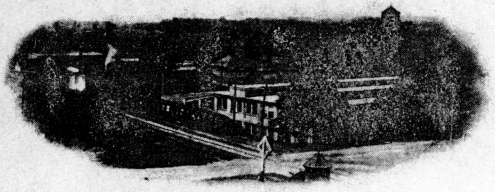
THE LOCKE INSULATOR MFG. CO.

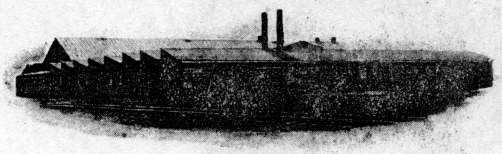
VICTOR, N. Y., U. S. A.



VICTOR, N. Y., WORKS

TRADE MARK

TRADE "VICTOR" NAME



LIMA, N. Y., WORKS

MANUFACTURERS — ENGINEERS

"VICTOR" INSULATORS AND POWER LINE SPECIALTIES

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Sheet 2
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Cancels 1

ANNOUNCEMENT

IN addition to the service of this book as a catalog of our products, it will be our purpose to include data pertaining to pole and tower line construction, wire, line protective devices, etc., and since this field is developing rapidly we have planned this book to be loose-leaf.

It is our further plan not to burden the recipient with the task of keeping additional sheets properly filed, but to issue frequently new complete revised copies—probably every eight or nine months.

Furthermore we will upon request at any time send catalogs which are revised up to the date of mailing, thus enabling those actively using our publication to obtain our very latest information.

In the upper right corner of this sheet is our record number of this particular copy. The two figures at the right denote the year; the two next figures the day of the month, and the remaining figures, the month of the issue of this copy. To avoid all chance of error in referring to particular items, give the sheet number shown in the lower right corners.

We take this opportunity of greeting all our friends.

THE LOCKE INSULATOR MFG. CO.

NOTES

Insulating Materials

In the early days of the study of electrical phenomena, attempt was made to divide all materials into two classes, conductors and non-conductors; but with the advance in the art, a hard and fast line of division between those materials which conduct and those which do not became increasingly difficult, until at the present time it is practically impossible to define our carelessly used word "insulator." Thus the word has become purely relative and has now only a commercial meaning to separate those materials which have very low resistance to the passage of current electricity from those which limit the flow to the smallest amount. So long as the electrical pressures used were very small, it was not difficult to confine the greater part of the current to the path designed for it, but as the voltages used became greater there arose a demand for better insulating materials.

In general, a modern insulating material must be low in first cost, easily moulded into complicated shapes and of long life.

The materials first used in electrical work were wood, rubber, glass, mica, asbestos, lava and various compositions, usually of an organic nature. For certain kinds of work they are still used, but generally for line work porcelain is now recognized as the only satisfactory material. For low voltages glass is still sometimes used, but its uncertain mechanical characteristics prevent its use on important work of any kind. Frequent attempt is made by enthusiastic inventors to concoct mixtures of shellac, asbestos and mica, which will withstand high voltages, but up to the present time no satisfactory compound has been made. It seems illogical to expect that any organic compounds can ever be made which will have lasting qualities, since high electrical pressures through the body and over the surfaces of such insulating materials merely hasten decay and ultimate failure. Such organic compounds deteriorate under normal atmospheric conditions, the very conditions under which they were made. Porcelain, on the other hand, contains only stable materials. Flint and feldspar were made ages ago and come to

NOTES—*Continued*

us unchanged. They are fused into a homogeneous mass at extremely high temperatures and the result, porcelain, is a material which, so far as is known, remains unacted upon by natural forces for an indefinite period. Concisely, all insulating materials may be classed as "temporary" and "permanent," and in the latter class there is but one material suitable—porcelain.

General Insulator Specifications

Specifications for porcelain insulators should cover the following points:

TYPE—Pin, suspension, strain, roof or wall insulator.

LOCATION—Indoor or out, geographical location and a statement concerning the atmospheric conditions under which the insulator must operate.

LINE VOLTAGE—Delta or star (voltage to ground).

DRY TEST VOLTAGE—How to be applied and time.

RAIN TEST VOLTAGE—How to be applied and time.

MECHANICAL TESTS—How to be applied and time.

COLOR OF GLAZE—Brown (standard), slate, white or special.

HOW PACKED—

Insulator Testing

Insulator tests may be roughly classified as design and routine tests.

Design Tests

Design tests cover those features of paramount interest to the purchaser and are carried out on representative

NOTES—*Continued*

samples of the product. This consists of an inquiry into the mechanical and electrical characteristics of insulators when subjected to the worst conditions to which they may ever be subjected in practice. It is customary to test all designs to their ultimate strength by immersing in oil and puncturing; to ascertain the flashover value when subjected to a heavy rain and to test mechanically to destruction by applying forces in the manner in which the insulator will be obliged to carry a load when in actual line service.

The methods necessary to pursue in finding the ultimate puncture strength and ultimate mechanical strength are obvious, but on account of the many variables it is necessary to carefully define the methods used in arriving at the values given in this catalog under "Rain Tests."

Rain tests on pin type insulators have usually proven most unreliable due to the fact that the angularity of the spray, its fineness, rate of precipitation, velocity, temperature, distance of nozzles from the insulator, time element, etc., all seriously interfere with an attempt to secure comparable or uniform results. Further, the size of cross arm, height of insulator above cross arm, size of pin, method of attaching transformer terminal to the top insulator, as well as voltage measurement and wave form of testing transformer, introduce complications any one of which may cause errors as great as 20%.

We have therefore found it necessary to standardize, at least for our own service, some set of conditions under which all design tests on insulators shall be carried out. These conditions are defined as follows:

TRANSFORMER—200 K. K., 60 cycles. Regulation by inductor regulator.

WAVE FORM—Sine.

VOLTAGE MEASUREMENT—Spark gap using No. 3 Sharp needles in connection with curve shown herewith.

SIZE CROSS ARM—5 x 7 inch long leaf yellow pine.

PIN—1 inch cold rolled steel.

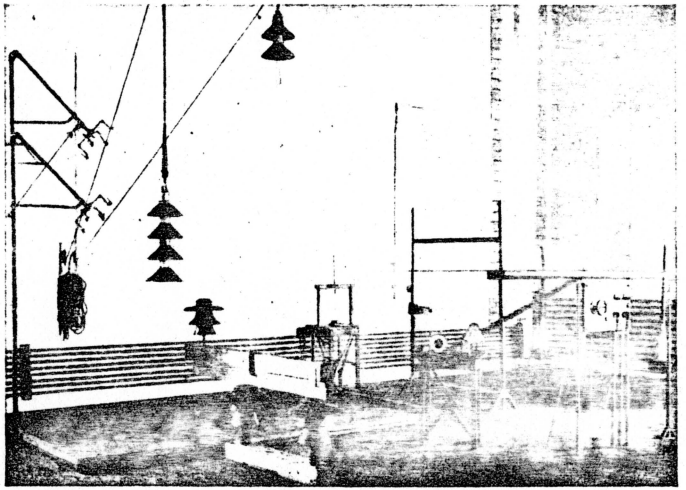
DISTANCE BETWEEN INSULATOR AND CROSS ARM—One-half the diameter of the lowest shell.

NOTES—*Continued*

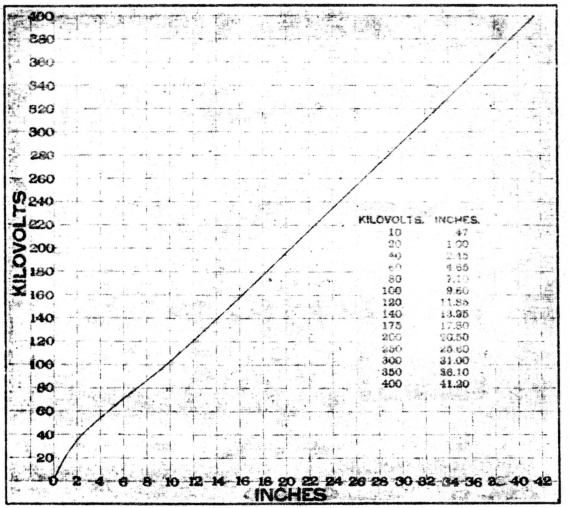
TOP ATTACHMENT—½ inch solid conductor tied in regular manner into the top wire groove, or in the absence of any top groove, to the side groove.

SPRAY—From Gould Mfg. Co. "Mistry" nozzles having an orifice .048 inch in diameter and operating under 40 pounds pressure.

RATE OF PRECIPITATION—$\frac{1}{5}$ inch per minute.



High voltage testing laboratory, showing four No. 273 and one No. 2092 insulators in position for precipitation test.



Striking distance in air between No. 3 Sharp needles, for effective sinusoidal voltages.

NOTES—*Continued*

ANGULARITY—45 degrees.

NOTE.—A sufficient number of nozzles are used to throw a uniform spray over an area large enough to accommodate the largest insulators.

TEMPERATURE—65 degrees to 70 degrees F.

To eliminate possible error the apparatus shown herewith was erected and with it all tests are carried out. Spray device, cross arm, and in fact all parts are permanently installed in order that tests under exactly similar conditions as when originally made may be repeated or that the relative value of different designs may be accurately determined.

Suspension insulators are also tested with this apparatus, the zone wetted by the sprays being sufficiently large to take in insulators up to six feet in length and 28 inches in diameter. Pin type strain insulators, roof insulators and wall insulators are also tested with this apparatus.

Routine or Dry Tests

Each piece of porcelain manufactured by us is subjected to an electrical test for a period of one minute unless otherwise specified. The potential applied to any shell has no relation to the line voltage at which the shell or assembled insulator is to be used, since the only object is to satisfy ourselves and customers that the porcelain supplied is of the highest quality and free of defects of any kind. All pieces are tested so that that portion subjected to the severest service on the line is in close contact with the terminals of the testing transformer.

The methods used in testing the various shells and insulators are as follows:

METHOD A. This is the usual method of test for either one piece or multipart insulators. The tests specified in this catalog are made by this method. The plan consists in immersing the head of the insulator in water up to the depth of the threading. Connections are made as illustrated.

NOTES ON SUSPENSION INSULATOR CONSTRUCTION

As early as 1850 European telegraph engineers utilized suspension insulators, employing the same general method of construction as used to-day. The use of this type of insulator for high voltage was first begun, we believe, by this company in 1901, but its general adoption was retarded by the reluctance of engineers to trust to the unavoidable cemented joints used in tension. The increasing potentials for transmission and the extreme cost of the usual pin-type insulator forced the adoption of the suspension type which has been generally used since 1906. It is a fact that the modern suspension method was designed primarily for insulation advantage, but the suspended line has also certain mechanical advantages.

SUPPORTING STRUCTURES

In general, the suspended line does not dictate any particular type of construction. Wood, concrete, or steel poles or towers are equally adaptable to pin or suspension insulators. At present, wood poles and steel towers are almost exclusively used, steel towers being generally favored, offering mechanical security and economy of long spans.

Steel towers of several types have been developed for this work. The first single-circuit towers carried two wires on one side and the remaining one on the other side. The modern single-circuit tower carries the three wires in a horizontal plane, supported by a single long cross-arm. Double circuits are usually supported from three cross-arms on a single tower, one circuit in a vertical plane on each side. (See sheets 48 and 56.)

The towers for suspension lines are, in general, of somewhat lighter construction, but slightly higher than for lines using pin-type insulators. With suspension insulators no torsional strain is brought upon the cross-arm.

Towers should be so placed that the contraction of the conductor in the coldest weather will not raise it upward at joints of support. In several cases where due care has not been used in placing towers the conductor has raised itself and come in contact with the cross-arms. A line passing over rough country where the spans are of varying length will have a longitudinal motion, causing the insulators to be drawn away from the vertical.

Wind will cause more or less swinging of the conductors, but if the insulators are of equal length and the sag of the conductors equal there is small danger of short-circuits. Forty-five-degrees transverse swing each side of the normal position of the insulator is standard clearance. This will influence the tower design in that sufficient clearance must be left at all time between the conductor and the nearest portion of the tower, and also that there may be sufficient flexibility between the insulator and the supporting cross-arm.

The usual line design provides a standard tower throughout, and as frequently as may be considered necessary a tower is head-guyed, the cables dead-ended, and a jumper connection inserted between spans, or in some plans, specially-strong towers

are provided at anchorage points. Sharp angles are turned by the use of this construction. It is at these points that strain, or anchorage, clamps are used. (See sheet 56 — Great Western Tower.)

CLAMPS AND CROSS-ARM CONNECTIONS

As the breaking of a conductor will allow the insulator to swing out nearly horizontally, the top insulator connection should be so designed as to permit of such longitudinal motion of the conductor without distortion of any connections.

An efficient method of cross-arm attachment, for both suspension and strain towers and which has had wide application, is a simple hook with eye (see catalog No. 2569A), allowing universal motion between strings of insulators and cross-arms. This method is particularly desirable, since it permits attaching hook and insulators to cross-arm without disturbing the receiving member of the cross-arm.

In designing the cross-arms it should be noted that the plane of this hook must be parallel with the line. Simply a hole in the web of the steel arm to receive the hook is entirely satisfactory and simple. (See Figs. 1–5.)

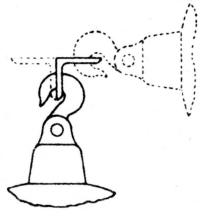
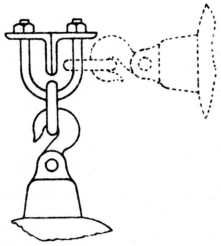


FIG. 1
Direct attachment of hook.

FIG. 2
"U" bolt, link and hook design.



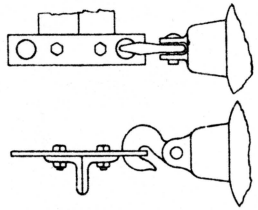


FIG. 3
Or the method shown in Fig. 2 can be simply modified at strain points as here shown, using a plate bolted through same holes used for U bolt.

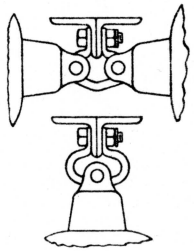
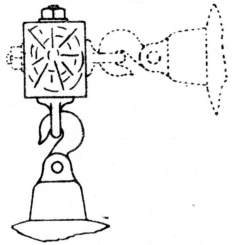


FIG. 4
Direct attachment to clevis, which is permitted to swing parallel to cross-arm.

FIG. 5
For wood cross-arms a bolt-eye such as No. 2681 and hook satisfy every requirement.



In general, dead-ending or anchoring should be avoided, when possible, as the effects are bad, mechanically and electrically. Dead-ending, by means of two horizontal sets of insulators with jumper has frequently been a cause of much trouble, due to the jumper wire coming in contact with the cross-arm when stranded conductor has been used with a type of insulator whose

connections between units allows of relative torsional motion. A change in temperature causes a change in the tension of the conductor at the dead-ends and the jumper is twisted up against the cross-arm. In some cases to remedy this difficulty it has been necessary to add a third string of insulators to hold jumper down (Fig. 6); in others of lower voltage, an extra cross-arm has been erected below the regular arm and pin-type insulators mounted with jumper tied to them, and still others have employed heavy weights secured to the bottom of jumper. There is no chance of these troubles with "Victor" designs.

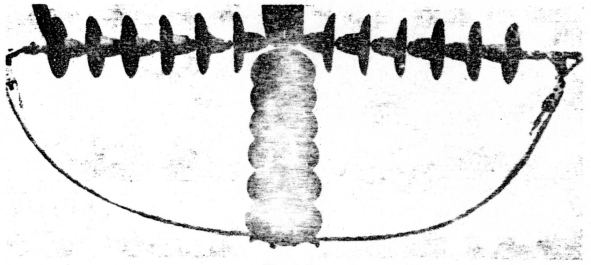


FIG. 6

Third string of insulator to hold jumper. An expensive and undesirable addition necessary because of defective insulator design.

Usually in strain insulators one unit more is used than in suspension string. This is not for electrical reasons, but because a broken unit in a strain string is much more difficult and expensive to replace than in a suspension string. With an extra unit in place, replacing of a broken unit may be deferred.

Cable clamps for suspension points are designed either to allow conductor to slip at nominal pull or to hold the cable to approximately breaking load, in case of a broken span. If designed to slip, probable damage to conductor for some length will result. Our clamps are designed as positive clamps and, with a few designs excepted, they will hold up to breaking strain of cable. Suspension clamps should be so designed with liberal cable seat, long free approaches, and so properly and flexibly connected to the insulator as to keep the cable free from damage either under normal conditions or in case of broken conductor, in which latter case the suspension clamp is temporarily thrown into use as a strain clamp.

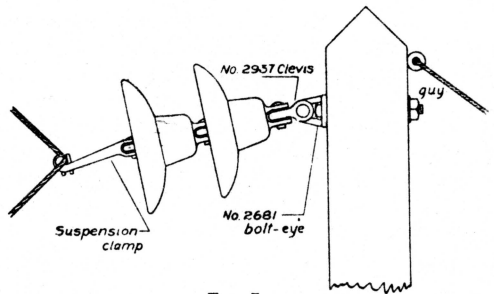


FIG. 7

Ordinary angles can be turned in this manner, avoiding jumper connection. Suspension clamps are used in this construction which may be employed in a line employing pin-type insulators on tangent.

Strain or anchorage clamps should have their cable-clamping grooves so arranged that the cable does not ride over any curved saddle or be otherwise distorted between the clamp and the span and clamping-areas should be liberally long and practically smooth and cable should not be held by J or U bolts, causing kinking and abrasion. These are vital precautions.

Connections between adjacent units and between units and clamp and units and cross-arm connections should embody the following features:— units

interchangeable; connections flexible to allow necessary accommodation to line vibrations though definitely limited in flexibiltiy to prevent adjacent porcelain striking together when handled in a string; simple, so that field supplies can be utilized in emergency; prevent relative torsional movement between units to prevent jumper connection grounding on cross-arm, and of universal application, so that no extra special fittings are necessary for special uses, as in securing to eye-bolts or web of structural steel as in power-house wiring or to steel strand by means of ordinary guy-clamps.

Of the many designs suggested, the simple bolt and clevis-type of joint originally adopted and continuously used by us, satisfies all the above requirements, has had most extensive operating approval, and its use become so extensive as to be considered the best standard approved construction.

ELECTRICAL CHARACTERISTICS

The use of metal parts in a modern suspension insulator is dictated by the demand for mechanical strength. Assuming, therefore, the necessity for the metal cap and interior bolt in the design, the desirable electrical characteristics are essentially high puncture strength, sufficient surface resistance and ability to rid itself of an arc, or to withstand the heat of the arc, in case of flashover.

In order to limit the voltage at flashover, it is desirable to space the units as closely as may be without reducing the effective surface resistance. Thus, for a 10″ diameter unit the surface resistance begins to appreciably drop when spacing is less than $5\frac{3}{8}$″. It appears impossible to avoid entirely damage to the insulators from a heavy arc-over without the application of arcing rings. (Sheet No. 6500.)

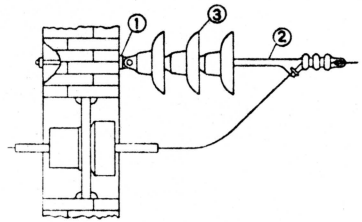
With suspension insulators, the difficulty of securing a triangular arrangement of wires, as usually adopted with pin-type insulators, has been met by discarding that arrangement almost universally, and in some cases eliminating all transpositions. No ill effects are reported either in transmission or on paralleling telephone circuits.

The overhead guard wire is without doubt of real help in preventing lightning disturbances, and its use is very general. It usually is of galvanized steel stranded conductor approximately $\frac{3}{8}$″ in diameter, and securely clamped to the tower top several feet higher than the conductors. Its primary object is to produce a zone of earth potential above the conductors, but there is little doubt it also acts effectively as a damper to any surge of heavy current flowing along the transmission line.

PIN-TYPE VERSUS SUSPENSION-TYPE INSULATORS

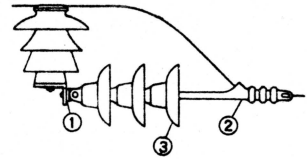
Above 66,000 volts there is no question concerning the superiority of suspension insulators, but for 66,000 volts and below the pin-type has much in its favor. Disregarding the mechanical advantage of suspending conductors the question reduces to one of cost. At present a 66,000 volt-pin type insulator and steel pin costs about seventy per cent. of the equivalent suspension insulator. A 33,000 pin-type about thirty-three per cent. of the equivalent suspension-type. For this reason pin-type insulators for voltages below 66,000 are at present generally used as their electrical and mechanical characteristics are very satisfactory. They lack, however, a feature which has prompted the use of suspension insulators for voltages much below 66,000—adjustment to later increased line voltage by the addition of one or more units.

SPECIAL APPLICATIONS OF SUSPENSION TYPE INSULATORS



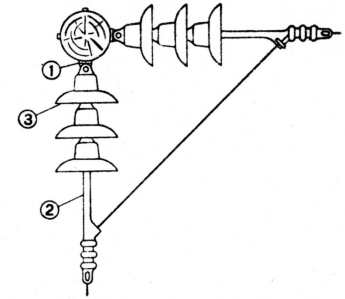
Anchorage at wall entrance insulator

(1) No. 2681 bolt eye or 2569A hook.



For special spans as over rivers, railroads, etc., in connection with pin type insulators for regular line construction.

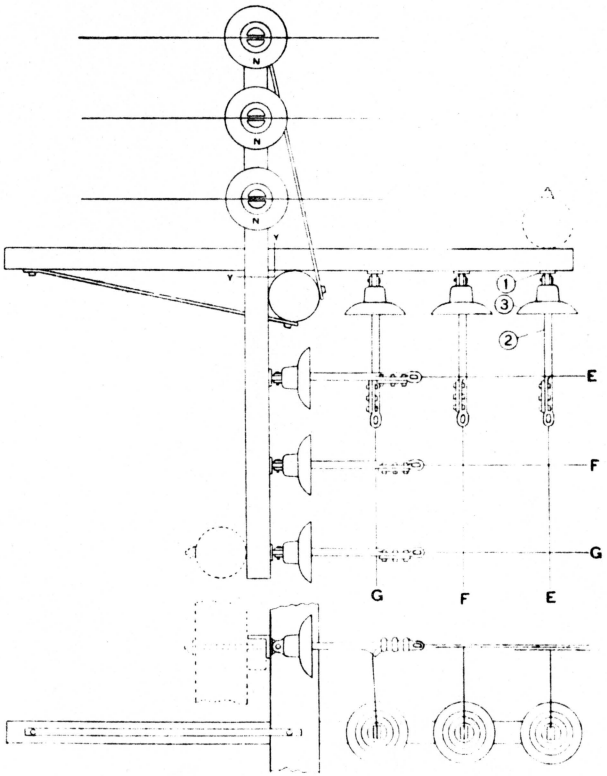
(2) Strain clamp No. 3032, etc.



For corners involving one circuit only the above construction is very good, the phases being placed one above the other.

(3) Suspension insulators No. 2335A, etc.

SPECIAL APPLICATIONS OF SUSPENSION TYPE INSULATORS



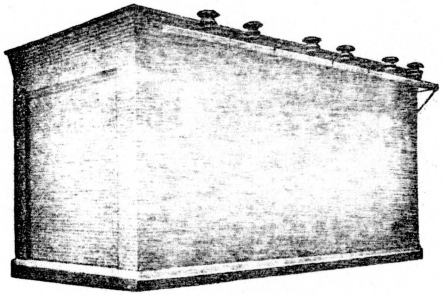
A system of angle construction in connection with pin type insulators for straight line, and specially valuable on account of economy of pole top space. If desired three poles can be compactly used as indicated. In case of a two, or more, circuit line, one or more circuits can be turned, while the straight circuits are carried at (N). If all circuits turn and three poles be used the cross-arms may be cut off at (Y). Engineers will be cheerfully furnished details of our material for laying out such angles for their particular voltage and clearance.

(1) No. 2681 bolt eye and No. 2569A hook. (2) Strain clamp No. 3032, etc. (3) Suspension insulators No. 2335A, etc.

NOTES—*Continued*

Test room No. 2 showing 1125 terminals for commercial test up to 200,000 volts.

At our Victor works are three testing rooms having a total of 1800 testing terminals, equivalent to 1800 to 3600 large multipart insulators per day. One piece insulators are tested in a separate department, having a capacity of 6000 ihsulators per day. The insulators here shown are No. 312. The insulator parts are cemented together on these racks so that they are undisturbed until ready for test.



Substation at Victor works containing three transformers each of 250,000 volts, 60 cycles, used for routine insulator testing.

Line Insulator Pins

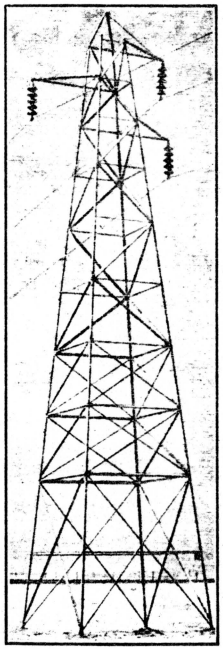
Wood, as a structural material for use in supporting line insulators, has for many years been regarded as most desirable. It is cheap, strong, easily fabricated, and in some slight degree adds to the insulator strength of the line. A properly impregnated pin of generous design is for all but the highest potentials very satisfactory. The fault with wood pins lies in the danger of burning or digesting of that portion adjacent to the porcelain. At the threaded portion the wood pin is of smallest cross section, and being thoroughly dry at this point, the resistance to leakage or capacity current flow is greatest. Also, the electrostatic flux density is greatest at the point of least cross section, so it is not surprising that the familiar burning or digesting occurs. Cross arm burning is of comparatively rare occurrence, its cross section usually being ample to conduct any reasonable leakage or capacity current. Moreover, when the insulator is subjected to the worst conditions, the cross arm becomes a fairly good conductor because of presence of water on its surface. Metal pins entirely relieve the burning and digesting difficulty and also provide greater mechanical strength. Porcelain base metal top pins have all the desirable characteristics of all metal pins together with some electrical superiority.

In general, wood pins used in connection with insulators of very high safety factor in climates not affected by salt fogs or chemical fumes are satisfactory, but for most cases an all metal pin or porcelain base pin with metal top will be found a good investment.

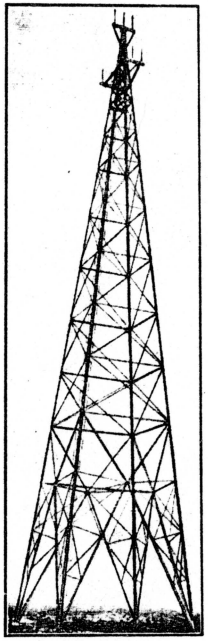
Solid steel or iron pins, necessitating cementing in the field at a very considerable cost as well as danger of improper workmanship, have given way to pins which include some form of separable thimble, which can be economically and properly cemented into the insulator at the factory and in turn screwed onto the pin body erected on the poles or towers. Probably the greatest benefit of this form of construction is the ease with which broken insulators can be replaced.

