the cement through changing temperature, or aging, is also relieved by the elastic joint so provided. The joint has the advantage of a considerable control in the elasticity, it holds the parts together firmly, and is cheaply made. By regulating the size of the projecting points, their number and the coating material it is readily seen that a wide range in elasticity may be provided for stresses applied to the point in either direction. Joints may be made by this method such that there will be no looseness between the parts but still they will have sufficient elasticity or give so as to relieve internal stresses or those due to applied load. Because of this greater elasticity insulators constructed in accordance with these principles are able to withstand the stresses due to expansion and contraction with less frequent breakage.

What I claim is:

1. The process of making insulators having a plurality of parts, which consists in coating adjacent corresponding surfaces with material which produces a glaze when the insulator parts are vitrified, in applying to the said coating before firing uneven par-

ticles of the same material as that of which the insulator parts are made which adhere to the said surfaces and project above the glaze, in vitrifying the parts thus coated so that the projecting particles will be uncoated with glaze and in joining the insulating parts by applying cement between the surfaces having the said uneven projections.

2. The process of making insulators with a plurality of parts, which consists in coating adjacent corresponding surfaces with a material which will produce an adhering coating of glaze when the insulating parts are fired; in applying to the coating before firing uneven particles which will withstand the firing heat without distorting, and will adhere to the insulator surface and project above the coating, in firing the parts thus coated so that the projecting particles will be uncoated with glaze; in coating the surface thus prepared with a yielding material and in applying cement between the said corresponding surfaces on top of the yielding coating to form a rigid connection between the parts and at the same time permitting of expansion and contraction thereof due to changes in temperature.

3. An insulator consisting of a plurality of parts having coöperating cementing surfaces, one or more of the surfaces having thereon an underlying glaze from which there are projections; a coating of yielding material reposing on the cementing surfaces and held in the spaces between the projections; and cement between the roughened surfaces of the parts to be united so that there will be a rigid connection but of sufficient resilience to permit of expansion and contraction without breaking the insulator parts.

4. An insulator consisting of a plurality of parts with corresponding cementing surfaces, the surfaces provided with a multiplicity of uneven, unglazed projections extending above a coating of glaze on the cementing surface and by which the projections are made to form a substantially integral part of the insulator; a coating of yielding material reposing on the cementing surfaces but from which the projection extremities are substantially free; a pad of yielding material interposed between adjacent corresponding surfaces not roughened; and cement interposed between the roughened cementing surfaces for rigidly connecting the projections so that a yielding action of the insulator parts may be had due to the expansion and contraction in use.

5. An insulator consisting of a plurality of parts with corresponding cementing surfaces, the surfaces provided with a multiplicity of uneven, unglazed particles having projections extending above a coating of glaze on the cementing surface and by which the projections are made to form a substantially integral part of the insulator; a coating of yielding material reposing on the cementing surfaces but from which the projection extremities are substantially free; and cement interposed between the roughened cementing surfaces for rigidly connecting the projections so that a yielding action of the insulator parts may be had due to the expansion and contraction in use.

6. An insulator consisting of a plurality of parts, one or more of the parts being composed of an insulating material, the parts being provided with corresponding cementing surfaces and the insulating member having its cementing surfaces provided with uneven unglazed projections extending above a glazed surface and forming a substantially integral part of the insulator, a layer of yielding material reposing on the projections, and cement rigidly connecting the projections of one part with the surface of the adjacent part so that a yielding action of the parts may be had in case of expansion and contraction in use.

7. An insulator comprising a plurality of parts, each of which has a glazed cementing surface one or more of which has projections which extend above the glaze, a coating of yielding material for said projections, and cement interposed between the cementing surfaces on top of the elastic coating and engaging said projections to form a rigid connection between the parts which permits of expansion and contraction being taken up largely in the rigid connection so as to reduce stress in the insulator parts proper due to expansion and contraction.

8. An insulator consisting of a number of parts provided with corresponding surfaces for uniting the various parts, the corresponding surfaces provided with uneven particles having projections extending above and integrally attached to the surface by a layer of glaze, yielding material interposed between the surfaces of the parts not roughened, and a layer of cement connecting the projections on the roughened surface, thereby producing a yielding joint between the parts in case of expansion and contraction in use.

9. An insulator consisting of a number of parts one or more of the parts having connecting surfaces provided with a plurality of pointed projections, a layer of yielding material reposing on the roughened connecting surfaces at the base of the projections, and cement connecting the projections above the yielding coating to carry the stresses between the insulator parts by the projections which extend into the cement.

10. An insulator composed of a plurality of parts having coöperating cementing surfaces, cement positioned between the coöperating cementing parts and one or more of the parts composed of a vitreous insulating

material, means distinct from the parts themselves projecting from the cementing surfaces and embedded in the cement whereby any stress is carried by a section of reduced area, thereby concentrating the stress or strain in the joints and reducing the stress in the insulating member.