Steel Transmission Tower Designs

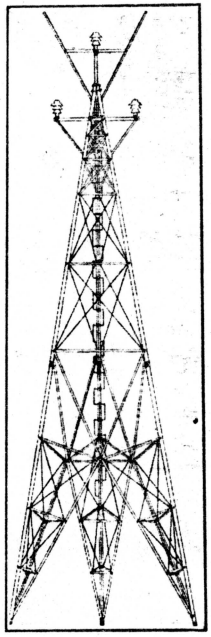
Here are shown a few representative types of modern towers and line construction.



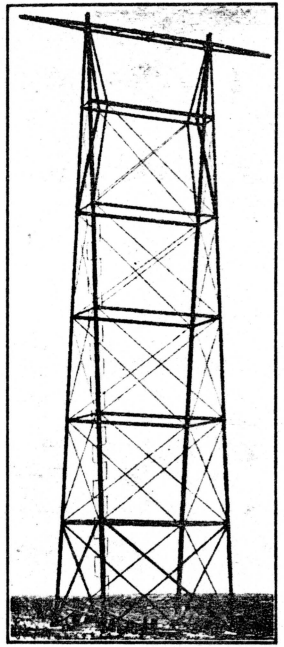
Aermotor Co. 65 ft. tower for Sierra-San Francisco Power Co. (Stanislaus). Sanderson & Porter, Engineers.



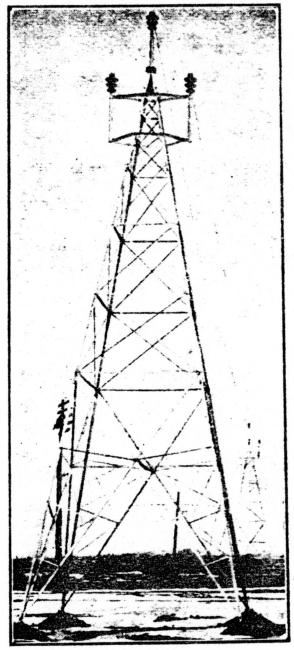
Aermotor Co. 75 ft. triple pin tower for Niagara, Lockport & Ontario Power Co.



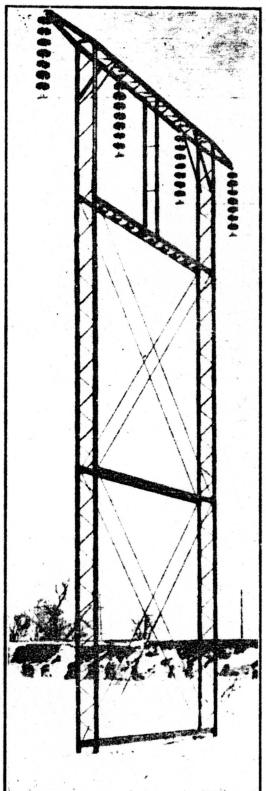
Aermotor Co. 40 ft. tower for Commonwealth Power Co.



Aermotor Co. 40 ft. tower for Michoacan Power Co.

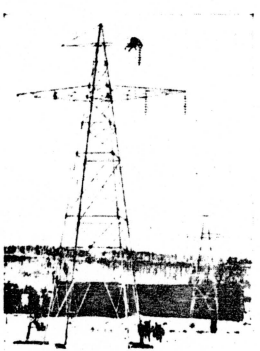


Aermotor Co. 49 ft. tower for Niagara, Lockport & Ontario Power Co.

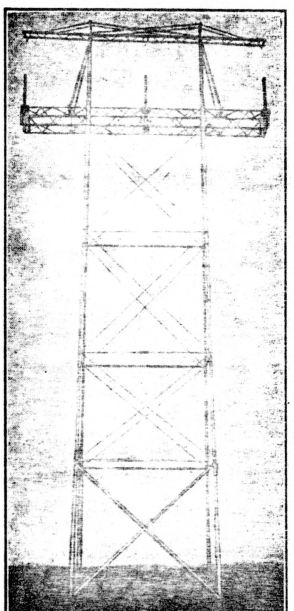


Archbold-Brady Co. semi-flexible transmission structure.

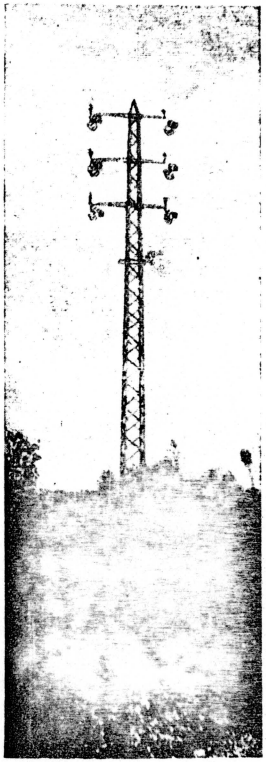
Riter-Conley Co. double circuit tower for Mexican Light & Power Co.



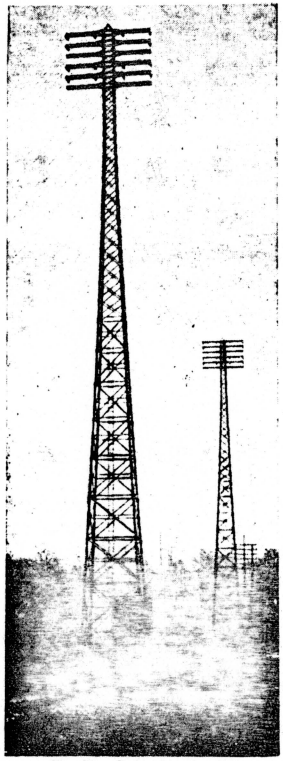
Canadian Bridge Co. tower for Hydro-Electric Power Commission of Ontario.



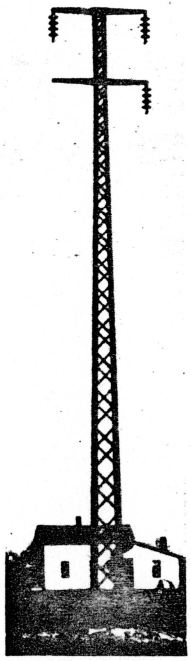
U. S. Wind Engine & Pump Co. combination pin and suspension insulator tower for Telluride Power Co.



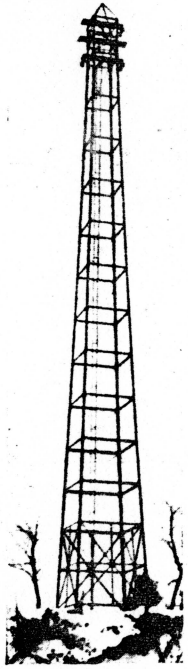
R. D. Coombs & Co.
Narrow base steel pole.



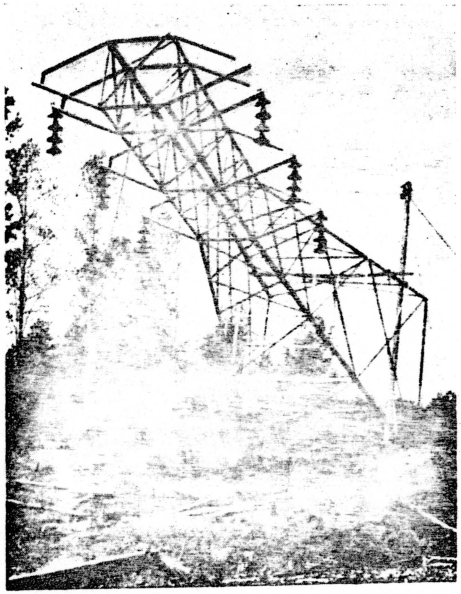
R. D. Coombs & Co.
River crossing tower,
156 ft. high.



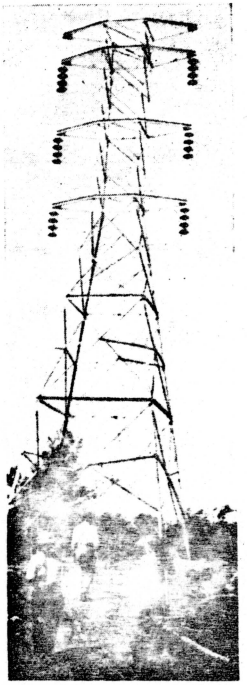
Archbold-Brady Co.
Narrow base steel
poles, 50 ft.



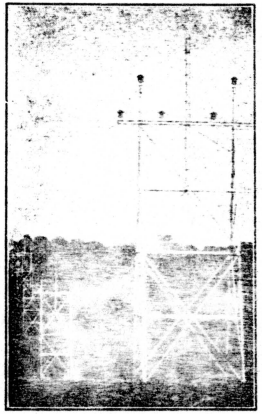
Archbold-Brady Co.
169 ft' river crossing
tower.



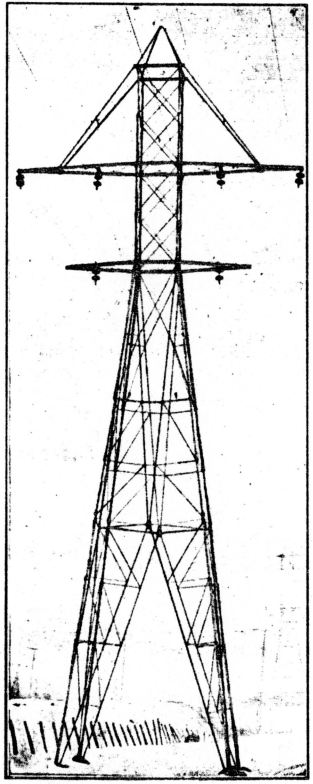
Method of erecting American Bridge Co. 70 ft. double circuit towers. Georgia Power Company.



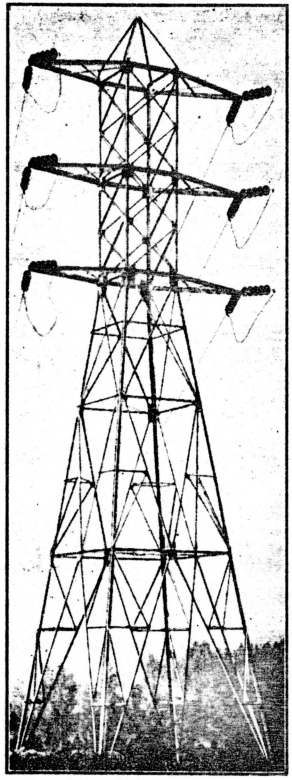
Erected tower American Bridge Co. 70 ft. Georgia Power Company.



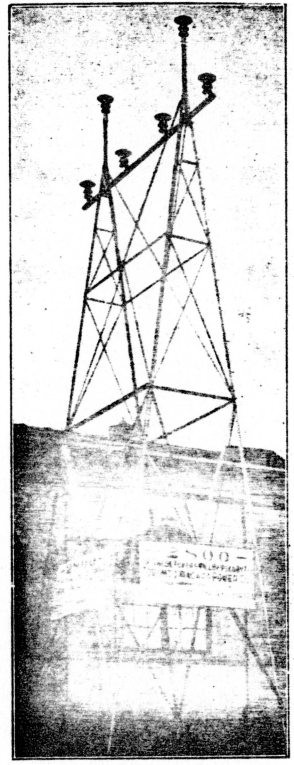
American Bridge Co. tower for Connecticut River Power Co.



Milliken transposition tower, Schaghticoke line.



Milliken 100,000 volt towe Great Western Power Co.

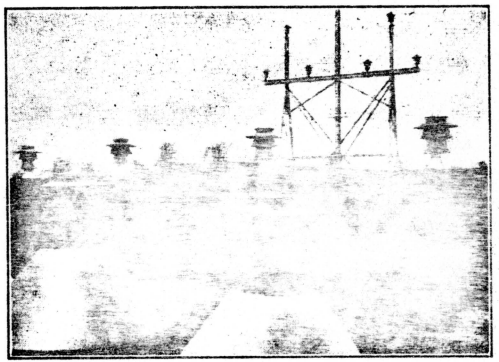


Canada Foundry Co. 60,000 volt tower used by Toronto-Niagara Power Co.

NOTES—*Continued*

Wall and Roof Outlet Insulators

The passing of high voltage wires through the walls, floors or roofs of power stations, calls for careful design of suitable bushings. Floor tubes are comparatively simple since the whole insulator is kept dry and clean. Roof and wall insulators demand most careful proportioning to secure satisfactory results since that portion outdoors is subjected to all kinds of weather and the portion inside quite likely to condense much moisture from the warm air of the room whenever cold weather prevails oudoors. Our designs are most conservative and are able to operate with good safety factor at specified voltage even when wet all over. The puncture strength is made many times higher than the dry flashover voltage, so the danger of failure is reduced to a minimum.



"Victor" roof insulators on the lines of the Connecticut River Power Co. Voltage 66,000, using insulator No. 360 on transmission lines. J. G. White & Co., Engineers.

Bus-Bar Insulators

We manufacture a line of bus-bar insulators up to 75,000 volts adapted to receive either copper bars or tubes. These are illustrated in this catalog. Above 60,000 we strongly urge the use of sectional strain insulators for supporting any kind of bus-bar. By the use of such insulators, neat, strong work is erected at small cost. (See illustrations under SUSPENSION STRAIN INSULATORS.)

Storage Battery Supporting Insulators

We manufacture special designs for supporting electrolytic tanks of all weights.

NOTES—*Continued*

Threading

The standard pitch for pin and pinhole threading is 4 threads per inch, and the standard diameters are 1 inch (standard pinhole) and $1\frac{3}{8}$ inch (large pinhole). These are the extreme diameters at the top of the pin and at the bottom of the pinhole. The standard taper for both diameters of pins and pinholes is $\frac{1}{16}$ inch increase in diameter per 1 inch in length.

Drawings

We are prepared to furnish to engineers complete drawings of any of our product. The line illustrations herein are, with few exceptions, $\frac{1}{6}$ full size.

Cement and Cementing

Shells of multipart insulators and metal connections of suspension insulators are joined by Portland cement. The secure fastening together of insulator parts is a matter of great importance especially in suspension insulators. Portland cement at its best is a very reliable material, but being notoriously variable in all its characteristics, it has been found necessary to exercise the greatest care in purchase and use. We purchase only the highest grade of cement offered in the American market, and not content with a manufacturer's guarantee, we consistently subject each barrel received to a searching test of all its mechanical and chemical properties.

It is our custom to mix our cement "neat," the mixture being 80% cement and 20% water by weight and is never allowed to stand more than 30 minutes before using.

Color of Glaze

Brown glazed porcelain is always furnished unless other color specified.

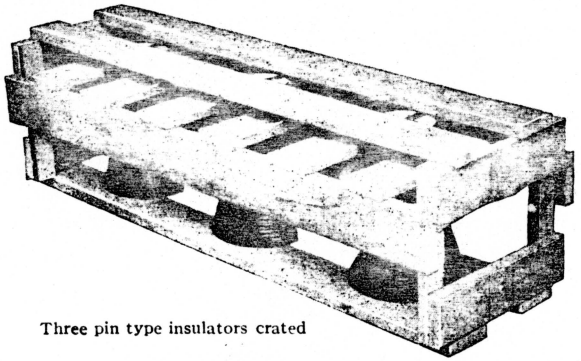
Shipping Notes

Packages and Packing All insulators herein shown are shipped complete ready for erection, unless otherwise specified, and packed in barrels or crates as indicated in the specifications.

Cubic Measurements The cubic measurement of crated insulators is approximately 55% more than the bare insulator. Our standard barrels are 24 inches in diameter by 30 inches high, or 10 cubic feet.

Export Shipping We furnish, when specified, at an extra net charge of 30c per barrel, a special barrel of extra heavy first grade stock and 10 instead of 6 hoops. This barrel weighs 9 pounds more than our standard, but the size is the same—24 x 30 inches.

Weights The weights given are subject to not more than 10% variation, depending upon the size of the insulator or special conditions.



Three pin type insulators crated

Export barrel

SHERARDIZING

A RUST-PROOFING PROCESS

FOR rust-proofing all iron and steel entering into our products, we now employ the Sherardizing process, the work being done entirely in our own plant at the Victor works. When galvanized material is ordered, sherardizing will always be supplied unless hot-dip process is plainly specified.

Sherardizing, sometimes called "dry galvanizing," is the forming of a zinc and zinc-iron alloy coating on the surface of the article treated. This coating is obtained by heating the thoroughly cleaned articles in the presence of zinc dust to a temperature of several hundred degrees for several hours. The process takes its name from the inventor, Mr. Sherard Cowper-Coles, and has been adopted very generally because of several distinct advantages over hot-dip galvanizing, which seems to be the only other rust-proofing process of any merit.

The advantages of sherardizing appealing to the consumer are: 1st.— The uniformity of the coating. It does not collect in corners, in ridges, or in beads; 2d.— Low comparative cost; 3d.— Its resistance to wear and abrasion.

The sherardized coating is practically uniform in thickness, which allows the thorough rust-proofing of threads without recutting, probably its greatest advantage for our class of product. The coating may be built up, by prolonging the process, to almost any desired thickness, fourteen ounces of coating having been applied to a square foot as a matter of experiment The coating is not uniform throughout its depth as to composition. It consists of a graduated zinc and zinc-iron alloy, knitted and "grown" into the texture of the body of the article, and gradually increasing in zinc until pure zinc is deposited on the surface. The resistance of the sherardized coating to wear and abrasion is remarkable. Bending, hammering, filing, etc., which may chip off the zinc surface, leaves the article rust-proof so long as the zinc-iron alloy is left. This alloy, intimately bound to the body of the metal, seems to have the property of resisting the action of solvents which readily dissolve either of the separate metals composing it. If, for example, a sherardized part is immersed in caustic soda the zinc outer coating is gradually dissolved, but when the alloy is reached the solvent action ceases. This remaining alloy coat, however, is still highly rust-proof. A galvanized part similarly treated will rust at once upon exposure.

The zinc dust is a very fine powder, almost impalpable, and penetrates and coats all parts, such as corners, holes, cavities, etc.

The exposed sherardized layer, being practically pure zinc, is capable of taking on a high polish.

All of our product is prepared for sherardizing by sand-blast so that the coating is built upon perfectly dry, clean, bright iron and steel.

The maximum temperature used being approximately 700 degrees F. and the articles very gradually heated and cooled, sherardizing does not injure the metal as is done many times by sudden plunging into melted zinc (788 degrees F). This, to us, is of particular value in the case of suspension insulator parts of malleable iron.

A further advantage of sherardizing is that no creeping or burrowing action of rust can take place, whereas with hot-dip process a pinhole not coated, due to dross or perhaps occluded acid or moisture used in cleaning the part, will allow rust to form and undermine the coating, peeling it off.

A gray or dark yellow powder, which may form upon the surface of sherardized articles which have been exposed to rain or sea-water, must not be mistaken for rust. The insoluble powder is evidently some form of zinc, and if it be wiped away the solid coating will be found intact beneath.

Finally, it may be said that, not unlike other products, the quality of sherardizing is greatly dependent upon the knowledge, skill, and good intentions entering into its production, and we are very careful that the quality of our sherardizing shall not fall below the standard set for our other products.

The Suspended Electrical Conductor and Its Insulation

The following notes were made after a careful investigation of practically all suspended lines in operation. Attempt has been made to keep them free of all bias and to present concisely the findings of the best engineers in the United States and Mexico.

Because of the recent use of flexibly suspended conductors for long overhead lines engineers are inclined to believe this method of construction novel and induced primarily by the demand for increased insulation for voltages above 60,000. Nothing could be further from the truth. First credit must be given to European Telegraph engineers, who used freely suspended conductors and flexibly connected insulators as early as 1850. These early suspension telegraph lines were dead-ended periodically by strain insulators and at such dead-ends a jumper wire was used. This early work antedates any possible claim to novelty by present day engineers. It is a fact that the modern suspension line was designed primarily for insulation advantage but it is worthy of special note that the suspended line has certain mechanical advantages which render it applicable to any over-head transmission system.

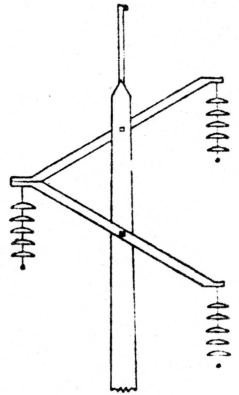


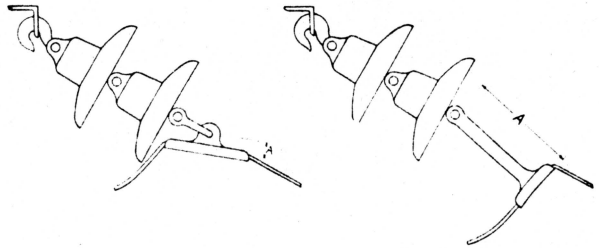
Fig. 1

Supporting Structures

In general the suspended line does not dictate any particular type of construction. Wood, concrete or steel poles or towers are equally adaptable to pin or suspension insulators. At present, wood poles and steel towers are almost exclusively used, steel towers being generally favored.

Where wood poles have been used the wish-bone construction as shown in Fig. 1 has been generally employed.

Steel towers of several types have been developed for this work. The first single circuit towers carried two wires on one side and the remaining one on the other side (Fig. 2). The modern single circuit tower carries the three wires in a horizontal plane supported by a single long cross-arm (Fig. 3). Double circuits are usually supported from three cross-arms on a single tower, one circuit in a vertical plane on each side (Fig. 4).



Length A, too short Fig. 5 Length A, too long

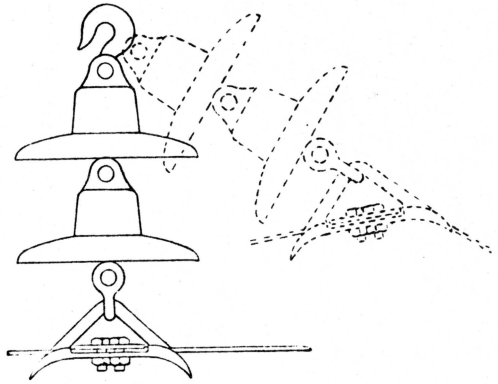


Fig. 6
Ideal Clamp in normal and emergency positions

rigid steel towers the problem of design becomes of greatest importance if freedom from troubles is expected.

Towers should be so placed that the contraction of the conductor in the coldest weather will not raise it upward at joints of support. In several cases where due care has not been used in placing towers the conductor has raised itself and come in contact with the cross-arms. It should also be kept carefully in mind that a line passing over rough country where the spans are of varying length will have a longitudinal motion causing the insulators to be drawn away from the vertical.

Wind will cause more or less swinging of the conductors, but if the insulators are of equal length and the sag of the conductors equal, there is no danger whatever of short-circuits. It is always well in laying out the tower to allow for a total of 45 degrees transverse swing each side of the normal position of the insulator.

This will influence the tower design in that sufficient clearance must be left at all times between the conductor and the nearest portion of the tower and also that there may be sufficient flexibility between the insulator and the supporting cross-arm. As the breaking of a conductor may at any time cause the insulator to swing out nearly horizontally, the top

insulator connection should be so designed as to permit of such longitudinal motion of the conductor.

In general, dead-ending or anchoring should be avoided as the effects are bad, mechanically and electrically. It prevents the line adjusting itself to temperature change and places, in many cases, unnecessary strains upon the structures.

The dead-ending, as usually accomplished by means of two horizontal sets of insulators with jumper, is frequently a cause of much trouble due to the jumper wire coming in contact with the cross-arm (Fig. 4). A change in temperature causes a change in the sag of the conductor at the dead-ends and consequently, unless precautions are taken, the jumper is twisted up against the cross-arm.

Insulators and clamps should have a safety factor of at least three.

The foregoing is a general statement of the mechanical demands of the conductor support. The insulator used on tangents or straight line suspension joints should have a connection between it and the cross-arm which will permit of practically universal motion below the cross-arm. The clamp for making connection between insulator and conductor should be so designed that free motion may occur reasonably close to the axis of the conductor. Reference to Fig. 5 will show how a clamp having its flexible connection raised too far above the conductor may damage the conductor whenever there is longitudinal motion of the line. If the flexible connection be to near the conductor there is equal possibility of damage (Fig. 5). As a compromise it is safe to design the clamp with a generous clamping length, with very easy approaches to prevent abrasion of the wire under normal conditions and also to prevent too sharp a bend, even when the axis of the insulators and the conductor becomes coincident. Fig. 6 shows clearly the desirable characteristics which should be incorporated in a satisfactory clamp.

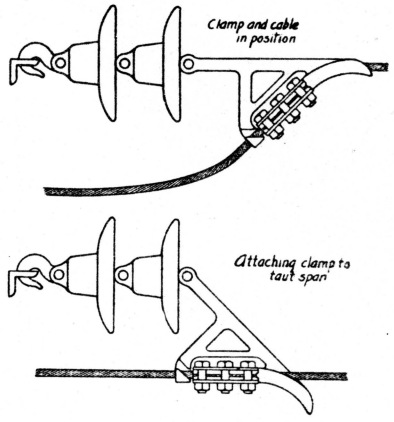


Fig. 7

There has been considerable discussion regarding the desirability of clamping the conductor loosely so that slipping may occur when any unusual strain comes upon the clamp. This scheme has not met with very general approval as it is difficult to prevent damage to the conductor, though the danger of such damage may be lessened by placing a sheet of soft copper or aluminum between the clamp and conductor.

Dead-end clamps are of secondary importance as comparatively few are used and have little opportunity of damaging the conductor. It is necessary that the clamps have a long smooth seat to receive the cable and sufficient clamping effect to develop the full strength of the cable without distorting or otherwise damaging it. As the conductor must change direction materially the cable seat should be curved so as to avoid possibility of damaging the conductor. Good quality malleable iron well rust-proofed is very satisfactory for dead-end clamps.

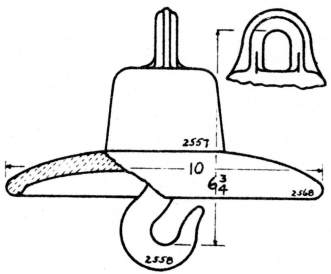


Fig. 8
Hook and Eye Type

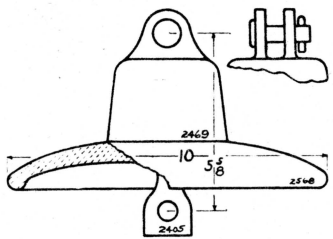


Fig. 8
Clevis Type

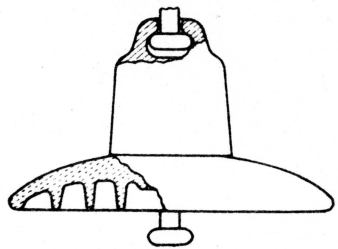


Fig. 8
Ball and Socket Type

For construction convenience many dead-end clamps are so made as to permit of the transfer of strain from a taut cable to a string of insulators without damaging insulators or conductor. Fig. 7 shows a strain clamp satisfying the above conditions.

Connections between the various units of a suspension insulator are dictated more by the buyer's individual preference than any real advantage. As practically all suspension insulators now being sold are of the cemented type it is only worth while to discuss those types.

Connections between units are made by hook and eye, eye bolt and clevis or ball and socket joints (Fig. 8). The requirements are, that units should be interchangeable, simple, moderately loose joined or flexible when connected, capable of being used without special castings to connect to cross-arm or clamp, and not too expensive. Too much flexibility is bad, since it will allow the shells to come in contact during erection and possibly break them. Too great rigidity is undesirable as it prevents the series of units from accommodating themselves to any sudden vibration originating in the conductor. Relative rotary movement of the units in a series is not necessary and in dead-ending insulators it is very undesirable as it is necessary that the dead-end clamp be held from twisting to prevent the jumper from touching the cross-arm.

Ball and socket connections are very undesirable particularly from a standpoint of ease in adapting to cross-arm or

clamps. Such joints are particularly awkward in emergency work. They call for extremely accurate casting to assure inter-changeability. Such devices, while inherently simple, are novel to the average line-man and in general are not as favorably received as the common mechanical devices.

The ball and socket joint has been adopted by one concern only, which lays claim to mechanical simplicity and universal motion between units but their chief argument concerns itself with apparent increased electrical efficiency. Careful tests show that this latter claim is untrue.

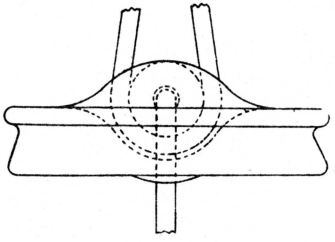


Fig. 9

The hook and eye type has been used largely and with success on several long lines. It has no electrical or mechanical disadvantage other than the possibility of the shells hitting one another when the insulator is assembled on the ground.

The clevis and square-ended eye bolt fulfills all the requirements of a satisfactory joint, and has been very generally adopted. Its directness and desirability are recognized by advocates of the ball and socket joint for it will be found in practically all connections between clamp and insulator even when ball and socket connections are used between the insulators. The clevis connection is particularly desirable on account of its adaptability to any service without the introduction of special fittings. For dead-ending it is much to be preferred over the ball and socket or the hook and eye as it positively prevents twisting the jumper up against the cross-arm. This type of connection is more largely used than any other and seems to be generally regarded as the most desirable.

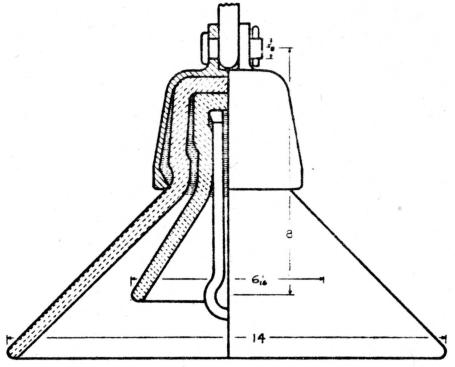


Fig. 10

Electrical Characteristics

The ideal pin or suspension type insulator for overhead lines is of course a small diameter rod of high mechanical strength and of material which will not deteriorate under weather or electrical stress. Such an insulator would have maximum surface resistance and minimum electro-static capacity. Its length would be proportional to voltage and would be practically immune from general line troubles. Such an insulator has not been developed.

The modern suspension insulator, as generally used, consists of a porcelain shell with an external malleable iron cap and an internal eye bolt, some good cement being used to fasten the parts securely together. The use of metal parts is dictated by the demand for mechanical strength and as this demand influences all the characteristics it is well before discussing the necessary qualities to have the general shape understood.

Assuming that metal cap and eye bolts and porcelain shells are necessary to the structure of suspension insulators the desirable electrical characteristics consist essentially of high puncture strength, sufficient leakage resistance, and ability to rid itself of an arc in case of flash-over.

Leakage resistance is secured by using several comparatively small diameter shells in series. It is essential that the shells be capable of easy cleansing by rains or manually. The artificial rain test indicates the ultimate flash-over under normal conditions only, but is not a measure of the insulator's ability to withstand abnormal conditions.

To secure high puncture strength for the insulator it is essential that the individual unit be of great electrical strength. In the individual unit it is a matter of distribution, and quality of porcelain. The double shelled unit whose parts are tested before assembly has a total dry test 50 per cent. to 70 per cent. more than the voltage which can ever come upon it after assembly. This provides a safety factor for the individual unit against puncture when high voltage is applied by abnormal conditions. The one piece porcelain unit has no such safeguard against puncture as flash-over is the maximum voltage that can be put upon the unit as a test and this voltage may come upon the unit at any time in service.

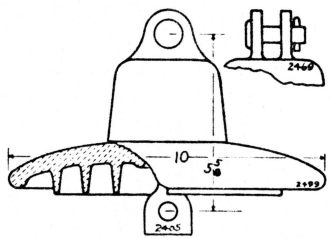


Fig. 11

A series of modern suspension insulators is a multiple plate condenser and is subject to all the strains inherent in such apparatus. The whole series is only as strong as its weakest link, the unit adjacent to the conductor, for it is on that unit that the potential will pile up under severe conditions.

It is customary to space units as closely as possible in order to limit the voltage which may fall upon a unit when flash-over over any series, due to a surge, comes upon the insulator. In other words the distance between conductor and cross-arm connection is made as short as possible for any given number of units to decrease the voltage that may be applied to the series of units. This has proved of little help, since a high frequency discharge, which is the greatest difficulty to guard against, is by its very nature difficult to divert from a straight line. Accordingly, unless the unit in itself is of great electrical strength trouble is sure to result.

Considerations of electro-static capacity and efficiency are of little interest to this discussion as an insulator only operates near full capacity at very infrequent intervals. The major portion of the time insulators operate at less than 25 per cent. of flash-over value.

Without some auxiliary device it appears to be impossible to prevent the puncture of insulators by a high frequency surge. There is good reason for believing that arcing rings have solved this difficulty.

Of modern suspension insulators there are two general types, those in which the individual unit is made up of two

separate shells cemented together and those in which each unit is of a single shell of porcelain. The General Electric unit (Fig. 9) is unlike any other type of unit in general use, in that it is made of a massive disc of porcelain in which two holes are drilled from opposite sides. The holes inter-link but do not connect so that wires can be threaded through and thus connect units together. The Victor insulator No. 278 (Fig. 10) is representative of the two part unit and the No. 2335 (Fig 11) of the single piece unit.

As the types represented by Victor No. 278 and No. 2335 are most extensively used they are the only ones at present worthy of serious consideration.

The arguments presented against the two piece unit are its greater cost, and the concentration of electrical stress upon its inside shell compared with the stress on the outer shell. These arguments are without weight as a unit operates at a voltage which is usually 12½ per cent. of the test voltage. The arguments in favor of the two piece unit are its high puncture strength, its tested safety factor, its smooth interior capable of ready cleaning, and above all its clean record of satisfactory operation.

The arguments against the single piece unit are its lack of tested safety factor (lacking in ability to resist line surges) and its corrugated surface which deteriorates rapidly with accumulation of dirt and does not permit of ready cleaning. The arguments in favour are its cheapness, multiplicity of units for any given insulator, thus decreasing the danger of shut-down when one unit becomes broken, the high rain test per unit and per pound material used, and ease of shipment and erection.

If cheapness and efficiency were desirable characteristics the one piece unit such as Victor No. 2335 would be most desirable but as neither are of moment in an important line the two piece unit has theoretically the safest position. Experience up to date shows the two piece unit in the lead so far as continuity of service is concerned, though it is only fair to say that with arcing rings installed on insulators made of one piece units the danger of puncture will be reduced to a minimum.

To give substance to the foregoing it is just to state that four lines using one piece insulators are giving serious trouble at the present time. No serious trouble has been reported on lines using the two piece units.

In the discussion of suspension insulators and lines the difficulty of securing an equilateral triangle arrangement of conductors and transposition usually arises. This imaginary difficulty has been met by discarding both the delta arrangement and all transpositions. Up to date no ill effects have been noted in either transmission or paralleling telephone circuits.

Lightning Protection

In the opinion of the foremost engineers all types of so called arresters originate as much trouble as they prevent

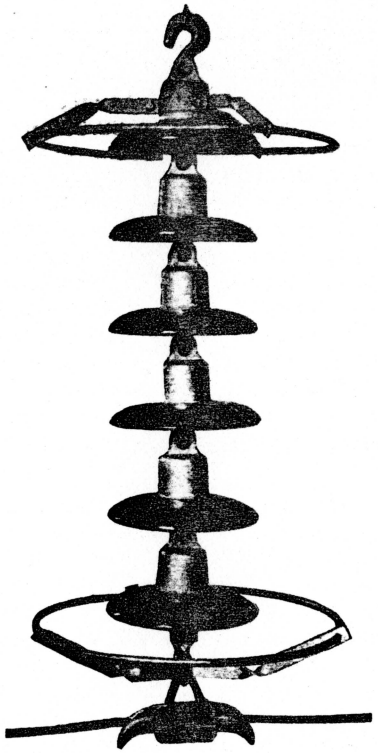


Fig. 12

and in at least two instances courageous engineers have discarded all terminal protection devices with very satisfactory results. In general the electrolytic arrester is favoured.

The overhead guard wire is without doubt of real help in preventing lightning disturbances and its use is very general. It usually is of galvanized steel stranded conductor approximately $\frac{3}{8}$ inch in diameter and securely clamped to the tower top several feet higher than the conductors. Its primary object is to produce a zone of earth potential above the conductors but there is little doubt it also acts effectively as a damper to any surge of heavy current flowing along the transmission line. It is well to note here that any conductor parallel to a conductor carrying a heavy surge acts as a damper and for this reason if for no other over-head conductors subject to lightning or switching surges should not be spaced needlessly far apart. Following the line of argument leads one to believe that the cross-arm adjacent to the conductor may of itself induce a potential rise on the attached insulator. On one line of one piece unit insulators conditions were materially improved by introducing an iron strap between insulator and cross-arm, thus materially reducing the damping effect of the tower structure.

The arcing ring used with such marked effect on an Eastern 60,000 volt line as well as others of lower voltage will unquestionably come into general use to prevent damage to insulators by flash-over. Fig. 12 shows clearly its adaptability to suspension insulators. It consists essentially of two rings so placed as to limit the voltage which may fall upon an insulator to a safe value and thus eliminate the possibility of puncture. It is so placed that the flashover under rain is unchanged but if from any cause flashover does occur the arc is maintained between the rings without damage to the insulator. The power house attendant can then extinguish the arc by opening the line in trouble and at once closing it again. In star-connected grounded neutral lines an ammeter installed in the earth side of each transformer will indicate which line is in trouble and the approximate distance from the

station. With such an arrangement only the phase in trouble need be opened and even synchronous machinery kept in synchronism.

Cost of Pin Type Versus Suspension Type Insulators

Above 60,000 volts there is no question concerning the superiority of suspension insulators, but for 60,000 and below the pin type has much in its favor.

Disregarding the mechanical advantage of suspending conductors the question reduces to one of cost. At present a 60,000 volt pin type insulator and steel pin costs about 55 per cent. of the equivalent suspension insulator. A 33,000 pin type about 33 per cent. of the equivalent suspension type. For this reason pin type insulators for voltages below 60,000 are at present generally used as their electrical and mechanical characteristics are very satisfactory.

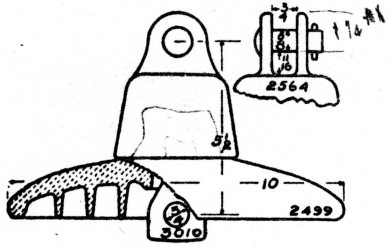
It is always unsafe to prophesy and no attempt shall be made here to enter that field but it is certain from present indications that the ideal insulator has not yet been developed nor can it be developed by manufacturers. Such development must come from engineers having long, high power lines at high voltage at their disposal.

PORCELAIN INSULATORS

SUSPENSION TYPE

#2335A

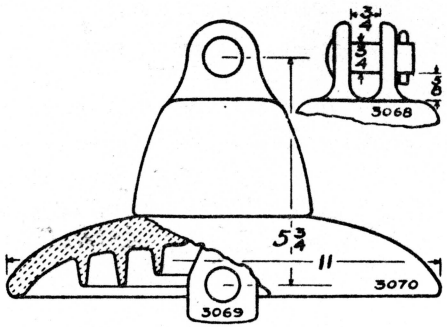
110000-VOLT INSULATOR



NO. 2335A INSULATOR

These insulators will be shipped four or six per crate unless otherwise specified. Weight crated 11¼ lbs. per unit.

Number Units,	1	2	3	4	5	6	7	8
Line voltage,	16500	33000	45000	66000	88000	110000	125000	140000
Test voltage,	85000	.....	.....	.....	.....	.....	.....	.....
Flashover voltage, dry,	90000	160000	225000	275000	325000	375000	425000	475000
Flashover voltage, wet,	56000	90000	130000	175000	220000	265000	310000	355000
Leakage distance, inches,	13½	27	40½	54	67½	81	94½	108
Guaranteed strength, lbs.,	9000	9000	9000	9000	9000	9000	9000	9000
Net weight, lbs.,	9¼	.....	.....	.....	.....	.....	.....	.....
Code word,	UXAMA	.....	.....	.....	.....	.....	.....	.....



Insulator No. 3043

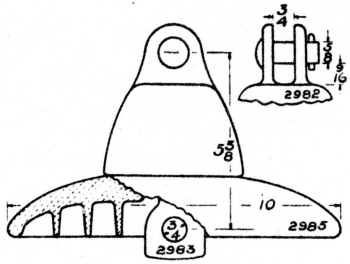
PORCELAIN INSULATOR

SUSPENSION TYPE

THIS unit enables us to supply a standard system of suspension insulation with guaranteed strength, free from distortion or slip of 8,000 to 10,000 pounds on suspension strings, using units No. 2335A, for example, with clamps Nos. 3045 or 3085 or 3086, and 16,000 to 18,000 pounds on strain or anchorage strings by use of this unit No. 3043 and strain clamps Nos. 3053, 3054, or 3055. If desired, unit No. 3043 can be used on suspension strings, giving uniform design of unit in both positions.

Number of Units	1	2	3	4	5	6	7	8
Line voltage, ...	16500	33000	45000	66000	88000	110000	125000	140000
Test voltage, ...	85000	.....	.....	.....	.....	.....	.....	.....
Flashover voltage, dry, .	90000	165000	230000	285000	335000	385000	440000	490000
Flashover voltage, wet,. .	58000	95000	135000	180000	230000	275000	320000	365000
Leakage distance, inches, .	13½	27	40½	54	67½	81	94½	108
Guaranteed strength, lbs.,.	16000	16000	16000	16000	16000	16000	16000	16000
Net weight, lbs.,.	13½	.....	.....	.....	.....	.....	.....	.....
Code word, ...	Urico	.....	.....	.....	.....	.....	.....	.....

These units are regularly packed 6 per crate, weighing 16 lbs. per unit.

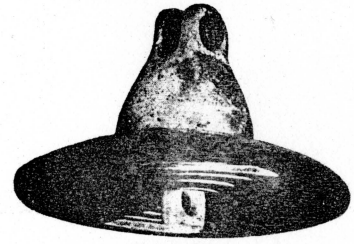


No. 2984

PORCELAIN INSULATOR

Suspension Type

This unit provides a medium between Nos. 2335A and 3043. Its ultimate strength, as with Nos. 2335A and 3043 is approximately 35% greater than the guaranteed strength. This unit is used with exactly same clamps and attachments as No. 2335A.

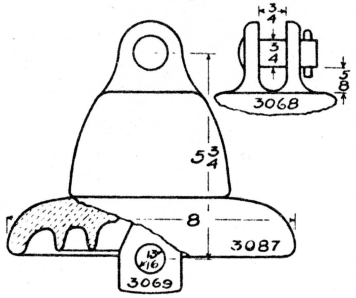


No. 2984

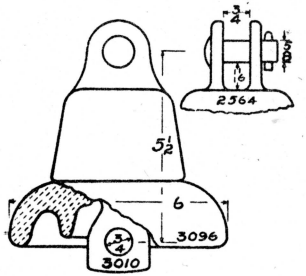
Number Units	1	2	3	4	5	6	7	8
Line voltage	16500	33000	45000	66000	88000	110000	125000	140000
Test voltage	85000	.....	.....	.....	.....	.....	.....	.....
Flashover voltage, dry	90000	160000	225000	275000	325000	375000	425000	475000
Flashover voltage, wet	56000	90000	130000	175000	220000	265000	310000	355000
Leakage distance	13½″	27″	40½″	54″	67½″	81″	94½″	108″
Guaranteed strength	12500 lbs.	12500 lbs.	12500 lbs.	12500 lbs.	12500 lbs.	12500 lbs.	12500 lbs.	12500 lbs.
Net weight	10½ lbs.	21 lbs.	31½ lbs.	42 lbs.	52½ lbs.	63 lbs.	73½ lbs.	84 lbs.
Code word	**Lodao**	.....	.....	.....	.....	.....	.....	.....

These insulators will be shipped 4 or 6 per crate unless otherwise specified. Weight, crated, 12½ lbs. each.

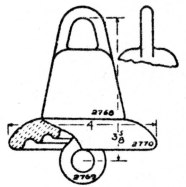
PORCELAIN INSULATORS — Suspension Type



No. 3066



No. 3039



No. 2672

THESE insulators are usually used singly for insulating guys, dead ending, etc., attaching the steel strand to one or both ends by means of ordinary guy clamps or our strain clamps.

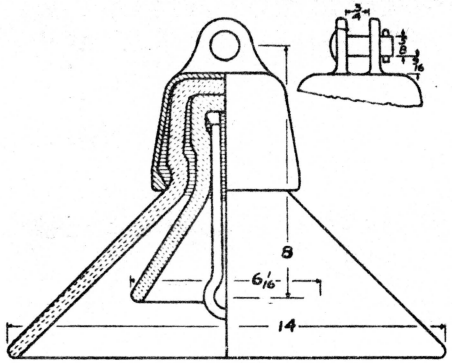
Nos. 3039 and 3066 can, however, be used with exactly same strain and suspension clamps and attachments as Nos. 2335A and 3043, and also can be connected in series, in which event 10000-volts line voltage may be safely imposed for each unit of No. 3039, and 13000 for each unit of No. 3066 used in series.

These units are rapidly superseding porcelain and composition-ball or globe-guy insulators because of their effective insulation, positive mechanical strength, and permanency. They may be used vertically, horizontally, or any angle between.

Insulator Nos.	2672	3039	3066
Line voltage	6600	10000	13000
Test voltage	30000	50000	75000
Flashover voltage, dry	50000	62000	78000
Flashover voltage, wet	20000	40000	50000
Leakage distance, inches	3¼	6	7¾
Guaranteed strength, lbs.	4000	12000	22000
Net weight, lbs.	2¼	7¾	11
Packed weight, lbs.	3	9	13
Usual packing	50 per bbl.	40 per bbl.	25 per bbl.
Code word	STAUB	USUAL	UVADA

PORCELAIN INSULATORS

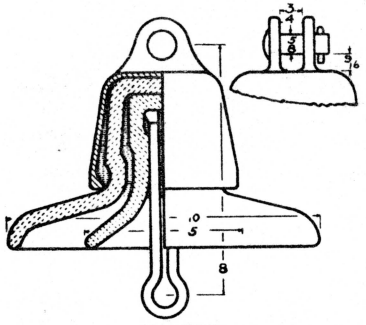
SUSPENSION TYPE



No. 2297

Number Units	1	2	3	4	5
Line voltage,	30000	66000	88000	110000	130000
Test voltage,	105000	.....	.....	.....	.....
Flashover voltage, dry,	120000	200000	275000	350000	425000
Flashover voltage, wet,	65000	120000	180000	240000	300000
Leakage distance, inches,	24	48	72	96	120
Guaranteed strength, lbs.,	12000	12000	12000	12000	12000
Net weight, lbs.,	17½	.....	.....	.....	.....
Code word,	SORAT	.....	.....	.....	.....

These units are regularly packed 5 per bbl., weighing 27 lbs. per unit.



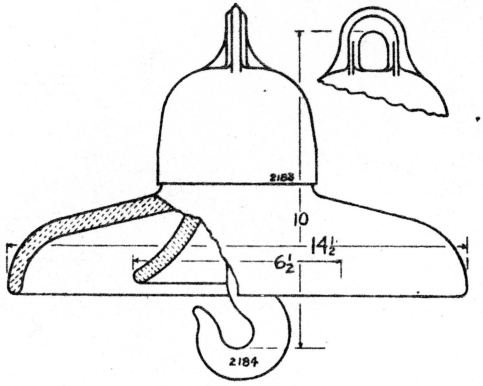
No. 3029

Number Units	1	2	3	4	5	6
Line voltage,	20000	40000	66000	88000	110000	130000
Test voltage,	80000	.....	.....	.....	.....	.....
Flashover voltage, dry,	85000	140000	200000	260000	320000	380000
Flashover voltage, wet,	50000	90000	135000	180000	225000	270000
Leakage distance,	13½	27	40½	54	67½	81
Guaranteed strength, lbs.,	12000	12000	12000	12000	12000	12000
Net weight, lbs.,	13	.....	.....	.....	.....	.....
Code word,	SONNE	.....	.....	.....	.....	.....

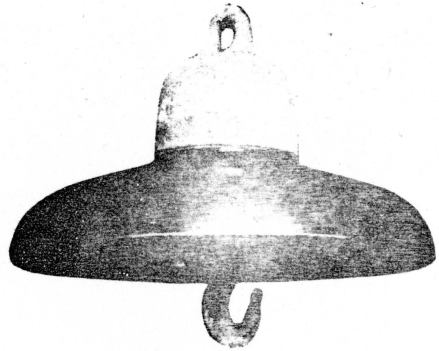
These units are regularly packed 10 per bbl., weighing 17½ lbs. per unit.

PORCELAIN INSULATORS

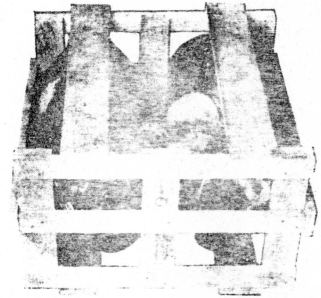
SUSPENSION TYPE



No. 2298



INSULATOR No. 2298

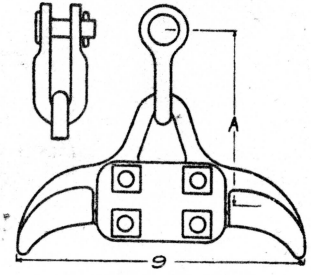


These insulators shipped four per crate unless otherwise specified. Weight, crated, 26 lbs. per unit.

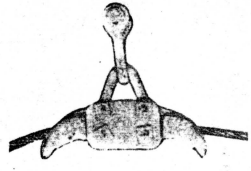
Number Units	1	2	3	4	5
Line voltage,	30000	66000	88000	110000	130000
Test voltage,	105000	.....	.....	.....	.....
Flashover voltage, dry,	120000	200000	280000	360000	440000
Flashover voltage, wet,	60000	120000	180000	240000	300000
Leakage distance, inches,	21¼	42½	63¾	85	106¼
Guaranteed strength, lbs.,	9000	9000	9000	9000	9000
Net weight, lbs.,	21	.....	.....	.....	.....
Code word,	SORLO	..	.....	.....	.....

CABLE CLAMPS FOR SUSPENSION-TYPE INSULATORS

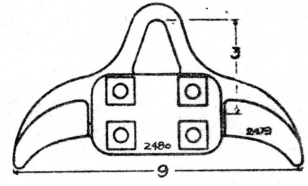
SUSPENSION CLAMPS



Nos. 2695, 2832, 3058, AND 3059



No. 2832



Nos. 2655 AND 2793

"VICTOR" Suspension Insulator Clamps are liberal in design, with full, long wire seats and large radius curve to take the cable when clamp is placed in strain position due to cable breaking on either side of clamp. All clamps are made of malleable iron, and they attach DIRECTLY to our Suspension Insulators without the intervention of any attachments. The designs of these clamps contemplate rigidly holding the cable whenever a span breaks, as opposed to the practice of allowing cable to slip through several spans to equalize the unbalanced conditions due to a break.

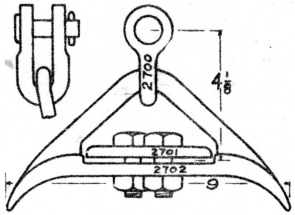
Aluminum clamping sleeves approximately $\frac{1}{10}$-inch thick should always be used with aluminum cable or wire. If these sleeves are made 6 inches, or more, longer than clamp they will also serve as arcing sleeves.

Clamp No.	A	Diameter Cable Received	Used with Insulator No.	Net Weight	Code Word
2832	8	$\frac{3}{8}$" to $\frac{23}{32}$"	2297	5 lbs.	URJAS
3058	$5\frac{1}{4}$	$\frac{3}{8}$" to $\frac{23}{32}$"	2335A, 3029, 3039	$4\frac{5}{8}$ lbs.	URPEX
3059	$5\frac{7}{8}$	$\frac{3}{16}$" to $\frac{3}{8}$"	2335A, 3029, 3039	$4\frac{5}{8}$ lbs.	URSON
2655	..	$\frac{3}{16}$" to $\frac{3}{8}$"	2298	4 lbs.	STROH
2695	8	$\frac{3}{16}$" to $\frac{3}{8}$"	2297	5 lbs.	STUFE
2793	..	$\frac{3}{8}$" to $\frac{23}{32}$"	2298	4 lbs.	URUNT

These clamps will hold against slip up to approximately 6,000 lbs.