11. An insulator consisting of a plurality of parts, particles with projections on the surfaces to be connected, the projections decreasing in area toward their end, and cement between the connecting surfaces in which the projections are embedded so that stresses between the parts will be carried by the projections, thus relieving the insulating parts themselves of internal strain.

12. An insulator consisting of a plurality of members, particles thereon with pointed projections, and cement uniting the members by connecting the outer ends of the projections thereby concentrating the strain between the parts in the projections which are of comparatively small cross section, and relieving the main insulating members of stress due to uneven expansion or contraction of the parts of material used in the assembly.

13. An insulator comprising a plurality of parts, one or more of which are composed of insulating material, means on the parts whereby they may be assembled into a single unit, the means comprising a partly rigid and partly yielding bearing surface whereby the stresses in the insulator members due to changes in temperature will be minimized and the stresses will be concentrated in the rigid bearing surface.

14. An insulator consisting of a plurality of parts having connecting surfaces which are roughened by projections, a coating of yielding material reposing on a part of the roughened surface, the remaining part of the surface being practically free of yielding material, and a fastening cement engaging the part of the projections free of yielding material and uniting the insulator parts, thus minimizing the stresses transmitted to the insulating members proper due to changes in temperature.

15. An insulator comprising a plurality of parts having roughened projections on the surface to be joined, a yielding material attached to a part of the roughened surface leaving the outer extremities of the roughened projections free from such material, and cement connecting the parts by engaging the outer extremities of the rough projections thereby minimizing the stresses transmitted from one insulating member to the other, and concentrating the strain in the connected projections.

16. An insulator consisting of a number of connected insulating parts, projections on the connecting surfaces, a yielding material reposing between the projections and partially covering the space therebetween, and cement interposed between the parts and into which the projections extend.

17. An insulator consisting of a number of parts, each part having a cementing surface with projections therefrom, a yielding material reposing in the spaces between the projections, the points of the projections being free of yielding material, and cement disposed between the points of the projections not coated, thereby reducing the actual contact surface between the parts and concentrating the strain in the projections.

18. An insulator consisting of a number of separate parts each having a connecting surface comprising particles with pointed projections extending from the body of the insulator and held thereto by a vitreous coating and forming a substantial continuation thereof, the cross section of the projections decreasing toward the end, and a cement interposed between the connected parts and between the extremities of such projections for concentrating the stress or strain due to expansion and contraction in the projections between the parts themselves.

19. An insulator consisting of a plurality of separate connected parts having cooperating connection surfaces each formed with projections substantially integral therewith decreasing in cross section toward their ends, a yielding coating applied to the projections and substantially filling the spaces at the bases thereof between the projections, leaving the extremities free of such material, and a connecting cement interposed between the parts and contacting with that portion of each projection which extends above the yielding coating applied thereto.

20. An insulator comprising a plurality of parts, each formed with a glazed connecting surface and each having corresponding roughened surfaces formed by applying particles of substantially the same material as the insulator parts to the glazed surface before firing, and a connecting cement interposed between the parts forming a substantially rigid but slightly yielding connection between the projections of the said roughened surfaces, due to the resilience of the projections.

21. An insulator comprising a number of parts each formed with a glazed connecting surface, particles of substantially the same material as the insulator part applied to the glazed surface before firing, so that the glaze substantially fills the spaces at the base of each projection, making it a substantial continuation of the insulator part itself, an elastic coating applied to the projections and caused by capillary attraction to collect at the bases of the projections, leaving the extremities of the projections free from such

material, and a fastening cement interposed between the connected parts and forming substantially rigid contact with the parts of the projections above the said yielding coating, thereby concentrating the stress or strain between the parts in the said projections.

22. An insulator consisting of a plurality of nested parts cemented together, one or more of the nested parts composed of a vitreous insulating material having its cementing surfaces formed with a multiplicity of small projections composed of the same material as the insulating members and held to the cementing surface of the insulating member by a vitreous glaze.

23. An insulator consisting of a plurality of parts united by a cement interposed between adjacent surfaces and one of the parts being composed of an insulating material having its cementing surfaces formed with a multiplicity of projections composed of a material similar to that of the insulating member and attached to the cementing surfaces of the insulating member by a vitreous glaze.

24. An insulator consisting of a plurality of parts united by a cement interposed between surfaces and one of the parts being composed of an insulating material having its cementing surfaces formed with a multiplicity of projections, and a yielding coating applied to the cementing surfaces and resting at the base of the projections leaving the larger portion of the projections free of the yielding material, the free part of the projections being embedded in the cement.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses on the 26th day of May, A. D. 1916.

ARTHUR O. AUSTIN.

Witnesses:
A. J. CRANE,
K. W. WONNELL.