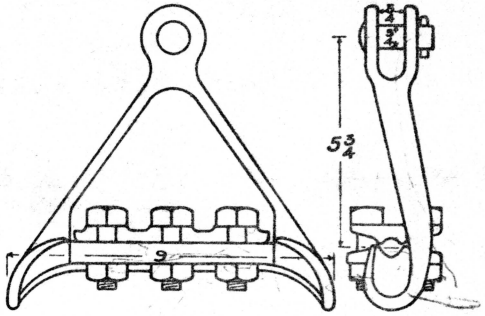
CABLE CLAMPS FOR SUSPENSION-TYPE INSULATORS

SUSPENSION CLAMPS



Nos. 2699 AND 3056
Two-clamping Bolts

No. 2699



Nos. 3045, 3085, AND 3086
Six-clamping bolts

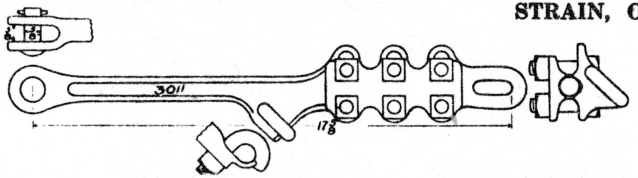
Clamp No.	Diameter Cable Received	Used with Insulator No.	Net Weight	Code Word
2699	$\frac{1}{4}$″ to $\frac{13}{32}$″ inclusive	2335A, 3029, 3039	2¾ lbs.	URUXI
3056	$\frac{5}{16}$″ to $\frac{8}{8}$″ "	2335A, 3029, 3039	3 lbs.	URZAL
3045	$\frac{7}{16}$″ to $\frac{9}{16}$″ "	2297, 2335A, 3029, 3039, 3043	6½ lbs.	UZEMA
3085	$\frac{3}{16}$″ to $\frac{3}{8}$″ "	3066	6½ lbs.	UZZAH
3086	$\frac{5}{8}$″ to $\frac{3}{4}$″ "	(See note.)	6½ lbs.	VACUO

Clamps Nos. 2699 and 3056 will hold against slip up to approximately 3,000 lbs.; clamps Nos. 3045, 3085, and 3086 up to 10,000 lbs.

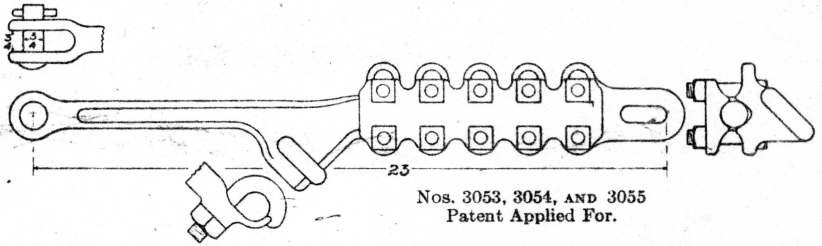
NOTE.—These clamps can be used with No. 2298 insulator by adding link No. 2671 047

CABLE CLAMPS FOR SUSPENSION-TYPE INSULATORS

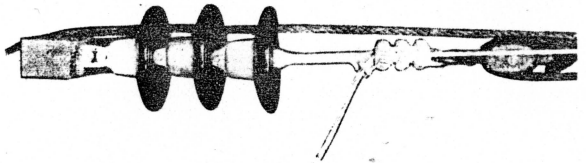
STRAIN, OR ANCHORAGE, CLAMPS



Nos. 3032, 3033, AND 3034
Patent Applied For.



Nos. 3053, 3054, AND 3055
Patent Applied For.



No. 3032
Showing method of erection and adjustment.

THIS type of clamp was designed and adopted by us as result of the last four years experience. The items of design are as follows:— 1st, the line cable is clamped parallel to span, instead of cable, under heavy load, riding over a curved cable seat, a practice now generally condemned; 2d, a special eye at span end of clamp, as shown, to which tackle can be attached for pulling up the span with insulators and clamp installed on cross-arm, and when the catenary is adjusted *exactly* as desired, the cable is laid in groove and permanently clamped as adjusted; 3d, very liberal clamping groove area and through machine bolts, instead of weak hook bolts sometimes used; and 4th, cable can be inserted without taking off any nuts in the field. The general symmetry of design of this clamp makes it acceptable for power-house wiring where no jumper connections are used. These clamps will hold against cable slip up to 10,000 pounds for Nos. 3032, 3033 and 3034; and 16,000 pounds for Nos. 3053, 3054, and 3055.

Clamp No.	Diameter Cable Received	Used with Insulator No.	Net Weight	Code Word
3032	$\frac{5}{16}$" to $\frac{7}{16}$" inclusive	2335A, 3029, 3039 *	6 lbs.	USABA
3033	$\frac{11}{16}$" to $\frac{13}{16}$" "	2335A, 3029, 3039 *	6 lbs.	USBEG
3034	$\frac{13}{16}$" to $\frac{15}{16}$" "	2335A, 3029, 3039 *	6 lbs.	USINE
3053	$\frac{15}{16}$" to $\frac{1}{16}$" "	3043, 3066	10½ lbs.	USIPI
3054	$\frac{1}{16}$" to $\frac{1}{8}$" "	3043, 306[illegible]	10½ lbs.	USONS
3055	$\frac{1}{8}$" to 1" "	3043, 306[illegible]	10½ lbs.	USTED

* Also used with insulator No. 2298 by adding link No. 3019 or No. 3047, and with insulator No. 2297 by adding special connection No. 3030.

CABLE CLAMPS FOR SUSPENSION-TYPE INSULATORS

(STRAIN, OR ANCHORAGE, CLAMPS)

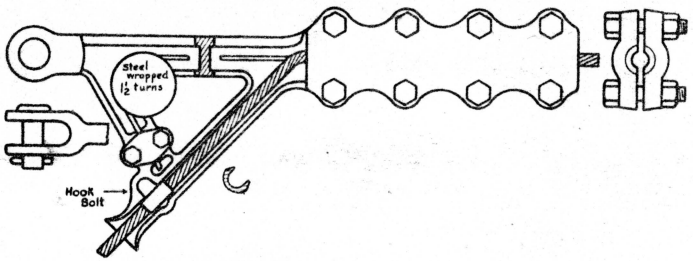


Illustration is one-sixth full size

THESE clamps are specially heavy and adapted for either aluminum or copper stranded over a steel-center strand, in which construction it is necessary to clamp each metal separately. The main clamping groove is bushed with cast aluminum and will hold against slip up to approximately 12,000 pounds.

Clamp No.	Diameter of Cable Received	Net Weight	Used with Insulator No.	Code Word
3048	¼″ to 5/16″ Inc.	11¼ lbs.	All numbers used with suspension units, Nos. 2335A, 3029, 3039, 3043, and 3066; also by using link No. 2671 or 3047 as connection between insulator and clamp, these clamps can be used with insulator No. 2298.	UPSET
3049	5/16″ to ⅜″ Inc.	11¼ lbs.		UPUPA
3050	⅜″ to 7/16″ Inc.	11¼ lbs.		URACA
3051	7/16″ to ½″ Inc.	11¼ lbs.		URANE
3052	½″ to ⅝″ Inc.	11¼ lbs.		URDES

ATTACHMENTS FOR SUSPENSION-TYPE INSULATORS

STRAIN YOKES

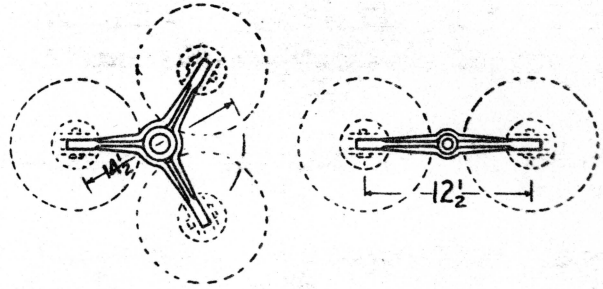
BY the use of these strain yokes, extra heavy loads, such as river crossings, special spans, etc., can be carried on the standard type of suspension insulator adopted for regular line work.

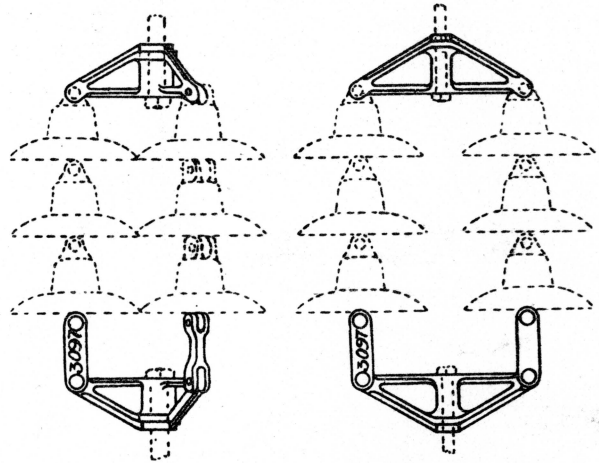
Ordinary machine or eye-bolts are used in the yokes, No. 2708 receiving $\frac{3}{4}$-inch diameter bolt, and No. 2711, 1-inch diameter.

These yokes can be used with insulators Nos. 2335A and 3039.

They are furnished in sets as shown below.

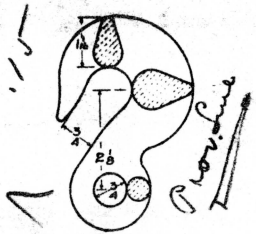
No.	2708	2711
Set consists of, ...	2 — No. 2708 2 — No. 2713	2 — No. 2711 3 — No. 2713
Ultimate strength, ...	18000 lbs.	27000 lbs.
Net weight per set, ...	17 lbs.	28 lbs.
Code word, ...	SYMKA	SYRMA



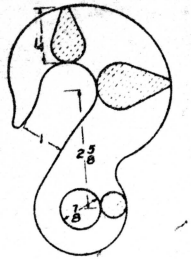


No. 2711—TRIPLE YOKE No. 2708—DOUBLE YOKE

ATTACHMENTS FOR SUSPENSION-TYPE INSULATORS



No. 2569A Hook



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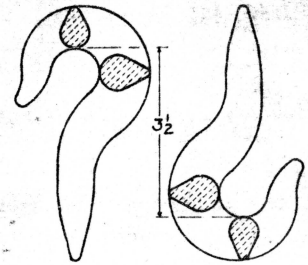
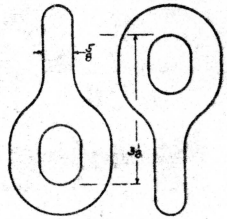
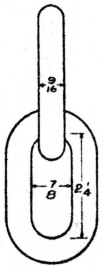


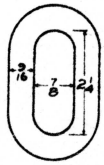
No. 2670 Hook



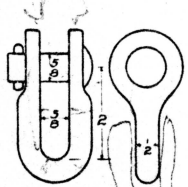
No. 2671 Link



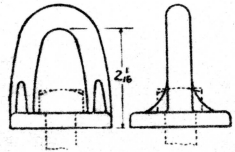
No. 3019 Link



No. 3047 Link



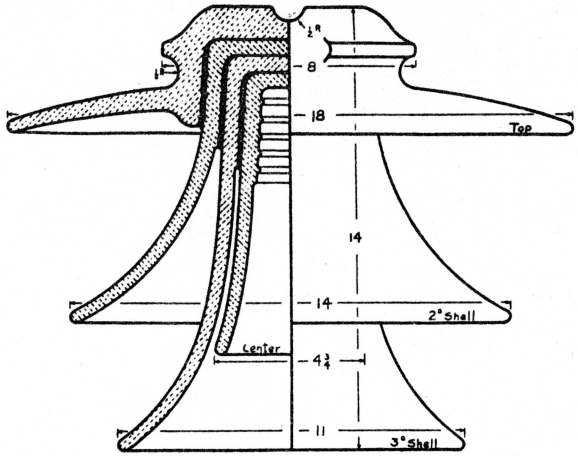
No. 2937 Clevis



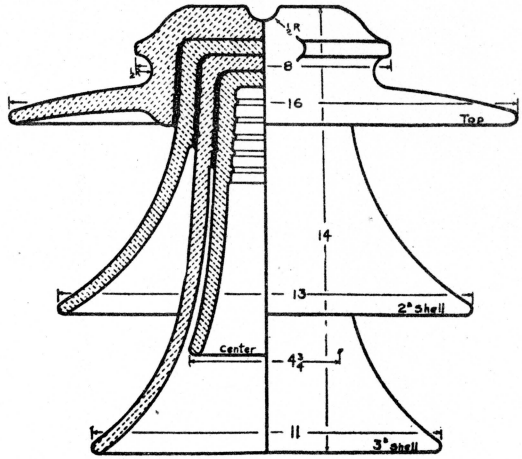
No. 2681 Eye
Use a regular $\frac{3}{4}$-inch machine bolt of suitable length for attaching this eye.

No.	Use with Insulator No.	Net Weight	Ultimate Strength	Code Word
2569A	2335A and 3039	1 lb.	10000 lbs.	Vaeco
2670	2298	1½ lb.	8000 lbs.	Surya
2671	2297, 2298, 3029	1 lb.	12000 lbs.	Susum
2681	2297, 2298, 2335A, 3029, 3039	¾ lb.	12000 lbs.	Swirl
2937	2297, 2298, 2335A, 3029, 3039	¾ lb.	10000 lbs.	Uvate
3019	2297, 2335A, 3029, 3039, 3043, 3066	1½ lb.	20000 lbs.	Uvero
3047	2297, 2335A, 3029, 3039, 3043, 3066	¾ lb.	20000 lbs.	Utile
3084	2297, 2335A, 3029, 3039, 3043, 3066	1¼ lb.	20000 lbs.	Vagem

PORCELAIN INSULATORS — *Pin Type*



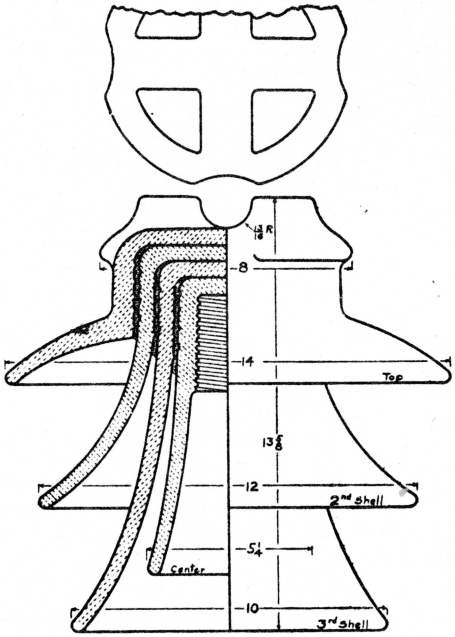
No. 347



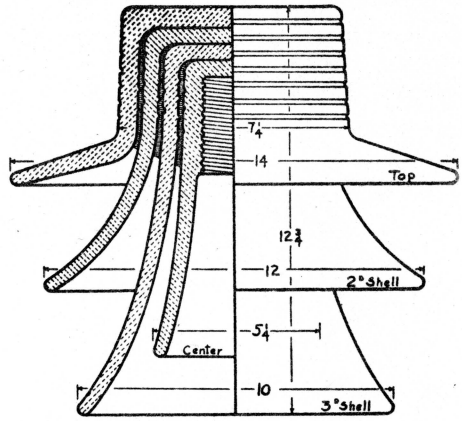
No. 2400

Insulator No.	347	2400
Line voltage	70000	70000
Test voltage	170000	170000
Rain test	145000	140000
Leakage distance	59″	57″
Striking distance	14″	13″
Size pin hole	Special 1¾″ (no threading)	Special 1¾″ (no threading)
Net weight	42½ lbs.	40 lbs.
Packed weight	53 lbs.	50 lbs.
Number per crate	3	3
Code word	**Kopten**	**Kortbondig**

PORCELAIN INSULATORS — *Pin Type*



No. 359

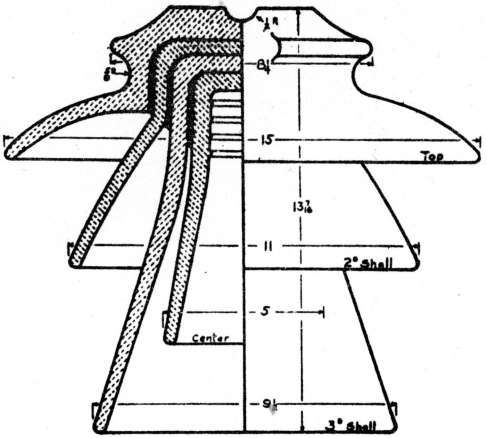


No. 365

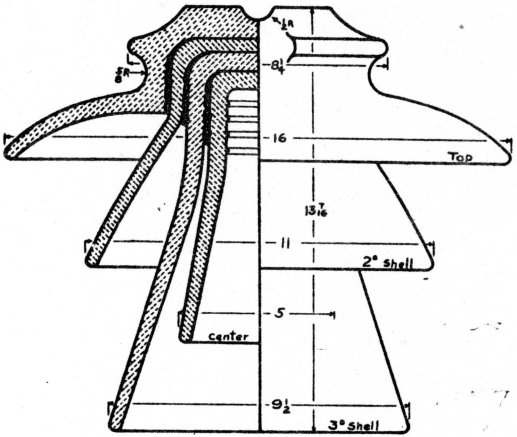
This insulator is very strong and rugged and adapted for mounting switches.

Insulator No.	359	365
Line voltage	66000	66000
Test voltage	180000	180000
Rain test	115000	115000
Leakage distance	50″	48½″
Striking distance	10″	10″
Size pin hole	Special 1⅞″	Special 1⅞″
Net weight	35½ lbs.	35 lbs.
Packed weight	49 lbs.	49 lbs.
Number per crate	3	3
Code word	**Korfmakers**	**Korftabak**

PORCELAIN INSULATORS — *Pin Type*



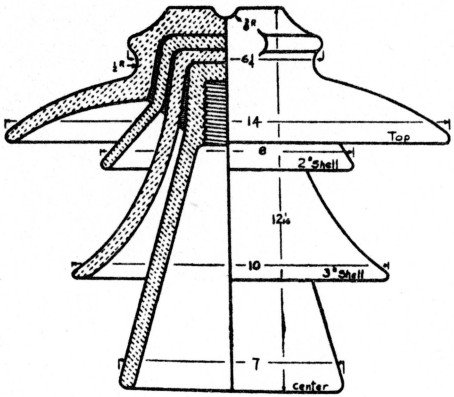
No. 360



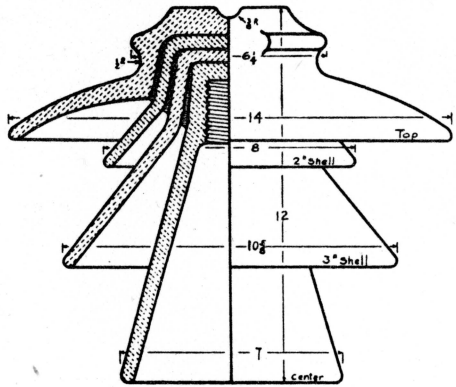
No. 364

Insulator No.	360	364
Line voltage	66000	66000
Test voltage	180000	180000
Rain test	125000	130000
Leakage distance	52″	53″
Striking distance	9½″	10″
Size pin hole	Special 2″ (no threading)	Special 2″ (no threading)
Net weight	31½ lbs.	35¾ lbs.
Packed weight	43 lbs.	47 lbs.
Number per crate	3	3
Code word	**Koralle**	**Korhaan**

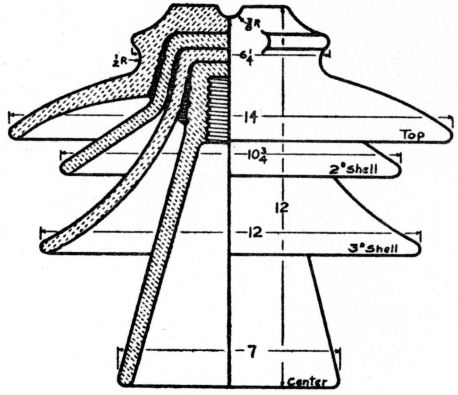
PORCELAIN INSULATORS — *Pin Type*



No. 340



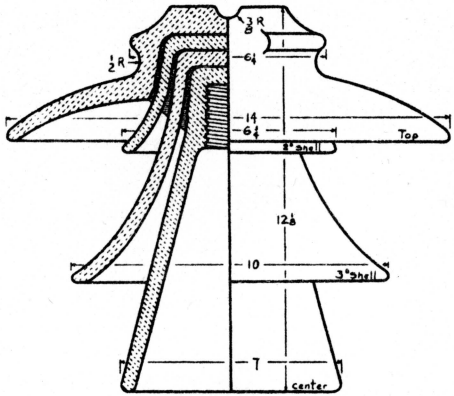
No. 341



No. 2051

Insulator No.	340	341	2051
Line voltage	60000	60000	60000
Test voltage	120000	120000	120000
Rain test	110000	110000	110000
Leakage distance	42¼"	42½"	44¾"
Striking distance	9½"	9¼"	9¾"
Size pin hole	1⅜"	1⅜"	1⅜"
Net weight	21¾ lbs.	24 lbs.	25 lbs.
Packed weight	33 lbs.	33 lbs.	34 lbs.
Number per crate	3	3	3
Code word	**Koppelbalk**	**Kopratas**	**Koriander**

PORCELAIN INSULATORS — *Pin Type*



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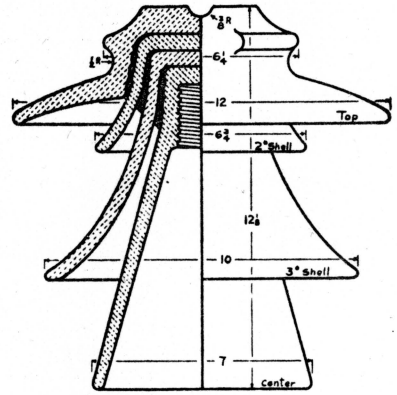

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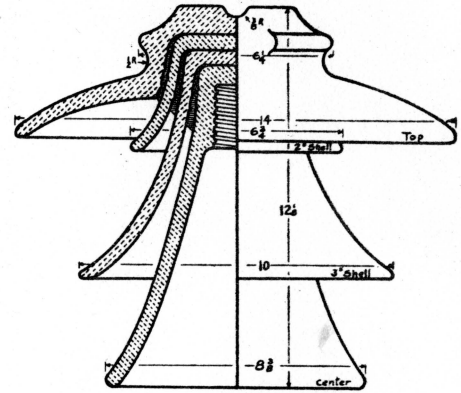
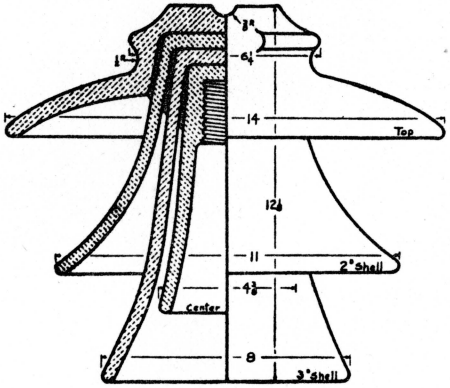


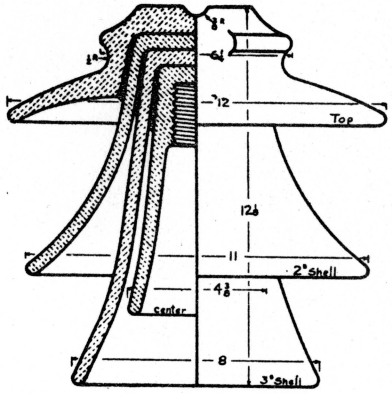
No. 353

Insulator No.	351	352	353
Line voltage	60000	55000	60000
Test voltage	120000	120000	120000
Rain test	110000	100000	115000
Leakage distance	41½"	39½"	41½"
Striking distance	9½"	9"	10"
Size pin hole	1⅜"	1⅜"	1⅜"
Net weight	21½ lbs.	20 lbs.	21½ lbs.
Packed weight	31 lbs.	33 lbs.	32 lbs.
Number per crate	3	3	3
Code word	**Koraalboom**	**Koraalmos**	**Koraalzaad**

PORCELAIN INSULATORS — *Pin Type*



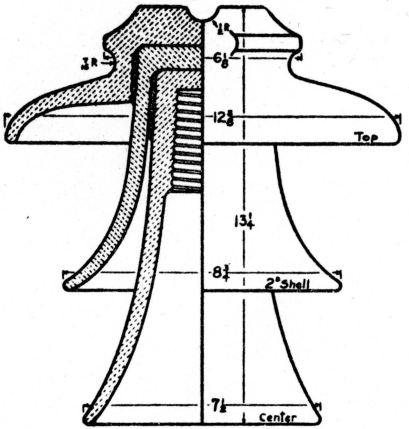
No. 2092



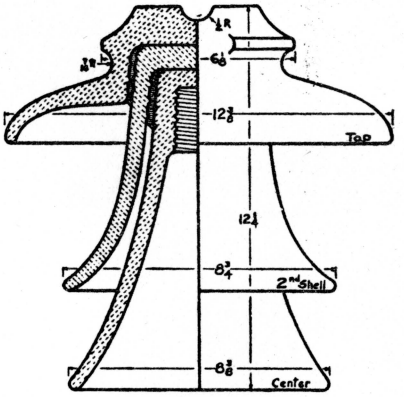
No. 2103

Insulator No.	2092	2103
Line voltage	66000	60000
Test voltage	160000	150000
Rain test	115000	105000
Leakage distance	49¾"	45¼"
Striking distance	9¾"	9⅜"
Size pin hole	1⅜"	1⅜"
Net weight	25½ lbs.	22¾" lbs.
Packed weight	33 lbs.	31 lbs.
Number per crate	3	3
Code word	**Korkartig**	**Korkbaum**

PORCELAIN INSULATORS — *Pin Type*



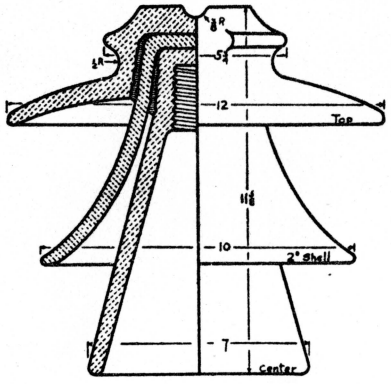
No. 336



No. 380

Insulator No.	336	380
Line voltage	50000	50000
Test voltage	150000	120000
Rain test	110000	100000
Leakage distance	37½"	37¼"
Striking distance	9½"	9"
Size pin hole	Special 1⅝"	1⅜"
Net weight	21 lbs.	20 lbs.
Packed weight	29 lbs.	30 lbs.
Number per crate	3	3
Code word	**Koppelst**	**Korksohle**

PORCELAIN INSULATORS — *Pin Type*



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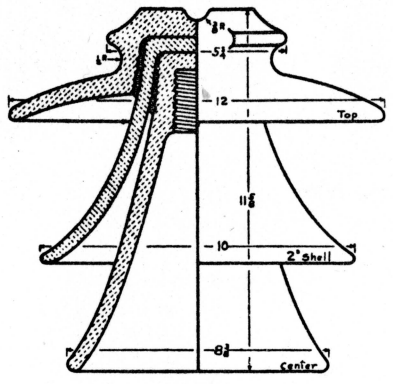

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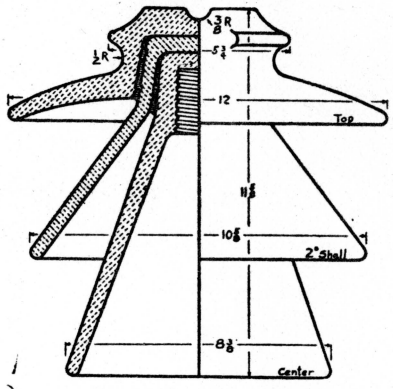
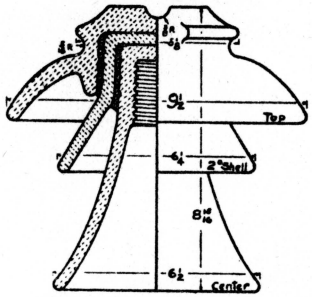


No. 362

Insulator No.	332	334	362
Line voltage	50000	50000	50000
Test voltage	120000	120000	120000
Rain test	95000	100000	100000
Leakage distance	36″	36½″	36½″
Striking distance	8¾″	9½″	8½″
Size pin hole	1⅜″	1⅜″	1⅜″
Net weight	17½ lbs.	17½ lbs.	18¾ lbs.
Packed weight	25 lbs.	25 lbs.	27 lbs.
Number per crate	3	3	3
Code word	**Koppeljagd**	**Koppelaars**	**Korkstueck**

PORCELAIN INSULATORS — *Pin Type*



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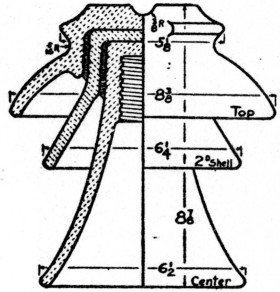
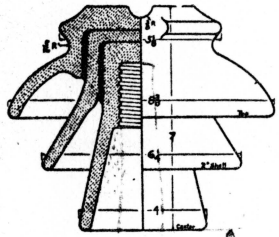


No. 2018

Insulator No.	319	2018
Line voltage	45000	40000
Test voltage	120000	110000
Rain test	75000	65000
Leakage distance	24″	23¼″
Striking distance	6¼″	5½″
Size pin hole	1⅜″	1⅜″
Net weight	10⅝ lbs.	8⅞ lbs.
Packed weight	14 lbs.	13 lbs.
Number per barrel	11	10
Code word	**Kopglas**	**Korkud**

PORCELAIN INSULATORS — *Pin Type*



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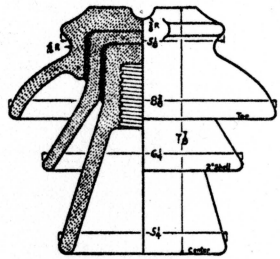

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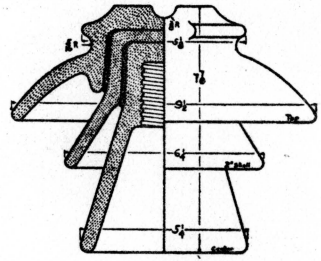
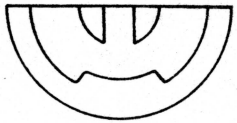
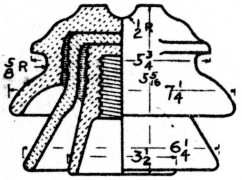


No. 315

Insulator No.	311	312	315
Line voltage	33000	36000	40000
Test voltage	100000	100000	110000
Rain test	60000	65000	70000
Leakage distance	19½″	21″	21½″
Striking distance	4⅜″	4½″	5⅛″
Size pin hole	1⅜″	1⅜″	1⅜″
Net weight	7⅞ lbs.	9 lbs.	10½ lbs.
Packed weight	10 lbs.	12½ lbs.	14¼ lbs.
Number per barrel	18	12	12
Code word	**Kopftuches**	**Kopfueber**	**Kopfwasser**



PORCELAIN INSULATORS — *Pin Type*



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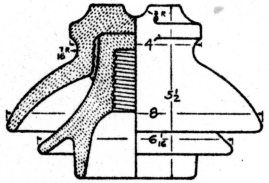

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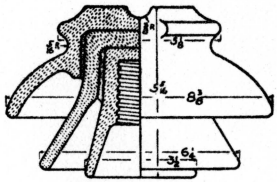
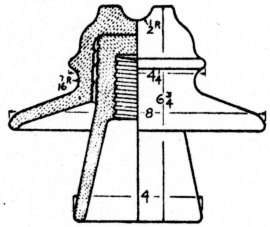


Nos. 2195 and 2246

Insulator No.	320	2195	2246	2233
Line voltage	~~25000~~	27000	27000	27000
Test voltage	80000	85000	85000	85000
Rain test	50000	55000	55000	55000
Leakage distance	14½"	16½"	16½"	14¼"
Striking distance	3½"	3⅞"	3⅞"	3¾"
Size pin hole	1⅜"	1"	1⅜"	1⅜"
Net weight	6¼ lbs.	7 lbs.	7 lbs.	6¼ lbs.
Packed weight	9 lbs.	9 lbs.	9 lbs.	8½ lbs.
Number per barrel	18	22	22	22
Code word	Kraehentod	Kraemchen	Kregelig	Kregelkop

PORCELAIN INSULATORS — *Pin Type*



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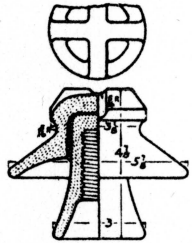

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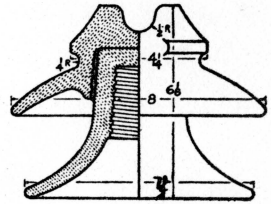

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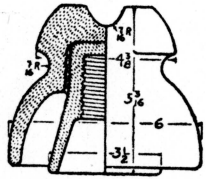
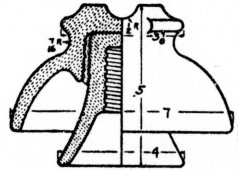


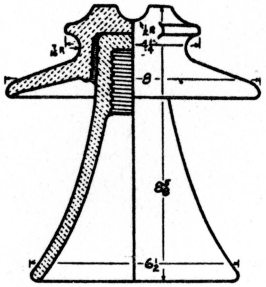
No. 2182



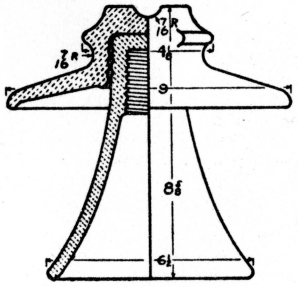
Nos. 2019 and 2643

Insulator No.	205	2019	2115	2182	2228	2643
Line voltage	27000	23000	15000	20000	25000	23000
Test voltage	80000	80000	60000	75000	80000	80000
Rain test	55000	40000	35000	35000	50000	40000
Leakage distance	12½″	11½″	8¼″	11″	13″	11½″
Striking distance	5⅛″	3″	2¾″	2¼″	4″	3″
Size pin hole	1½″ Special	1″	1″	1¾″	1⅜″	1⅜″
Net weight	5¾ lbs.	4 lbs.	2⅝ lbs.	4⅝ lbs.	4¾ lbs.	4 lbs.
Packed weight	8⅓ lbs.	5⅓ lbs.	4 lbs.	6 lbs.	6¼ lbs.	5⅓ lbs.
Number per barrel	18	30	45	36	25	30
Code word	**Kopfmohn**	**Kreidefels**	**Kreideln**	**Kreidewand**	**Kerisamt**	**Llama**

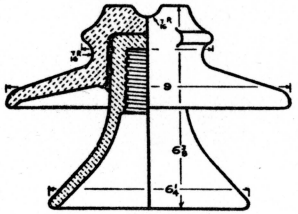
PORCELAIN INSULATORS — *Pin Type*



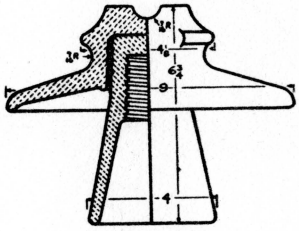
No. 408 B



No. 409



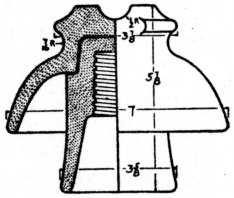
No. 418



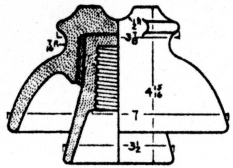
No. 419

Insulator No.	408 B	409	418	419
Line voltage	30000	33000	30000	30000
Test voltage	80000	85000	80000	80000
Rain test	65000	70000	60000	55000
Leakage distance	18″	18¾″	14½″	14¼″
Striking distance	5⅝″	6″	5¼″	4¾″
Size pin hole	1⅜″	1⅜″	1⅜″	1⅜″
Net weight	5⅝ lbs.	6½ lbs.	5½ lbs.	5⅛ lbs.
Packed weight	9 lbs.	9 lbs.	9 lbs.	8½ lbs.
Number per bbl.	15	15	16	18
Code word	**Korbstich**	**Korbwelle**	**Korenkever**	**Korenmeter**

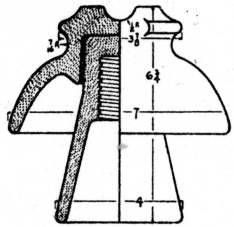
PORCELAIN INSULATORS — *Pin Type*



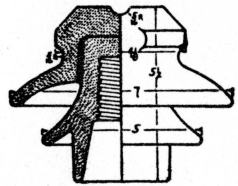
Nos. 100 and 100A



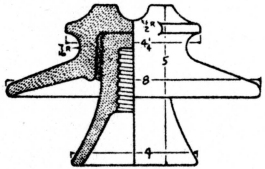
Nos. 101 and 102



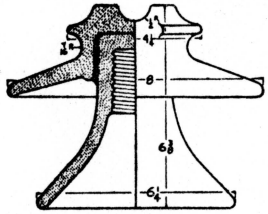
Nos. 103 and 107



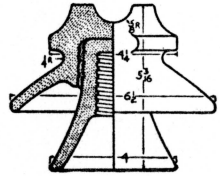
No. 400



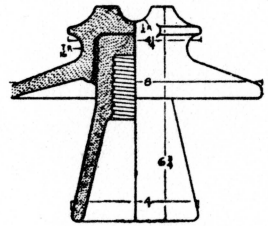
No. 404 and 3168



No. 405A



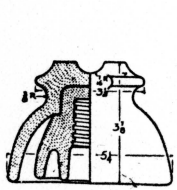
Nos. 407 and 2012



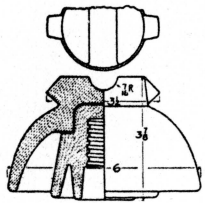
Nos. 408A and 2057

Insulator No.	100	100A	101	102	103	107	400	404	405A	407	408A	2012	2057	3168
Line voltage	25000	25000	23000	23000	27000	27000	25000	20000	27000	18000	27000	18000	27000	20000
Test voltage	80000	80000	80000	80000	80000	80000	80000	70000	80000	70000	80000	70000	80000	70000
Rain test	45000	45000	40000	40000	50000	50000	45000	50000	55000	40000	50000	40000	50000	50000
Leakage distance	12½"	12½"	11"	11"	14¼"	12¼"	12¼"	11¼"	14"	9¾"	13¾"	9¾"	13¾"	11¼"
Striking distance	3¼"	3¼"	3"	3"	3½"	3½"	3⅜"	4"	5¼"	3⅛"	4⅜"	3⅛"	4⅜"	4"
Size pin hole	1⅜"	1"	1⅜"	1"	1⅜"	1"	1⅜"	1"	1⅜"	1"	1⅜"	1⅜"	1"	1⅜"
Net weight	4¾ lbs.	4⅞ lbs.	3⅞ lbs.	4 lbs.	4⅝ lbs.	4¾ lbs.	4⅛ lbs.	4½ lbs.	4⅝ lbs.	3¼ lbs.	4½ lbs.	3⅛ lbs.	4⅝ lbs.	4½ lbs.
Packed weight	6¼ lbs.	6¼ lbs.	5¼ lbs.	5½ lbs.	6⅓ lbs.	6⅓ lbs.	5¾ lbs.	5¾ lbs.	7½ lbs.	4½ lbs.	6 lbs.	4½ lbs.	6 lbs.	5¾ lbs.
Number per bbl.	30	30	35	35	30	30	30	30	20	40	30	40	30	30
Code word	**Kopfbandes**	**Kopflauch**	**Kopfende**	**Kopfgeld**	**Kopfgelder**	**Korkulme**	**Korbdeckel**	**Korbfeige**	**Korbhenkel**	**Korbrebe**	**Korbstange**	**Korhyra**	**Kornacker**	**Lioro**

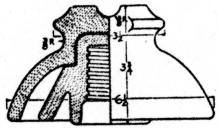
PORCELAIN INSULATORS — *Pin Type*



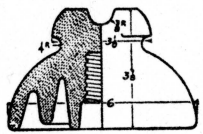
No. 3



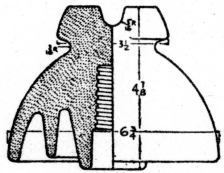
No. 3½



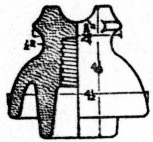
Nos. 3¾ and 2421



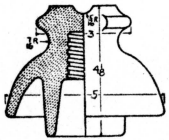
No. 60



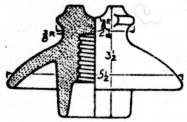
No. 64



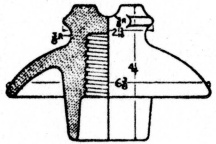
No. 296



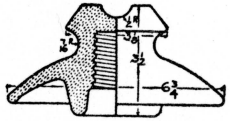
No. 297



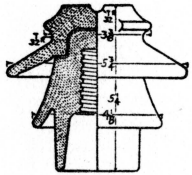
No. 298



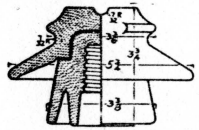
No. 303



No. 403



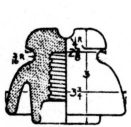
No. 406

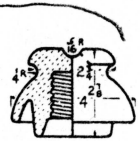


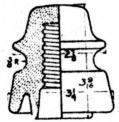
No. 406 B

Insulator No.	3	3½	3¾	60	64	296	297	298	303	403	406	406 B	2421
Line voltage	18000	20000	23000	20000	23000	10000	13000	15000	18000	13000	18000	18000	23000
Test voltage	70000	75000	80000	60000	60000	40000	60000	60000	60000	60000	70000	60000	80000
Rain test	32000	36000	40000	36000	40000	25000	30000	35000	35000	37000	50000	35000	40000
Leakage distance	11¼″	11¼″	11½″	10⅝″	12½″	7¾″	8¼″	7″	8¾″	7″	11¼″	9⅜″	11½″
Striking distance	2″	2⅜″	2⅝″	2¼″	2⅝″	1⅝″	2″	2¼″	3″	2¾″	2⅞″	2½″	2⅝″
Size pin hole	1″	1″	1⅜″	1″	1″	1″	1″	1″	1⅜″	1⅜″	1″	1″	1″
Net weight	2⅞ lbs.	3⅛ lbs.	3⅞ lbs.	3⅝ lbs.	5 lbs.	1⅞ lbs.	2⅛ lbs.	1¾ lbs.	2⅜ lbs.	2½ lbs.	3 lbs.	2⅜ lbs.	3⅞ lbs.
Packed weight	3⅞ lbs.	4¼ lbs.	4¾ lbs.	4½ lbs.	6 lbs.	2¼ lbs.	2½ lbs.	2⅛ lbs.	3¼ lbs.	3⅓ lbs.	4 lbs.	3 lbs.	4¾ lbs.
Number per bbl.	50	50	50	50	40	100	100	100	50	60	50	50	50
Code word	Koperkleur	Kopermolen	Kopfsalat	Korken	Korkmesser	Kopfscheu	Kopfschild	Kopfseite	Kopfsteuer	Krachten	Korbmacher	Korbkiste	Tulle

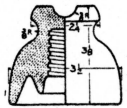
PORCELAIN INSULATORS — *Pin Type*

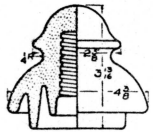

No. 12

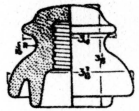

No. 2232


No. 44

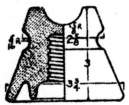

No. 2578

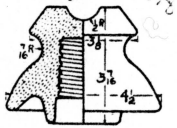

No.63

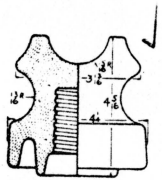

No. 3146

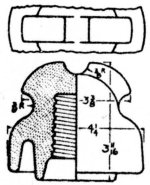

No. 2101 and 2235

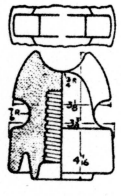
CABLE INSULATORS

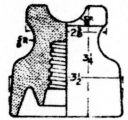

No. 2


No. 396


Nos. 5 A and 55

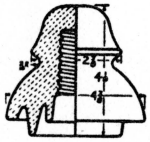

No. 46


No. 47

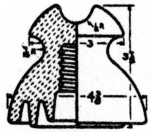

No. 62

Insulator No.	2	5 A	12	44	46	47	55	62	63	396	2101	2232	2235	2578	3146
Line voltage	6600	10000	8000	6600	10000	7500	10000	7500	7500	10000	7500	8000	7500	4400	10000
Test voltage	40000	60000	40000	40000	40000	40000	60000	40000	40000	50000	40000	45000	40000	30000	40000
Rain test	15000	20000	18000	12000	20000	12000	20000	15000	15000	20000	18000	18000	18000	10000	30000
Leakage distance	4¼″	5⅞″	5⅝″	4″	5¾″	3⅞″	5⅞″	4⅞″	4¾″	4¾″	5¼″	5″	5¼″	3½″	7″
Striking distance	1¼″	1½″	1¼″	1″	1½″	1″	1½″	1⅛″	1⅛″	1½″	1¼″	1⅝″	1¼″	1″	1¾″
Size pin hole	1″	1⅜″	1″	1″	1⅜″	1″	1″	1″	1″	1⅜″	1″	1⅜″	1⅜″	1″	1″
Net weight	1 lb.	2⅜ lbs.	1⅛ lbs.	1 lb.	1⅜ lbs.	1 lb.	2⅜ lbs.	1⅛ lbs.	1 lb.	1¾ lbs.	1⅛ lbs.	1¼ lbs.	1¼ lbs.	¾ lb.	1¾ lbs.
Packed weight	1⅓ lbs.	2¾ lbs.	1⅜ lbs.	1¼ lbs.	2 lbs.	1¼ lbs.	2¾ lbs.	1½ lbs.	1½ lbs.	2⅓ lbs.	1½ lbs.	1½ lbs.	1½ lbs.	⅞ lb.	2¼ lbs.
Number per barrel	200	100	200	200	125	200	100	150	125	100	150	150	150	350	100
Code word	Koperkies	Kopfsaege	Kopersteen	Kopfnicken	Korenzeef	Kopfartig	Korstiger	Korkfabrik	Korkkugel	Krachsauer	Kortachtig	Kraechzet	Lista	Tuiez	Loase

GLASS INSULATORS — *High and Low Voltage*

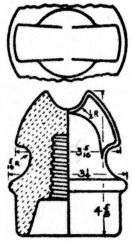


No. 15

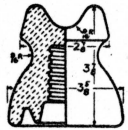


No. 20

Nos. 21 and 22



No. 48



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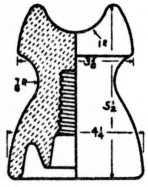

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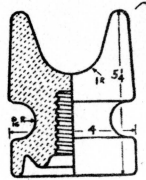

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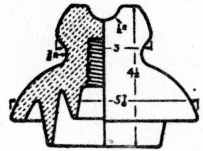

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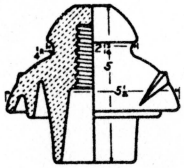

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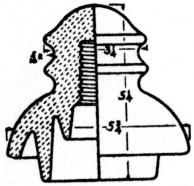

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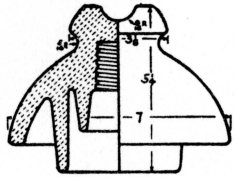
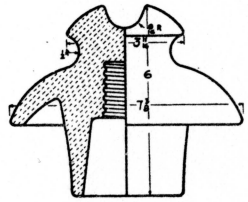


No. 17-A



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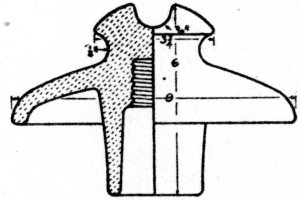
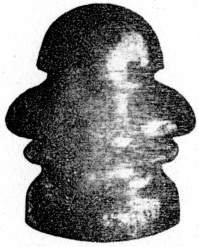


No. 23

Insulator No.	15	16	17-A	18	19	20	21	22	23	26	48	50	51	52
Line voltage	10000	18000	20000	18000	23000	10000	10000	10000	25000	18000	6600	7500	10000	7500
Rain test	20000	36000	40000	35000	45000	20000	18000	18000	55000	35000	12000	15000	20000	18000
Leakage distance	6¼"	9½"	13¾"	10½"	10¾"	6½"	5½"	5½"	13¼"	9½"	4¼"	4¼"	6½"	4¼"
Striking distance	1¾"	2⅝"	3⅛"	2⅝"	3⅜"	1⅝"	1½"	1½"	4⅝"	2⅝"	1"	1⅛"	1½"	1⅜"
Size pin hole	1"	1"	1⅜"	1"	1⅜"	1"	1⅜"	1"	1⅜"	1"	1"	1"	1"	1"
Net weight	1⅞ lbs.	3⅞ lbs.	6 lbs.	2⅞ lbs.	5⅞ lbs.	2¼ lbs.	2⅜ lbs.	2⅜ lbs.	6⅞ lbs.	3⅞ lbs.	1⅞ lbs.	2¾ lbs.	3 lbs.	3 lbs.
Packed weight	2¼ lbs.	4¼ lbs.	7½ lbs.	3¾ lbs.	7 lbs.	2½ lbs.	2⅝ lbs.	2⅝ lbs.	9½ lbs.	4½ lbs.	2⅛ lbs.	2 lbs.	4 lbs.	3⅞ lbs.
Number per bbl.	125	40	33	50	30	125	75	75	20	50	110	125	50	50
Code word	Korenschip	Korentang	Kopflaenge	Korenvink	Korenvlam	Korenvloot	Korenwan	Korenworm	Korenzak	Kopfringes	Kopflerche	Kopflinie	Kopflos	Kopflorer

FLINT GLASS INSULATORS — *For Telephone and Low Voltage*



No. 14—One-piece Transposition
Patented May 22, 1894

Two-piece Transposition

Deep Groove

D. G. D. P.

Ex. D. G. D. P.

Double Petticoat

Regular

Pony Double Pett.

No. 9 Pony

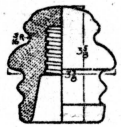
Double Groove Pony

Insulator	Diameter	Height	Size Wire Groove	Weight per 1000 Packed	Weight per 1000, Net	No. per Bbl.	Size Pin Hole	Code Word
No. 14	3 7/8″	4 1/2″	3/8″	2250 lbs.	1850 lbs.	100	1″	**Korenroos**
2-piece Transposition	3 5/8″	5″	1/4″	2000 lbs.	1700 lbs.	125	1″	**Kornart**
Double Petticoat	3″	4″	1/4″	1500 lbs.	1250 lbs.	165	1″	**Kornarten**
D. G. D. P.	3 1/8″	4″	1/4″	1475 lbs.	1188 lbs.	175	1″	**Kornbau**
Ex. D. G. D. P.	3 1/8″	3 5/8″	3/4″	1550 lbs.	1250 lbs.	165	1″	**Kornbaues**
Deep Groove	3″	4″	1/2″	1275 lbs.	1000 lbs.	200	1″	**Kornbeere**
Regular	2 3/4″	3 3/4″	1/4″	1100 lbs.	940 lbs.	250	1″	**Kornblume**
Pony Double Petticoat	2 7/8″	3 1/4″	3/8″	950 lbs.	850 lbs.	275	1″	**Kornboden**
Pony No. 9	2 1/8″	3 1/2″	1/4″	740 lbs.	563 lbs.	350	1″	**Kornboerse**
Double Groove Pony	2 1/8″	3 3/4″	1/4″	760 lbs.	625 lbs.	340	1″	**Kornbrand**

Standard 1½″ x 9″ wood pins are usually used with these insulators, except the 2-piece transposition with which a special wood pin, with long thread, must be used. For stiff, heavy construction all wood top steel pins Nos. 8, 12 or 34 may be used, especially with D. G. D. P. and Ex. D. G. D. P.

PORCELAIN INSULATORS—*Pin Type*

TELEPHONE INSULATORS



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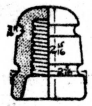

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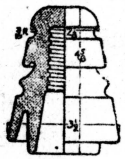
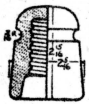


No. 8A



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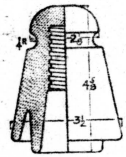
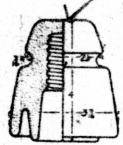


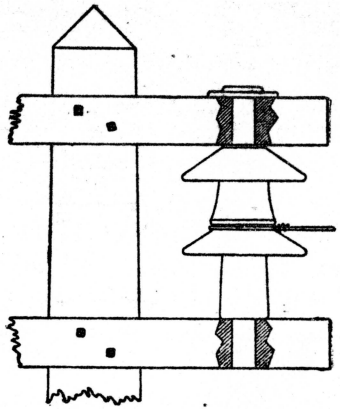
No. 2088



No. 2438

Insulator No.	7	8	8A	9	2088	2438
Leakage Distance	5″	3″	6¼″	3″	6¼″	6½″
Size pin hole	1″	1″	1″	1″	1″	1″
Net weight, per 1000	1000 lbs.	500 lbs.	1250 lbs.	500 lbs.	1250 lbs.	1500 lbs.
Packed weight, per 1000	1300 lbs.	625 lbs.	1500 lbs.	665 lbs.	1450 lbs.	1750 lbs.
Number per barrel	150	400	150	400	150	200
Code word	Koperoxyde	Koperpool	Kopfkiemer	Koperroest	Kosteloos	Tuons

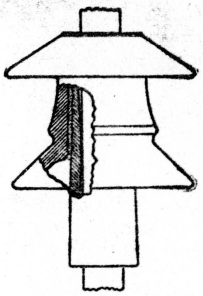
STRAIN INSULATORS—*Pin Type*



Dead-ending live wire.

Corners, curves, dead-ends and similar points in a transmission line where the line pull is too heavy for the ordinary insulator and pin, should be provided with strain insulators. The manner of using is clearly shown and the mechanical efficiency of the construction so obtained has firmly established this type of insulator.

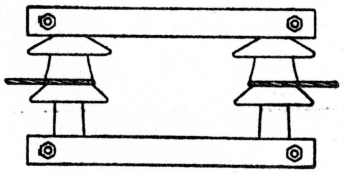
Varying with the size, these insulators will stand up to 15,000 lbs. maximum for a single insulator and for heavier loads the insulators may be used in multiple, as illustrated, and for voltages above 30,000 volts the insulators may be used in series.



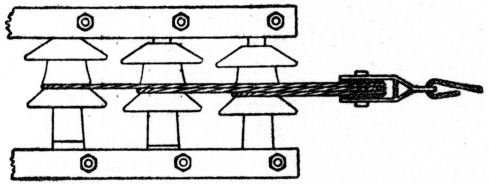
Showing pin tangent opposite wire groove for compression.

To obtain maximum strength of this type of insulator it is essential that the pin used be allowed free play in the hole and *not fit snugly*. Also, if for special reasons it is necessary or advisable to cement the pin solidly into the insulator it is absolutely necessary that the pin be of such strength as to remain without any flexure under maximum load, since the insulators are so designed that the porcelain will be under compression only at a point between the wire and pin.

We can furnish special strain insulators for all loads and for any voltage, using special designs and methods of application. We solicit correspondence.

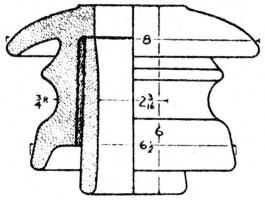


Series application.

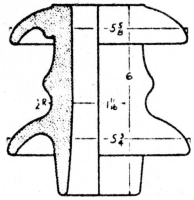


Application in multiple for heavy loads.

PORCELAIN INSULATORS — *Strain or Anchorage Type*



No. 599



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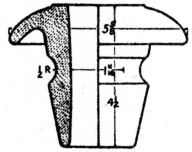

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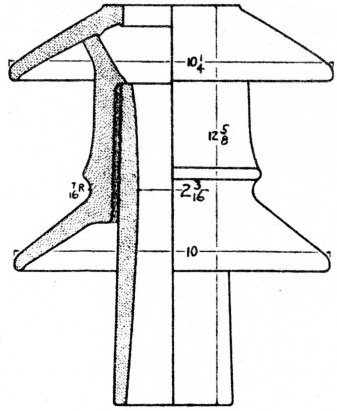
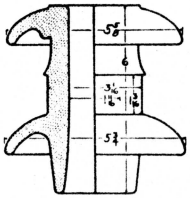
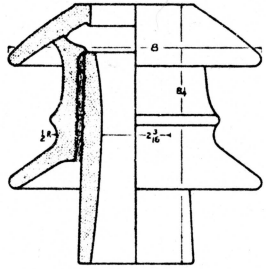


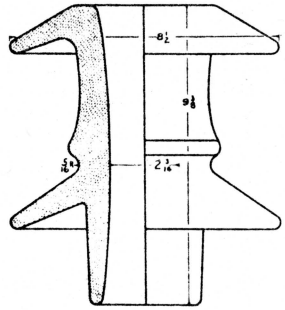
No. 606
Patented July 25, 1905



No. 601A



No. 603. Pat. July 25, 1905

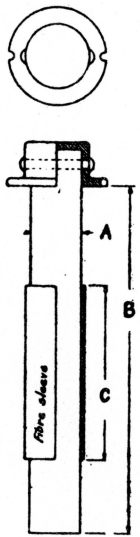


No. 605

Insulator No.	599	601	601A	602	603	605	606
Line voltage	7500	10000	10000	5000	23000	23000	30000
Test voltage	40000	40000	40000	25000	50000	60000	80000
Rain test	15000	20000	20000	10000	40000	40000	60000
Leakage distance	5¾″	5½″	5¼″	2½″	7½″	8½″	11″
Striking distance	¾″	1¼″	1¼″	2½″	2¼″	3″	4¼″
Ultimate mechanical strength	15000 lbs.	12000 lbs.	12000 lbs.	12000 lbs.	12000 lbs.	12000 lbs.	12000 lbs.
Net weight	9½ lbs.	4¼ lbs.	4¼ lbs.	2¼ lbs.	9¼ lbs.	10½ lbs.	16 lbs.
Packed weight	13 lbs.	6¼ lbs.	6¼ lbs.	3½ lbs.	13 lbs.	14 lbs.	28 lbs.
Number per barrel	15	25	25	50	13	8	4
Use pin not over	2″ diam.	1½″ diam.	1½″ diam.	1½″ diam.	2″ diam.	2″ diam.	2″ diam.
Code word	**Korrel**	**Kornzolles**	**Koronea**	**Koropedion**	**Koroniden**	**Korpsen**	**Korpsgeist**

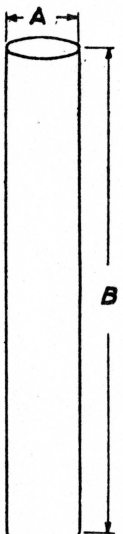
INSULATOR PINS FOR STRAIN INSULATORS

These pins are designed for use with strain insulators Nos. 601, 601A, 602, 603, etc. The Nos. 61-64 wood pins are split hickory, treated with paraffine. The Nos. 65-68 iron pins are extra heavy standard pipe provided with a cap at the top to cover holes in pipe and cross-arm. Pins Nos. 70-74 are made of standard cold rolled shafting; otherwise they are the same as Nos. 65-68. The iron pins include flexible fibre sleeves as cushion between the iron and porcelain. Iron pins furnished plain, unless galvanized specified; wood pins paraffined unless otherwise specified.



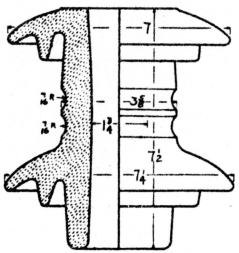
Iron Pins
Nos.65-68,70-74

No.	Dimensions in Inches			Weight Packed	Code Word
	A	B	C		
61	1½	16	...	¾ lb.	**Koterde**
62	2	18	...	1½ lbs.	**Koterende**
63	2	20	...	1¾ lbs.	**Kothabzug**
64	2	23	...	2½ lbs.	**Kothartig**
65	1.32	16	4½	3½ lbs.	**Kothbad**
66	1.9	18	5	5½ lbs.	**Kothball**
67	1.9	20	6½	6 lbs.	**Kothfliege**
68	1.9	23	8½	7½ lbs.	**Kothgrube**
70	1 7/16	16	4½	8 lbs.	**Kothrinde**
71	1 15/16	16	5	14½ lbs.	**Kothurn**
72	1 15/16	18	5	17¾ lbs.	**Kothvulkan**
73	1 15/16	20	6½	18¾ lbs.	**Kothwetter**
74	1 15/16	23	8½	20 lbs.	**Kotje**

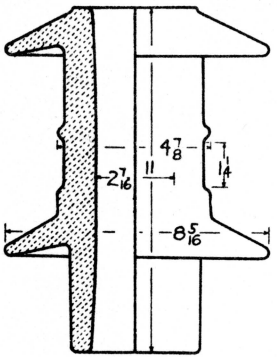


Wood Pins
Nos. 61-64

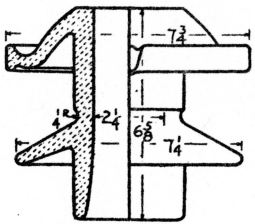
PORCELAIN INSULATORS—*Strain or Anchorage Type*



No. 2137



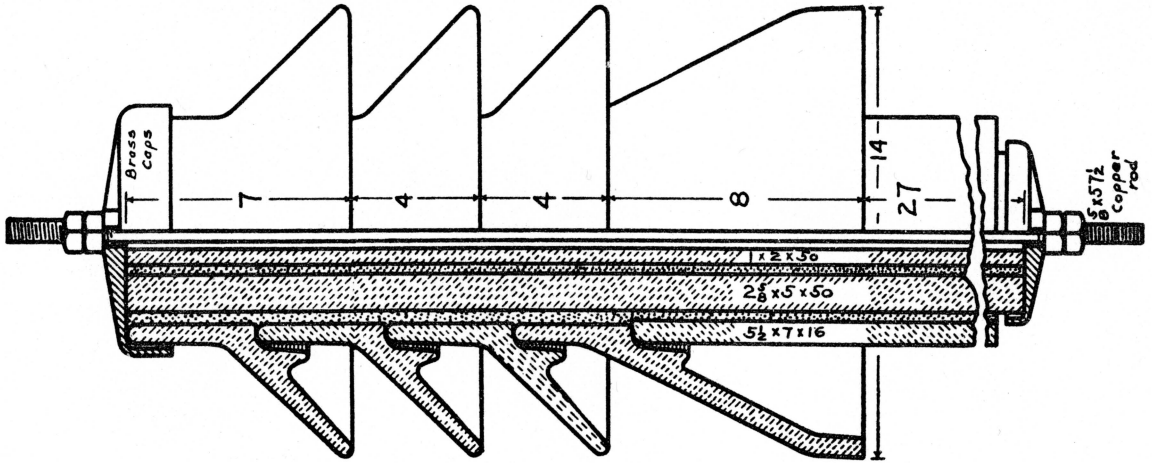
No. 2230



No. 600

Insulator No.	600	2137	2230
Line voltage	13000	11000	18000
Test voltage	50000	40000	70000
Rain test	23000	23000	35000
Leakage distance	6½″	7″	8½″
Striking distance	1¾″	1½″	2¾″
Ultimate mechanical strength	12000 lbs.	12000 lbs.	12000 lbs.
Net weight	6⅜ lbs.	8¾ lbs.	13½ lbs.
Packed weight	11½ lbs.	11½ lbs.	19 lbs.
Number per barrel	10	16	8
Use pin not over	2″ diam.	1½″ diam.	2¼″ diam.
Code word	**Kornzoll**	**Kraeftig**	**Kraeftigen**

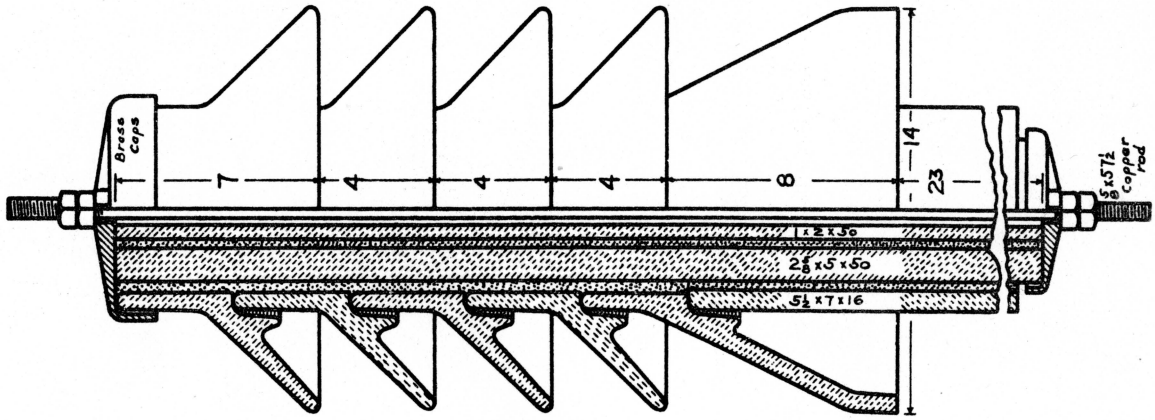
PORCELAIN INSULATORS FOR ROOF ENTRANCES



No. 2218

Insulator No.	2218
Line voltage	55000
Test voltage	150000
Rain test	120000
Leakage distance	42½"
Striking distance	7½"
Net weight	160 lbs.
Packed weight	210 lbs.
Code word	Kraehen

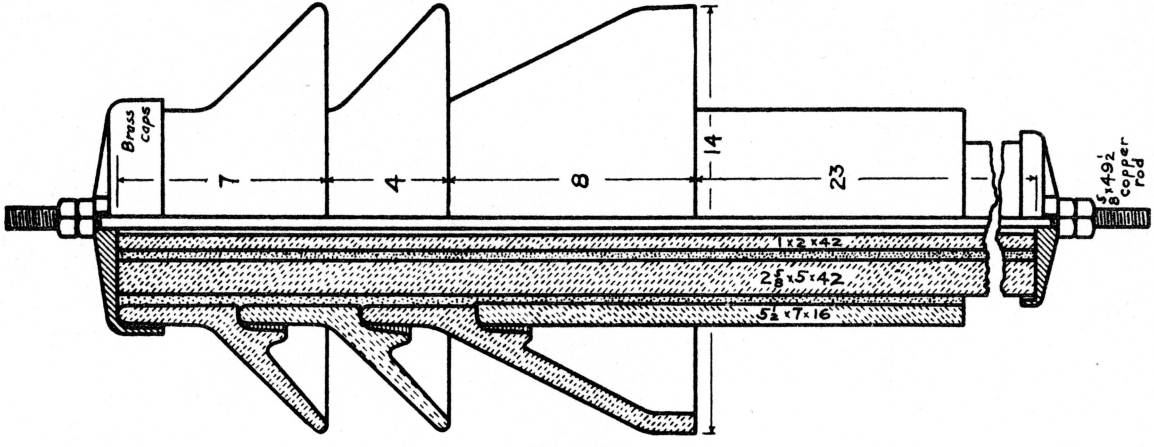
PORCELAIN INSULATORS FOR ROOF ENTRANCES



No. 504

Insulator No.	504
Line voltage	66000
Test voltage	175000
Rain test	140000
Leakage distance	54″
Striking distance	10″
Net weight	180 lbs.
Packed weight	300 lbs.
Code word	**Kostenlos**

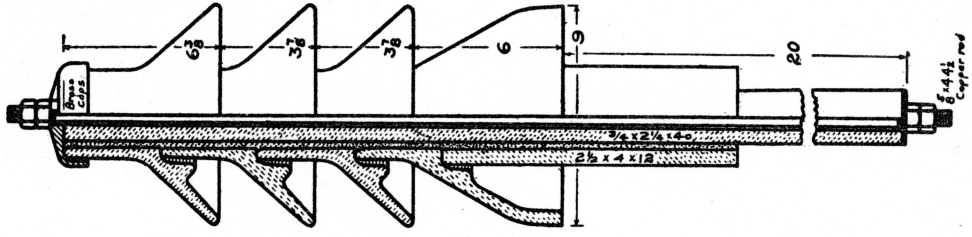
PORCELAIN INSULATORS FOR ROOF ENTRANCES



No. 2097

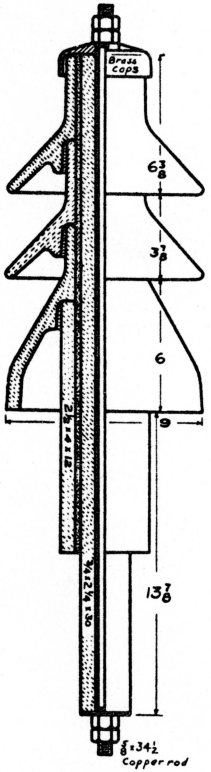
Insulator No.	2097
Line voltage	44000
Test voltage	120000
Rain test, vertical	100000
Leakage distance	32″
Striking distance	5″
Net weight	130 lbs.
Packed weight	200 lbs.
Code word	**Krabsel**

PORCELAIN INSULATORS FOR ROOF ENTRANCES



No. 2105

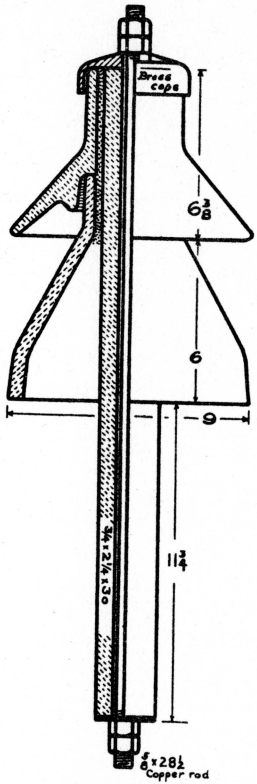
Insulator No.	2105
Line voltage	40000
Test voltage	100000
Rain test	90000
Leakage distance	34½"
Striking distance	6"
Net weight	35 lbs.
Packed weight	110 lbs.
Code word	**Krabspin**



No. 2099

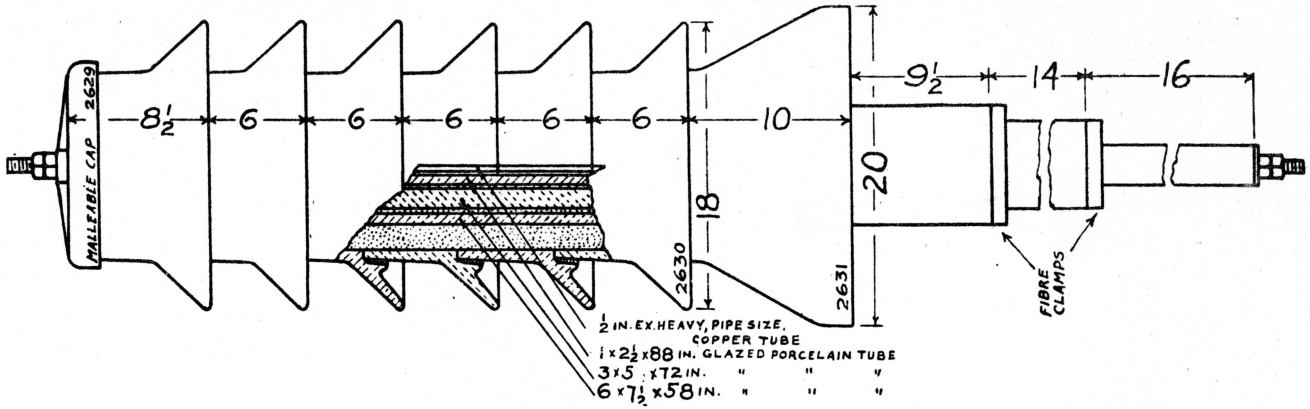
PORCELAIN INSULATORS FOR ROOF ENTRANCES

Insulator No.	2099	2104
Line voltage	33000	18000
Test voltage	90000	85000
Rain test	80000	60000
Leakage distance	25½″	16½″
Striking distance	4″	2″
Net weight	30 lbs.	28 lbs.
Packed weight	88 lbs.	80 lbs.
Code word	**Krabvormig**	**Krabsters**



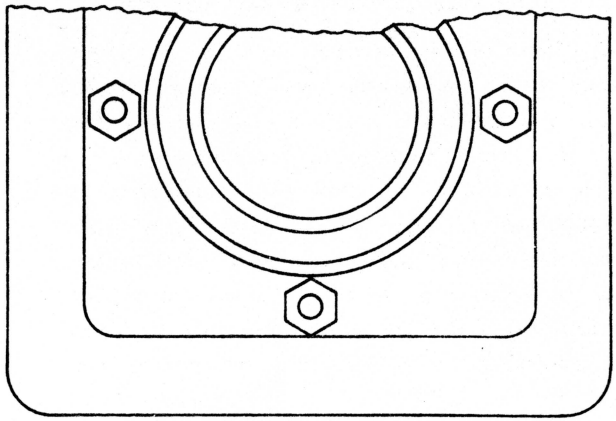
No. 2104

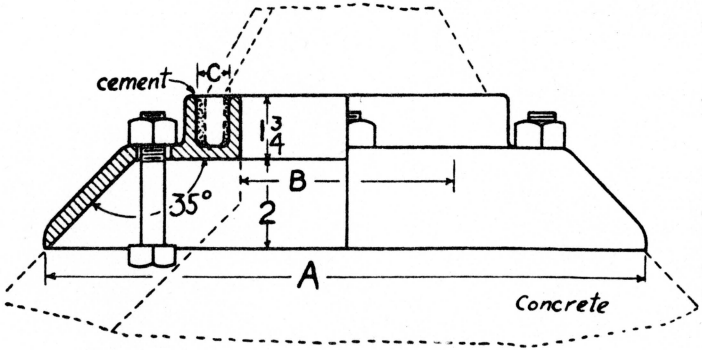
PORCELAIN INSULATORS FOR ROOF ENTRANCES



No. 2628

Insulator No.	2628
Line voltage,	110000
Test voltage,	250000
Rain test,	210000
Leakage distance,	75″
Striking distance,	18″
Net weight,	480 lbs.
Packed weight,	600 lbs.
Usually packed,	1 per box, complete
Code word,	SUPRA





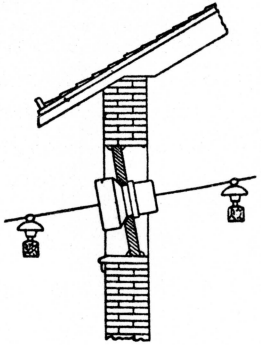
BASES FOR ROOF INSULATORS

THESE gray-iron bases are furnished with 4 ¾-inch x 4-inch sherardized machine bolts. They considerably simplify and reduce the cost of installation of roof insulators, forming a substantial weatherproof support.

Installation of the insulator is made by simply pouring neat Portland cement in a "slush" condition into the cement groove and, if desired, coating the exposed cement joint with roofing cement after setting. All tightening of the securing bolts must be done BEFORE the installation of the insulator. Both holes are 1 inch in diameter.

Base No.	2541	2553	2755
For Insulators, Nos., .	504, 2097 2218	2099, 2104 2105	2628
A, ...	23 ″	18 ″	30 ″
B, ...	11½″	6½″	16½″
C, ...	1¼″	1¼″	1¾″
Net weight, ...	52 lbs.	32 lbs.	100 lbs.
Code word, ...	SUOLA	SUPPE	TREJA
Circle diameter c.-c. of bolts, ...	17¾″	12¼″	24¼″

WALL ENTRANCE INSULATORS

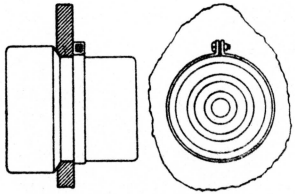


Method of entranee

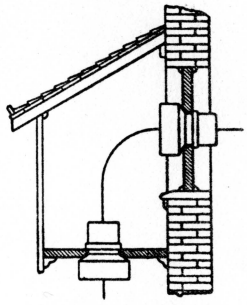
Various methods have been proposed and employed in passing high voltage wires through walls, referring especially to entrance from pole line into the power house. Glass and porcelain tubes have been used alone, but their cost and fragility, when solely depended upon for this purpose, has worked against their general adoption.

The insulators here shown may be used in various manners for bringing wires into power houses or substations or used as insulating bushings in many other positions. These insulators are made of concentric porcelain rings, cemented together, making them thoroughly substantial mechanically; electrically, the design presents an abundance of leakage surface and maximum puncture strength and form a weatherproof entrance.

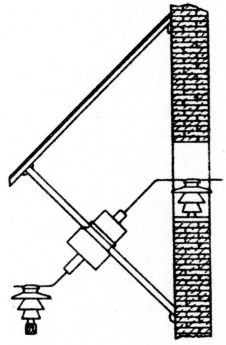
The method shown for securing insulator into panel is recommended. The material for the panels may be slate, marble, glass or seasoned and thoroughly varnished wood, and the line voltage recommendations are made with the understanding that such materials are used and that the diameter of the panel shall be at least twice that of the insulator. At the operating voltages given, the insulators and panels may be installed directly in the wall, fully exposed to the weather.



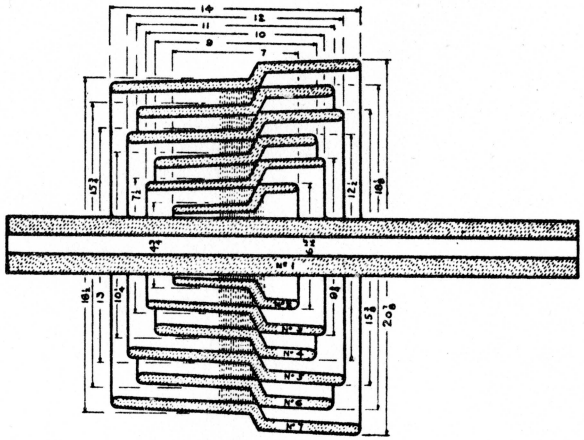
Method of securing insulator into panel by iron band



Method of entrance



Method of entrance



Nos. 661-666
Patented Feb. 11, 1908

PORCELAIN INSULATORS FOR WALL ENTRANCES

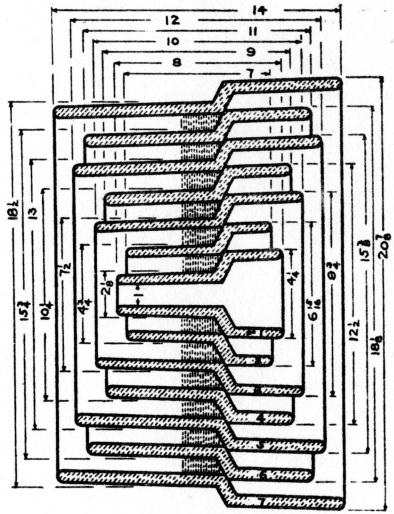
The porcelain tubes (part 1) in these insulators are of the following dimensions:

Insulators Nos. 661-2—¾″ x 2¼″ x 15½″
Insulator No. 663—¾″ x 2¼″ x 24″
Insulator No. 664—1″ x 2½″ x 24″
Insulators Nos. 665-6—1″ x 2½″ x 32″

Insulator No.	661	662	663	664	665	666
Line voltage	27000	44000	55000	66000	75000	90000
Test voltage	60000	80000	100000	120000	130000	140000
Rain test	50000	65000	80000	95000	110000	125000
Consists of parts Nos.	1, 2	1, 2, 3	1, 2, 3, 4	1, 2, 3, 4, 5	1-6 Inc.	1-7 Inc.
Net weight	8¼ lbs.	21 lbs.	42½ lbs.	72 lbs.	118 lbs.	166 lbs.
Packed weight	15 lbs.	40 lbs.	80 lbs.	116 lbs.	150 lbs.	205 lbs.
Number per bbl.	8	3	Cased	Cased	Cased	Cased
Use panel No.	2	3	4	5	6	7
Use band No.	2	3	4	5	6	7
Code word	**Kosters**	**Kostfrau**	**Kostfrauen**	**Kostganger**	**Kostgeber**	**Kostgeld**

PORCELAIN INSULATORS FOR WALL ENTRANCES

Insulator No.	650	651	652	653	654	655	656
Line voltage	10000	17000	27000	40000	55000	60000	60000
Test voltage	45000	60000	75000	85000	120000	130000	160000
Rain test	18000	25000	40000	55000	70000	85000	100000
Leakage distance	2½″	7½″	15″	21¾″	31¼″	39¾″	51½″
Consists of shells Nos.	1	1, 2	1, 2, 3	1, 2, 3, 4	1-5 Inc.	1-6 Inc.	1-7 Inc.
Net weight	2¾ lbs.	7¾ lbs.	20 lbs.	38½ lbs.	68 lbs.	104 lbs.	152 lbs.
Packed weight	3½ lbs.	12 lbs.	35 lbs.	55 lbs.	100 lbs.	165 lbs.	240 lbs.
Number per bbl.	50	14	4	3	2	1	Cased
Use panel No.	1	2	3	4	5	6	7
Use band No.	1	2	3	4	5	6	7
Code word	Kosewort	Koslarniza	Kosmas	Kosmetisch	Kossaeer	Kossynier	Kostbar

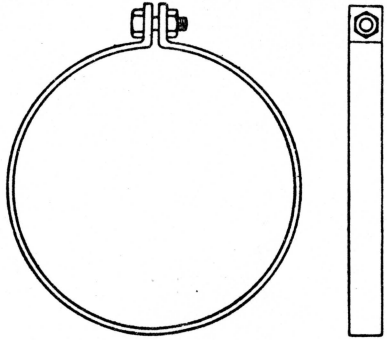


No. 650-656
Patented Feb. 11, 1908

BANDS FOR WALL INSULATORS

For securing wall insulators into slate or other panels.

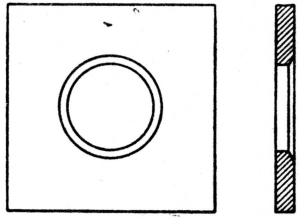
These bands are all made of ¼"x1" iron, with ½" square head bolts. Furnished plain or galvanized. These bands are bolted snugly around the insulators.



Band No.	Inside Diam.	For Insulators Nos.	Weight Net	Code Word
1	2"	650	1 lb.	**Kosthuizen**
2	4¾"	651 and 661	1½ lbs.	**Kostjuffer**
3	7½"	652 and 662	3¼ lbs.	**Kostkind**
4	10¼"	653 and 663	3½ lbs.	**Kostkinder**
5	13"	654 and 664	3¾ lbs.	**Kostschip**
6	15¾"	655 and 665	5 lbs.	**Kostschool**
7	18½"	656 and 666	6 lbs.	**Kostschule**

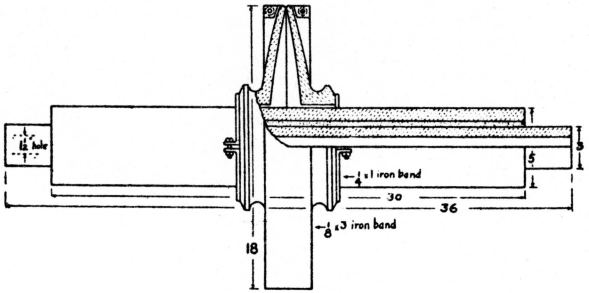
SLATE PANELS FOR WALL INSULATORS

These panels are used for supporting wall insulators and are furnished either plain or enameled as desired. Plain furnished if enameled not specified.

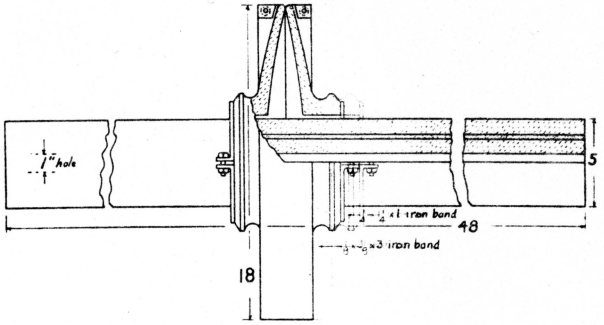


Panel No.	Diam. of Hole	Outside Dimensions	Weight Packed	For Insulators No.	Code Word
1	2¼"	8" x 8" x 1"	17 lbs.	650	**Kothhaufe**
2	5"	14" x 14" x 1¼"	25 lbs.	651 and 661	**Kothhof**
3	7¾"	19" x 19" x 1½"	50 lbs.	652 and 662	**Kothhofes**
4	10⅝"	25" x 25" x 1¾"	100 lbs.	653 and 663	**Kothig**
5	13⅜"	30" x 30" x 2"	165 lbs.	654 and 664	**Kothiger**
6	16⅛"	36" x 36" x 2"	235 lbs.	655 and 665	**Kothkarren**
7	18⅞"	40" x 40" x 2"	290 lbs.	656 and 666	**Kothknecht**

PORCELAIN INSULATORS FOR WALL ENTRANCES



No. 672

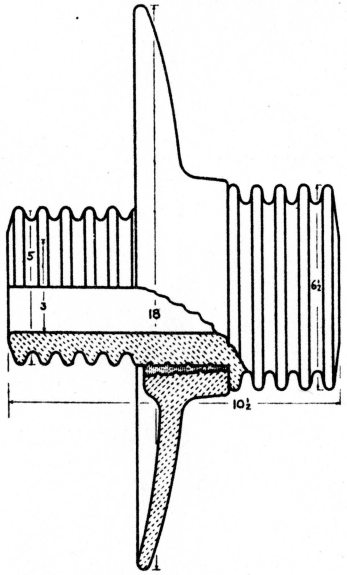


No. 676

Insulator No.	672	676
Line voltage	60000	75000
Test voltage	150000	150000
Rain test	125000	140000
Leakage distance	23″	28″
Striking distance	18½″	24″
Net weight	80 lbs.	120 lbs.
Packed weight	110 lbs.	160 lbs.
Code word	**Kottyphos**	**Koudemeter**

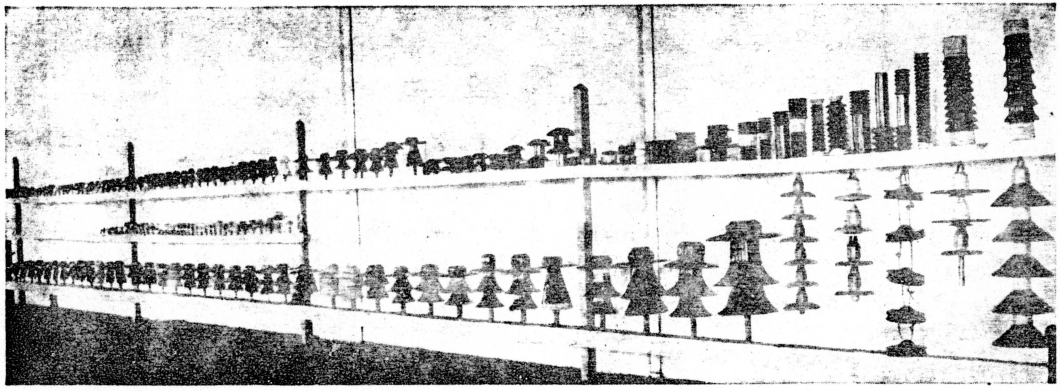
No cement is used in assembling these insulators. The parts are secured together by the iron bands. The parts are packed unassembled, except the tubes, which are nested and secured together ready for assembly in the flanges.

PORCELAIN INSULATORS FOR WALL ENTRANCES



No. 675
Patented Nov. 5, 1907

Insulator No.	675
Line voltage	60000
Test voltage	100000
Rain test	70000
Leakage distance	13¼″
Striking distance	8¾″
Net weight	28 lbs.
Packed weight	50 lbs.
Number per bbl.	2
Code word	**Koudegraad**



In our "Museum"

PORCELAIN TUBES, BUSHING, AND SPECIAL PIECES

PORCELAIN TUBES

We are prepared to manufacture all sizes of porcelain tubes for high-voltage use. Standard diameters, usually in stock up to sixty inches long, are as follows:

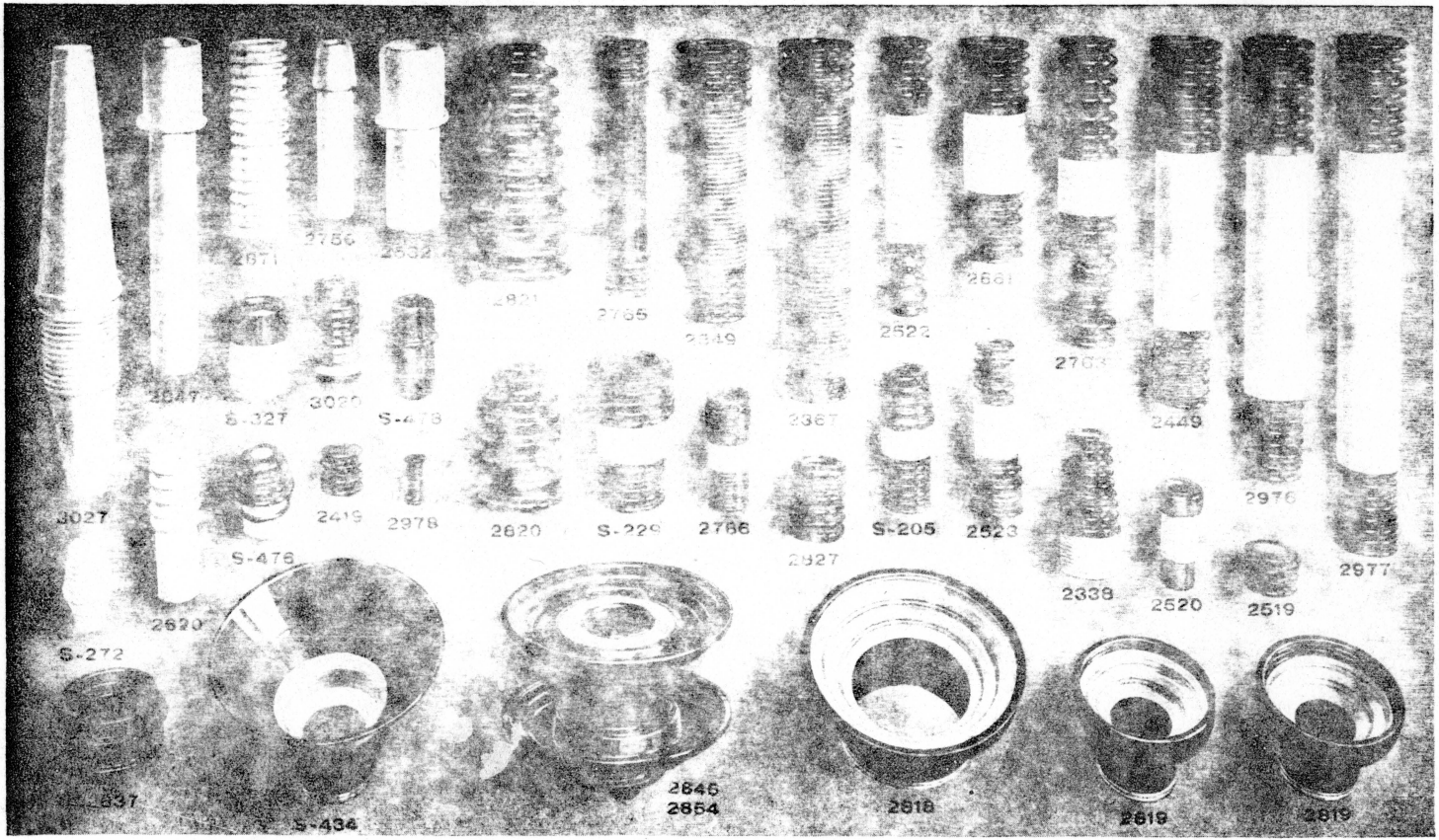
$\frac{1}{2}$″ x 2″, $\frac{3}{4}$″ x 2$\frac{1}{4}$″, 1″ x 2″, 1″ x 2$\frac{1}{2}$″, 1$\frac{1}{2}$″ x 3″, 2″ x 3$\frac{1}{2}$″, 2$\frac{1}{2}$″ x 4″, 2$\frac{5}{8}$″ x 5″, 3″ x 5$\frac{1}{2}$″, 3$\frac{1}{2}$″ x 6$\frac{1}{2}$″, 4″ x 7″, 4$\frac{1}{2}$″ x 7$\frac{1}{2}$″, 5$\frac{1}{2}$″ x 7″.

Special sizes can be readily furnished or extra-thick tubes are built up by nesting and cementing thinner tubes. All sizes are glazed brown and without heads unless otherwise ordered, and can be furnished any length practically straight. Our standard tube heads are 2$\frac{1}{2}$″ long and 1″ larger diameter than outside diameter of tube, and length of tube is measured over all.

BUSHINGS AND SPECIAL PIECES

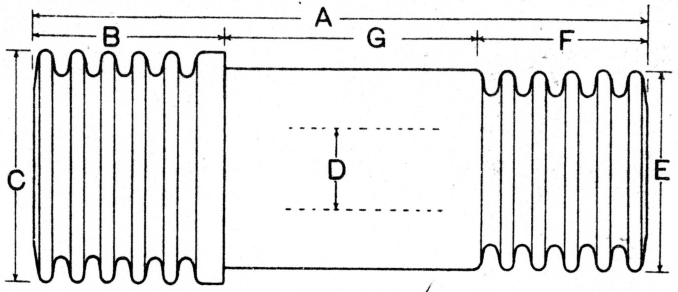
Our facilities are complete for the manufacture of this class of work. On the back of this sheet are shown a few representative specimens of our product, including some special exclusive designs of customers.

PORCELAIN BUSHINGS AND SPECIAL PIECES



STANDARD PORCELAIN BUSHINGS

STYLE C

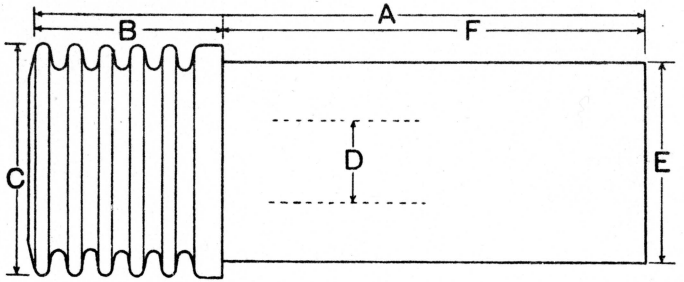


Cat. No.		4000	4001	4002	4003	4004	4005	4006	4007	4008	4009	4010	4011	4012	4013	4014	4015	4016	4017	4018	4019
Dimension in ins.	A	8	8	8	8	10	10	10	10	14	14	14	14	18	18	18	18	22	22	22	22
	B	3	3	3	3	3¾	3¾	3¾	3¾	4½	4½	4½	4½	5¼	5¼	5¼	5¼	6	6	6	6
	C	3½	4	4½	5	3½	4	4½	5	3½	4	4½	5	3½	4	4½	5	3½	4	4½	5
	D	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½
	E	3	3½	4	4½	3	3½	4	4½	3	3½	4	4½	3	3½	4	4½	3	3½	4	4½
	F	2½	2½	2½	2½	3¼	3¼	3¼	3¼	4	4	4	4	4¾	4¾	4¾	4¾	5¼	5¼	5¼	5¼
	G	2½	2½	2½	2½	3	3	3	3	5½	5½	5½	5½	8	8	8	8	10¾	10¾	10¾	10¾
Net Wt. Lbs.		5	6¼	7½	9	6¼	7¾	9½	11	8¾	11	13	15½	11¼	14	17	20	13¾	17	20¾	24
Code Word		VIOLE	VIRAN	VIRIL	VIRUS	VISOR	VIVDA	VIXEN	VIZIR	VLAAG	VLIEG	VLOED	VOCAL	VODKA	VOEUX	VOICE	VOILA	VOJET	VOLOP	VOLPE	VOMER

Cat. No.		4020	4021	4022	4023	4024	4025	4026	4027	4028	4029	4030	4031	4032	4033	4034	4035
Dimension in ins.	A	26	26	26	26	30	30	30	30	34	34	34	34	36	36	36	36
	B	7½	7½	7½	7½	8¼	8¼	8¼	8¼	9¾	9¾	9¾	9¾	10½	10½	10½	10½
	C	3¾	4¼	4¾	5¼	3¾	4¼	4¾	5¼	3¾	4¼	4¾	5¼	3¾	4¼	4¾	5¼
	D	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½
	E	3¼	3¾	4¼	4¾	3¼	3¾	4¼	4¾	3¼	3¾	4¼	4¾	3¼	3¾	4¼	4¾
	F	6¾	6¾	6¾	6¾	7½	7½	7½	7½	9	9	9	9	9¾	9¾	9¾	9¾
	G	11¾	11¾	11¾	11¾	14¼	14¼	14¼	14¼	15¼	15¼	15¼	15¼	15¾	15¾	15¾	15¾
Net Wt. Lbs.		16¼	20½	24½	28½	19½	23½	28	33	21	26½	32	37½	22½	28¼	34	39½
Code Word		VOOGD	VOSSO	VOTIF	VOTUM	VOYOU	VOZNO	VREES	VROUW	VUIST	VURMO	VYASA	WAARE	WAFER	KROCH	KRONE	KUBUS

STANDARD PORCELAIN BUSHINGS

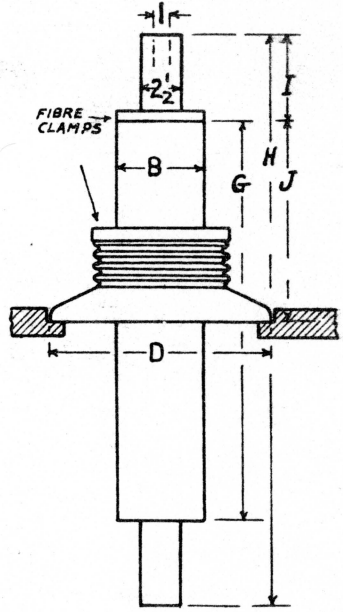
STYLE P



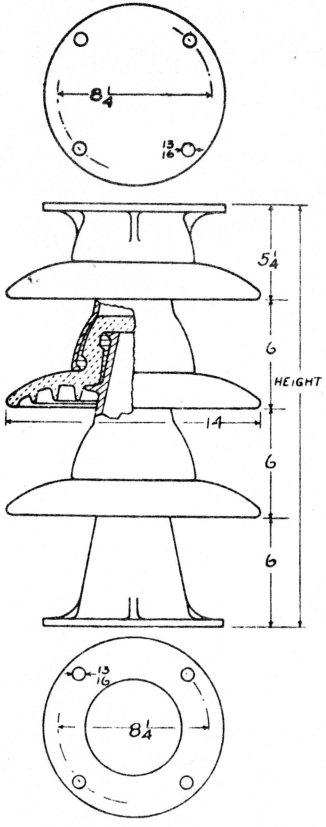
Cat. No.		4036	4037	4038	4039	4040	4041	4042	4043	4044	4045	4046	4047	4048	4049	4050	4051	4052	4053	4054	4055	4056	4057	4058	4059	4060	4061	4062	4063	4064	4065	4066	4067	4068	4069	4070	4071
Dimension in ins.	A	8	8	8	8	10	10	10	10	14	14	14	14	18	18	18	18	22	22	22	22	26	26	26	26	30	30	30	30	34	34	34	34	36	36	36	36
	B	3	3	3	3	3¾	3¾	3¾	3¾	4½	4½	4½	4½	5½	5½	5½	5½	6	6	6	6	7½	7½	7½	7½	8½	8½	8½	8½	9¾	9¾	9¾	9¾	10½	10½	10½	10½
	C	3½	4	4½	5	3½	4	4½	5	3½	4	4½	5	3½	4	4½	5	3½	4	4½	5	3¾	4¼	4¾	5¼	3¾	4¼	4¾	5¼	3¾	4¼	4¾	5¼	3¾	4¼	4¾	5¼
	D	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½	1	1½	2	2½
	E	3	3½	4	4½	3	3½	4	4½	3	3½	4	4½	3	3½	4	4½	3	3½	4	4½	3¼	3¾	4¼	4¾	3¼	3¾	4¼	4¾	3¼	3¾	4¼	4¾	3¼	3¾	4¼	4¾
	F	5	5	5	5	6½	6½	6½	6½	9½	9½	9½	9½	12¾	12¾	12¾	12¾	16	16	16	16	18½	18½	18½	18½	21¾	21¾	21¾	21¾	24¼	24¼	24¼	24¼	25½	25½	25½	25½
Net Wt. Lbs.		5	6¼	7½	9	6¼	7¾	9½	11	8¾	11	13	15½	11½	14	17	20	13¾	17	20¼	24	16¼	20½	24½	28½	19	23½	28	33	21	26½	32	37½	22½	28¼	34	39½
Code Word		KUGEL	KUNST	KYLON	LAARS	LABEO	LABRY	LACCA	LAGER	LAHAD	LAITY	LAKUM	LAMPE	LANCE	LAPUZ	LARME	LASHA	LATHY	LAXOS	LAZUR	LAZZI	LEARN	LEMAS	LEMBO	LEMON	LEMUR	LENCO	LENZA	LEPRA	LESAO	LEUTE	LEWAT	LEXIS	LEZEN	LICHT	LINDE	LINFA

FLOOR INSULATORS

THESE floor insulators are to be used indoor and in a vertial position only. Provision is made for 1 inch effective leakage distance for each 2½ K. V. line voltage, the surface of the porcelain disc not being included in measuring the leakage path. The porcelain discs remove the ground terminal sufficiently to reduce the stress on the tubes to a safe value. The tubes are held in place by fibre ring clamps, permitting ready adjustment or repair. Below 18,000 volts the use of bushings or tubes is suggested.



Insulator No.		2632	2633	2634	2635	2636	2637	2638
Dimensions in Inches	A,	.....	.....	.....	3	3	3	3
	B,	.....	.....	.....	5½	5½	5½	5½
	C,	6½	10	12½	16½	25½	35	43
	D,	10	10	10	15	15	20	20
	E,	3½	7	9½	12½	21½	30	38
	F,	4	4	4	5	5	6	6
	G,	.....	.....	.....	24	36	48	59
	H,	15	22	27	35	53	72	88
	I,	.....	.....	.....	5½	8½	12	14½
	J,	.....	.....	.....	13	19	25	30½
Line voltage,		18000	27000	33000	44000	66000	88000	110000
Test voltage,		60000	80000	100000	132000	175000	220000	275000
Leakage distance,		7½″	11″	13½″	17½″	26½″	36″	44″
Net weight,		16 lbs.	20 lbs.	30 lbs.	70 lbs.	90 lbs.	125 lbs.	145 lbs.
Packed weight,		28 lbs.	35 lbs.	50 lbs.	120 lbs.	150 lbs.	200 lbs.	245 lbs.
Code word,		THIGH	THORIUM	THRIA	THRON	TIARA	TIBNI	TIEDE



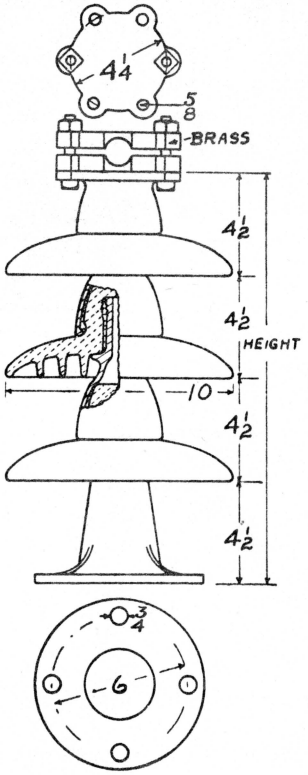
PEDESTAL INSULATORS

HEAVY TYPE

THESE insulators are suitable for the support of bus-bars, horn-gaps, switches, etc., and may be used vertically or horizontally, and can be attached to support either at top or bottom. The relative position of bolt holes in top and bottom casting is standard as shown. Metal regularly furnished sherardized.

Insulator Nos.,	3077	3078	3079	3080	3081	3082	3083
Height,	23¼	29¼	35¼	41¼	47¼	53¼	59¼
Number units,	3	4	5	6	7	8	9
Line voltage, indoor,	75000	110000	120000	140000	160000	175000	190000
Line voltage, outdoor,	66000	90000	110000	130000	145000	160000	175000
Flashover voltage, dry,	200000	250000	300000	360000	420000	480000	540000
Flashover voltage, wet,	150000	190000	225000	270000	315000	360000	400000
Leakage distance, inches,	33	44	55	66	77	88	99
Mechanical strength—							
Horizontally, lbs.,	1300	1000	800	675	640	550	500
Axially, lbs.,	10000	10000	10000	10000	10000	10000	10000
Net weight, lbs.,	110	135	160	185	210	235	260
Packed weight, lbs.,	160	200	240	275	325	355	400
Code word,	VENGO	VENZO	VERAZ	VERBO	VERSE	VERTU	VESCE

Porcelain units are tested at 100,000 volts. Complete insulators packed one per crate.



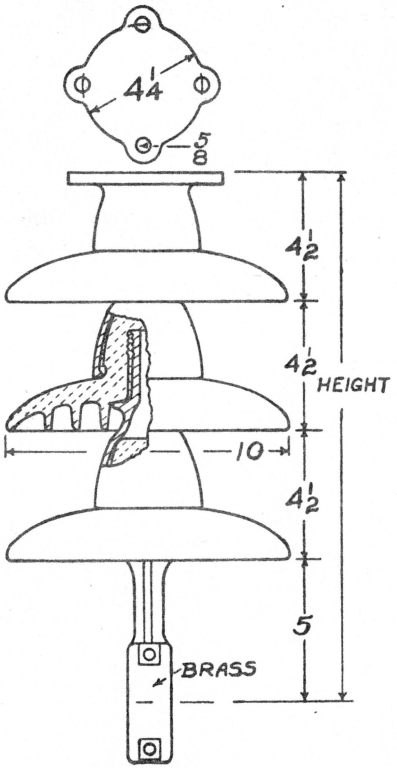
PEDESTAL INSULATORS

THESE insulators are suitable for the support of bus-bars, horn gaps, switches, etc., and may be used vertically or horizontally outdoor, and in any position indoor.

The clamp at top is fitted with grooves ½-inch, 13/16-inch, and 1¼-inch diameters, thus accommodating the pipe sizes of copper tube now practically standardized for H. T. busses. These clamps will also receive rectangular section busses up to 3¾-inch wide and 1-inch thick, inclusive. Or the ⅝-inch holes in top of cap may be utilized for bolting switches, horns, etc. The relative position of bolt holes in top cap and the three bolt holes in base is standard as shown. All metal is regularly furnished sherardized.

Insulator Nos.	2942	2943	2944	2945	2946	2947	2948	2949
Height,	13½	18	22½	27	31½	36	40½	45
Number of units,	2	3	4	5	6	7	8	9
Line voltage, indoor,	35000	50000	75000	90000	110000	125000	140000	155000
Line voltage, outdoor,	30000	45000	66000	80000	90000	110000	125000	140000
Flashover voltage, dry,	140000	200000	250000	300000	350000	400000	450000	500000
Flashover voltage, wet,	90000	120000	155000	190000	225000	260000	295000	330000
Leakage distance, inches,	10¾	21½	32¼	43	53¾	64½	75¼	86
Mechanical strength—								
Horizontally, lbs.,	1250	950	750	675	525	450	400	350
Axially, lbs.,	6000	6000	6000	6000	6000	6000	6000	6000
Net weight, lbs.,	24	32	40	48	56	64	72	80
Packed weight, lbs.,	35	50	60	75	85	100	110	125
Code word,	UNFUG	UNIDA	UNION	UNONA	UNPEG	UNSAY	UNXIA	UPIDE

Individual units are tested at 90,000 volts. Complete insulators packed one per crate.



PEDESTAL INSULATORS

INVERTED TYPE

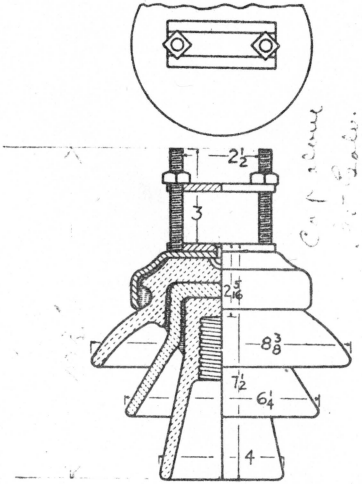
THESE insulators are designed for the support of standard pipe size copper tube bus-bars. Special forms of lower attachment, as for switch attachment, etc., can be readily supplied. These insulators may be attached vertically or horizontally outdoor, and in any position indoor.

The clamp at bottom is fitted with ½-inch, 1 3/16-inch, and 1¼-inch diameter grooves for the reception of copper pipe, and will also take rectangular busses up to ⅝-inch by 2¾-inch. The relative positions of holes in top cap and bus-bar clamp is standard as shown. All metal is regularly supplied sherardized.

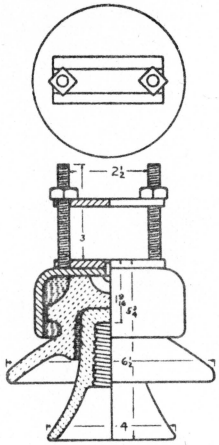
Insulator No.	3088	3089	3090	3091	3092	3093	3094	3095
Height, ...	14	18½	23	27½	32	36½	41	45½
Number of units, . . .	2	3	4	5	6	7	8	9
Line voltage, indoor, .	35000	50000	75000	90000	110000	125000	140000	155000
Line voltage, outdoor, .	30000	45000	66000	80000	90000	110000	125000	140000
Flashover voltage, dry,	140000	200000	250000	300000	350000	400000	450000	500000
Flashover voltage, wet,	90000	120000	155000	190000	225000	260000	295000	330000
Leakage distance, inches,	10¾	21½	32¼	43	53¾	64½	75¼	86
Mechanical strength—								
Horizontally, lbs., .	1250	950	750	675	525	450	400	350
Axially, lbs., ...	6000	6000	6000	6000	6000	6000	6000	6000
Packed weight, lbs., . .	35	50	60	75	85	100	110	125
Code word, ...	VEUVE	VIACA	VIAJO	VIBRE	VIGIO	VIGNA	VILLA	VIMOS

Individual units are tested at 90,000 volts. Complete insulators packed one per crate.

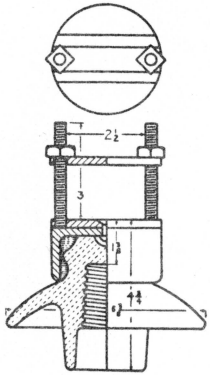
PORCELAIN INSULATORS FOR BUS-BAR SUPPORT



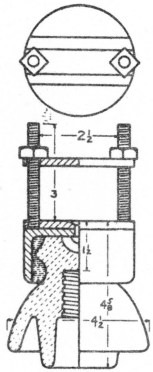
No. 2179



No. 2117



No. 268



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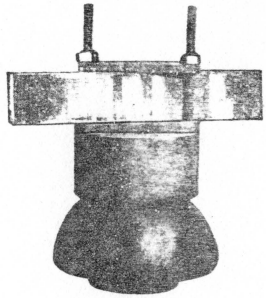


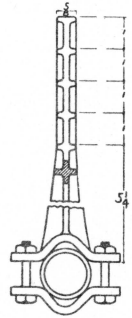
No. 269

No.	Line Voltage	Test Voltage	Rain Test	Leakage Distance	Striking Distance	Net Weight	Packed Weight	Number per bbl.	Code Word
268	16000	60000	35000	8¾″	3″	6¼ lbs.	7½ lbs.	30	**Koppiger**
269	10000	40000	25000	7¾″	1⅝″	5 lbs.	6 lbs.	50	**Koppelriem**
2117	18000	70000	40000	9¾″	3⅞″	8¼ lbs.	10 lbs.	25	**Krachmost**
2179	33000	100000	60000	19½″	4⅜″	15 lbs.	18 lbs.	12	**Krachneu**

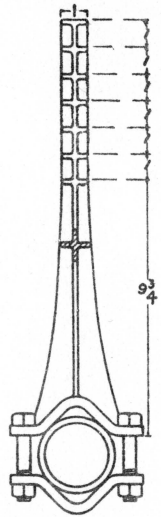
IRON PINS FOR BUS-BAR INSULATORS

These pins, made of malleable iron, are designed for attaching to pipe rack in power houses and sub-stations. No. 220 will accommodate pipe up to $1\frac{5}{8}''$ outside diameter and No. 2170 pipe up to 3″ outside diameter. No. 220 has two clamping bolts $\frac{1}{4}'' \times 1\frac{3}{4}''$ and No. 2170 has four clamping bolts $\frac{1}{2}'' \times 2\frac{3}{4}''$.

The pins are cemented into the insulator, either our bus-bar insulators or any other type of pin insulators, and the height of pin adjusted by sawing off the pin if necessary just above any button or enlargement which will give a selection of 5 heights for No. 220 pin and 7 for No. 2170 pin. Pins furnished plain unless ordered galvanized.

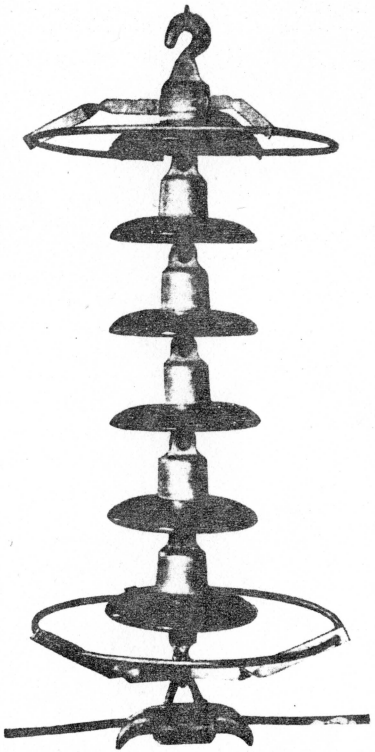


No. 220



No. 2170

No.	220	2170
Net weight	2 lbs.	7 lbs.
Packed weight	2½ lbs.	8 lbs.
Code word	**Krappbad**	**Kreekje**



Rings applied to a series of suspension type insulators.

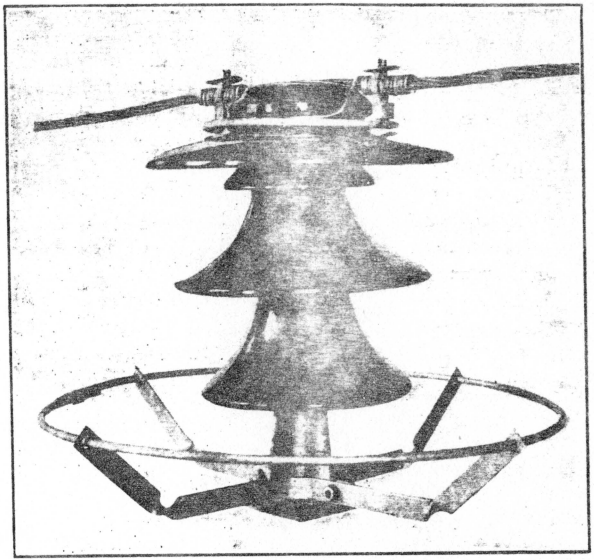
NICHOLSON ARCING RINGS

A PROTECTIVE DEVICE FOR HIGH-VOLTAGE INSULATORS

Patented February 25, 1908; April 5, 1910; August 9, 1910.

IT is probable that ninety-five per cent. of all high voltage line insulators destroyed by puncture, so called, are first cracked or broken by the heat of an arc allowing current to flow through the break and literally blow up the insulator.

These destructive arcs may result from excess voltage of lightning discharge, switching, etc., and against the damage of these discharges it is impossible to guard by mere strength of insulation.



Arcing rings applied to 60,000-volt pin-type insulator.

These arcing rings are essentially protective appliances. They consist of two steel rings, one at top and bottom as shown, and supported free from the porcelain. Their office is to form terminals for and limit the voltage of the destructive discharges over the insulator which result from heavy excess voltage on the line.

On pin-type insulators the top ring is usually placed level with the side-wire groove, and

the bottom ring approximately level with the bottom of the insulator. On a series of suspension-type insulators the rings are placed at about the level of the edges of the top and bottom unit. In all cases, the rings are removed a definite distance from the insulator.

The exact location of the rings on any particular design of insulator is so determined that with rings in place the rain test of the insulator is not decreased, but the dry flashover voltage is decreased to approximately the rain-test value.

The result of this arrangement is that an arc breaking over the insulator is immediately taken by the rings as terminals, whether such arc be a direct flash over a dry insulator or an indirect arc forming on the surface of a wet insulator and breaking out to the rings.

The line being cut out and the arc extinguished, it is found upon again closing the line that it is secure and tight. On 150 miles of line equipped the rings operated seventy odd times during one season with not more than six shattered insulators, probably due to direct lightning stroke. With unprotected insulators the problem is presented in nearly every case of finding the troubled insulator, if it be damaged but not completely shattered by the discharge.

The ring design is essential, since the arc can with equal facility form at any point around the insulator, and if the arc forms on the windward side of the insulator, it is readily blown around to the lea side, harmless; whereas with fixed terminals, as with one or more arching points or rods, the arc may be blown under the insulator.

The efficacy of this appliance has been amply shown in heavy service, and since it at present appears impossible by design and quality of insulators to protect against the damage of these arcs, usually from lightning, the installation of these rings, if insulators be of good quality, generally eliminates the one cause of service interruption.

When the importance of uninterrupted service warrants, the rings have been and should be installed on the entire line.

Continuity of service is not, however, the only reason for installing this appliance. Many lines are run through territory very nearly inaccessible, and repairs of broken insulators are tedious and expensive, or long spans, river crossings, etc., may be equipped, and arcing rings installed through such sections result in large saving of time, expense, and good-will.

Because of the large variety of design of insulators and pins in use, it is not possible to standardize these rings. To enable us to estimate on equipment, a complete drawing of pin and insulator should be submitted and size wire or cable.

INSULATOR PIN CLASSIFICATION

THIS table indicates at a glance the pins which we consider suitable for our insulators for first-class standard construction. Many other styles of pins are made by us for special conditions.

Insulator No.	Cross-arm Pins					For Pole Tops			Ridge Irons
	Miscellaneous Styles (Iron)	Separable Thimble	Porcelain Base	Wood Top	All Wood	Wood Pins	Iron Pins	Iron Brackets	
2	14, 33, 2172, 3075, 3182,, 3183	2736, 2737	4, 26	12, 34	80	2163	2751	3064	27, 28, 68, 88
3	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
3½	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
3¾	99, 3076, 3178, 3180	2734, 2735	16, 17, 24, 2143	31, 32	83	2164	125, 2751	3063	48
5A	99, 3076, 2172, 3075, 3180, 3181	2736, 2737	5, 2143	6	85	2164	125	3064	48
7	14, 33, 3182, 3183	2736, 2737	.....	8, 10, 34	80	2163	2751	3064	27, 28, 68
8	14, 33, 3182, 3183	2736, 2737	.....	8, 10, 34	80	2163	2751	3064	27, 28, 68
8A	14, 33, 3182, 3183	2734, 2735	.....	.....	80	2163	2751	3063	68
9	14, 33, 3182, 3183	2736, 2737	.....	8, 10, 34	80	2163	2751	3064	27, 28, 68
12	14, 33, 3182, 3183	2736, 2737	4, 26	12, 34	80	2163	2751	3064	27, 28, 68, 88
44	14, 33, 3182, 3183	2736, 2737	4, 26	12, 34	80	2163	2751	3064	27, 28, 68, 88
46	99, 3076, 2172, 3075	2736, 2737	5,	6	85	2164	125	3064	48
47	14, 33, 2172, 3075, 3182, 3183	2736, 2737	4, 26	12, 34	80	2163	2751	3064	27, 28, 68, 88
55	14, 33, 2172, 3075, 3182, 3183	2736, 2737	4, 26	12, 34	80	2163	2751	3064	27, 28, 68, 88
60	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
62	14, 33, 3182, 3183	2736, 2737	4, 26	12, 34	80	2163	2751	3064	27, 28, 68, 88
63	14, 33, 3182, 3183	2736, 2737	4, 26	12, 34	80	2163	2751	3064	27, 28, 68, 88
64	99, 3076	2734, 2735	3, 27, 2142	13, 35	81	2163	2751	3063	28, 68, 88
100	2133, 3074, 3174, 3175	2732, 2733	21, 22, 25, 2144	31, 32	83	2165	125, 2751	3063	58
100A	2133, 3074	2732, 2733	3, 27	13, 35	81	.....	2751	3063	78
101	99, 3076, 3178, 3179	2734, 2735	16, 17, 24, 2143	31, 32	83	2164	125, 2751	3063	48
102	99, 3076	2734, 2735	3, 27, 2142	13, 35	81	2163	2751	3063	78, 98
103	201, 3073, 3174, 3175	2730, 2731	21, 22, 25, 2144	31, 32	83	2165	125	3062	58
107	.....	.....	.....	.....	81	.....	2751	.....	Special
205	201, 3073	2730, 2731	Special	Special	Special	Special	125	3062	Special
268	99, 220, 3076, 3178, 3179	2734, 2735	5, 2143	.....	.....	.....	.....	3063	
269	99, 220, 3076	2734, 2735	2, 20, 2142	.....	.....	.....	.....	3063	
296	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
297	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
298	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
303	99, 3076, 3178, 3179	2734, 2735	5, 20, 2142	7	85	2164	125, 2751	3063	48
311	201, 3073, 3174, 3175	2730, 2731	21, 22, 25, 2144	.....	83	2165	125	3062	58

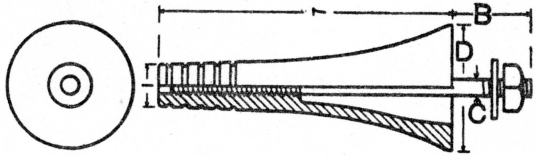
Insulator No.	Cross-arm Pins					For Pole Tops			Ridge Irons
	Miscellaneous Styles (Iron)	Separable Thimble	Porcelain Base	Wood Top	All Wood	Wood Pins	Iron Pins	Iron Brackets	
312	100, 3071	2728, 2729	23, 28, 2145	.....	84	2166	125	3062	108
315	100, 3071	2728, 2729	23, 28, 2145	.....	84	2166	125	3062	108
319	.....	2724, 2725	23, 28, 2145	.....	84	2167	2704	3061	108
320	2133, 3074, 3178, 3179	2732, 2733	16, 17, 24, 2143	31, 32	83	2165	125, 2751	3063	48
332	.....	2722, 2723	2147	.....	2161	2168	127	3060	
334	.....	2722, 2723	2147	.....	2161	2168	127	3060	
336	.....	2720, 2721	Special	.....	Special	Special	127	3060	
340	.....	2722, 2723	2147	.....	2161	2168	127	3060	
341	.....	2722, 2723	2147	.....	2161	2168	127	3060	
347	.....	2718, 2719	.....	.....	.....	.....	127	3060	
351	.....	2722, 2723	2147	.....	2161	2168	127	3060	
352	.....	2722, 2723	2147	.....	2161	2168	127	3060	
353	.....	2722, 2723	2147	.....	2161	2168	127	3060	
359	.....	2718, 2719	Special	.....	Special	Special	127	3060	
360	.....	2718, 2719	.....	.....	.....	.....	127	3060	
362	.....	2722, 2723	2147	.....	2161	2168	127	3060	
364	.....	2718, 2719	.....	.....	.....	.....	127	3060	
365	.....	2718, 2719	Special	.....	Special	Special	127	3060	
380	.....	2722, 2723	2147	.....	2161	2168	127	3060	
396	3180, 3181	2736, 2737	2143	6	85	2164	125, 2751	3064	48
400	2133, 3074, 3178, 3179	2734, 2735	2143	31, 32	83	2165	125, 2751	3063	48
403	99, 3076, 3180, 3181	2734, 2735	16, 17, 24, 2143	31, 32	83	2164	125, 2751	3063	48
404	2133, 3074, 3178, 3179	2732, 2733	3, 27	13, 35	80	2163	2751	3063	38, 78, 98
405A	201, 3073	2730, 2731	21, 22, 25, 2144	.....	83	2165	125	3062	58
406	200, 3072	2734, 2735	3, 27, 2142	13, 35	80	2163	2751	3063	28, 68, 88
406B	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
407	99, 3076	2734, 2735	3, 27, 2142	13, 35	80	2163	2751	3063	38, 78, 98
408A	201, 3073, 3174, 3175	2730, 2731	21, 22, 25, 2144	31, 32	83	2165	125	3062	58
408B	100, 3071	2726, 2727	23, 28, 2145	.....	84	2166	125	3061	108
409	100, 3071	2726, 2727	23, 28, 2145	.....	84	2166	125	3061	108
418	201, 3073	2730, 2731	21, 22, 25, 2144	.....	83	2165	125	3062	58
419	201, 3073, 3174, 3175	2730, 2731	21, 22, 25, 2144	31, 32	83	2165	125	3062	58
599	66, 71	.....	.....	.....	62				
600	66, 71	.....	.....	.....	62				
601	65, 70	.....	.....	.....	61				
601A	65, 70	.....	.....	.....	61				
602	65, 70	.....	.....	.....	61				
603	66, 72	.....	.....	.....	62				
605	67, 73	.....	.....	.....	63				

Insulator No.	Cross-arm Pins					For Pole Tops			Ridge Irons
	Miscellaneous Styles (Iron)	Separable Thimble	Porcelain Base	Wood Top	All Wood	Wood Pins	Iron Pins	Iron Brackets	
606	68, 74	.....	.....	.....	64				
2012	99, 3076, 3178, 3179	2734, 2735	16, 17, 24, 2143	31, 32	85	2164	125, 2751	3063	48
2018	.....	2724, 2725	23, 28, 2145	.....	84	2167	2704	3060	108
2019	200, 3072, 3178, 3179	2734, 2735	3, 27, 2142	13, 35	80	2163	2751	3063	28, 68, 88
2051	.....	2722, 2723	2147	.....	2161	2168	127	3060	
2057	.....	.....	.....	.....	81	.....	2751	.....	Special
2088	14, 33, 201, 3073, 3182, 3183	2734, 2735	.....	13, 35	80	2163	2751	3063	68
2092	.....	2722, 2723	2147	.....	2161	2168	127	3060	
2101	14, 33, 3182, 3183	2736, 2737	4, 26, 2142	12, 34	80	2163	2751	3064	27, 28, 68, 88
2103	.....	2722, 2723	2147	.....	2161	2168	127	3060	
2115	14, 33, 99, 3076, 3182, 3183	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88
2117	99, 220, 3076	2734, 2735	3, 27, 2142	13, 35	80	.....	.....	3063	
2137	65, 70	.....	.....	.....	61				
2179	210, 220, 2170, 3174, 3175	2730, 2731	21, 22, 25, 2144	.....	.....	.....	.....	3062	
2182	200, 3072, 3178, 3179	2734, 2735	21, 22, 25, 2144	31, 32	83	2165	2751	3063	58
2195	2133, 3074	2732, 2733	.....	.....	81	.....	2751	3063	Special
2228	201, 3073, 3174, 3175	2730, 2731	21, 22, 25, 2144	31, 32	83	2165	125	3063	58
2230	67, 73	.....	.....	.....	64				
2232	.....	2736, 2737	5, 2143	6	85	2164	125, 2751	3064	48
2233	2133, 3074, 3176, 3177	2732, 2733	21, 22, 25, 2144	31, 32	83	2165	125, 2751	3063	58
2235	3180, 3181	2736, 2737	2143	6	85	2164	125, 2751	3064	48
2246	2133, 3074, 3178, 3179	2732, 2733	21, 22, 25, 2144	31, 32	83	2165	125, 2751	3063	58
2307	3180, 3181	2736, 2737	5, 2143	6	85	2164	125, 2751	3064	48
2320	201, 3073, 3174, 3175	2730, 2731	21, 22, 25, 2144	31, 32	83	2165	125	3062	58
2400	.....	2718, 2719	.....	.....	.....	.....	127	3060	
2421	99, 3076	2734, 2735	3, 27, 2142	13, 35	80	2163	2751	3063	38, 78, 98
2438	14, 33, 200, 3072, 3182, 3183	2734, 2735	3, 27	13, 35	80	2163	2751	3063	38, 78, 98
3146	14, 33, 99, 3076	2734, 2735	2, 20, 2142	8, 10, 34	80	2163	2751	3063	27, 28, 68, 88

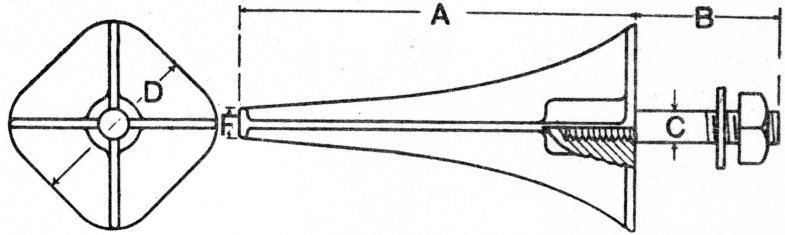
IRON INSULATOR PINS

THESE pins are cemented directly into the insulators. Plain pins regularly furnished unless sherardized are ordered.

To avoid cementing and to facilitate changing an insulator, we can furnish pins Nos. 99, 100, 200, 2133, 3076, 3071, 3072, and 3074 with lead-threaded thimbles for insulators with 1″ or 1⅜″ pin holes and pins Nos. 201 and 3073 for 1⅜″ pin holes. An extra charge is made for these lead thimbles or for cementing the pins into insulators.



STYLE 1



STYLE 2

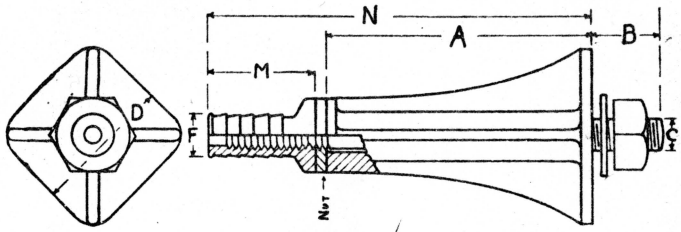
Pin No.	Style	A	B	C	D	F	Net Weight	Code Word
99	2	5 ″	7 ″	¾ ″	3 ″	⅝ ″	2⅞ lbs.	KRANRECHT
100	2	9 ″	7 ″	¾ ″	4 ″	11/16 ″	4¼ lbs.	KORVETBRIK
200	1	5½″	6 ″	7/16 ″	2½″	¾ ″	1¾ lbs.	KORNPULVER
201	1	7 ″	6 ″	7/16 ″	3 ″	1 ″	3 lbs.	KRANZGELD
2133	2	6 ″	7½″	¾ ″	3½″	⅝ ″	4 lbs.	VELOZ
2172	1	4¾″	1¾″	⅝ ″	2½″	¾ ″	1¾ lbs.	VALID
3076	2	5 ″	1½″	¾ ″	3 ″	⅝ ″	2½ lbs.	VALSO
3071	2	9 ″	1½″	¾ ″	4 ″	11/16 ″	4 lbs.	VALVA
3072	1	5½″	1½″	7/16 ″	2½″	¾ ″	1⅝ lbs.	VAPOS
3073	1	7 ″	1½″	7/16 ″	3 ″	1 ″	2¾ lbs.	VARDA
3074	2	6 ″	1½″	¾ ″	3½″	¾ ″	3¾ lbs.	VARON
3075	1	4¾″	6 ″	⅝ ″	2½″	¾ ″	2 lbs.	VAZIO

IRON INSULATOR PINS

SEPARABLE-THIMBLE TYPE

THE thimbles of these pins are usually cemented into the insulators at the factory, and the price of pin includes cementing the thimbles into our insulators.

Pins Nos. 2732–2737 inclusive can be used with 1-inch or larger diameter pin-holes; Nos. 2718–2731 inclusive with $1\frac{3}{8}$-inch or larger diameter pin-holes.



A decided advantage of this design of pin is that the base is self-centering on the bolt; whereas with plain cone bases the pin is bolted tight with the base eccentric with the bolt, perhaps materially reducing the strength of the pin. Any length bolt can, of course, be specially furnished.

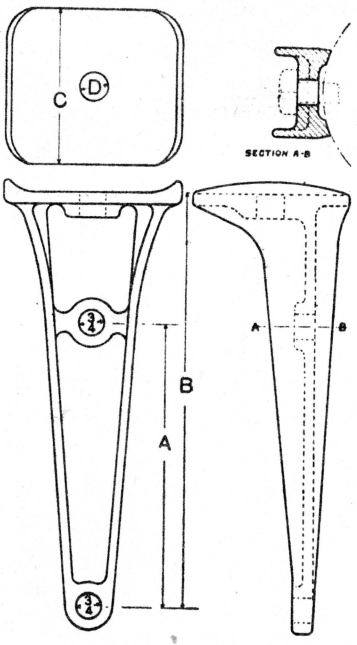
No. 2721 Pin
No. 3060
Bracket.

Pin Nos.		2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737
A,	Inches	11¾	11¾	10¾	10¾	9¾	9¾	6¾	6¾	5¾	5¾	4¾	4¾	3¾	3¾	3¼	3¼	2¼	2¼	1¼	1¼
B,		9	2	9	2	9	2	7	2	7	2	6½	2	6½	2	5½	1½	5½	1½	5½	1½
C,		¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	¾	½	½	½	½
D,		5	5	5	5	5	5	4	4	4	4	3½	3½	3½	3½	3½	3½	3½	3½	2½	2½
F,		1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	1⅛	¾	¾	¾	¾	¾	¾
M,		3	3	3	3	3	3	3	3	3	3	3	3	3	3	2½	2½	2½	2½	2½	2½
N,		15	15	14	14	13	13	10	10	9	9	8	8	7	7	6	6	5	5	4	4
Use with Pole-top Bracket No.		...	3060	...	3060	...	3060	...	3061	...	3061	...	3062	...	3062	...	3063	...	3063	...	3064
Net weight, lbs.,		11½	11	10	9½	9½	9	8	7½	6	5½	4½	4	4	3½	2½	2¼	2	1¾	1½	1½
Packed weight, lbs.,		12	11½	10½	10	10	9½	8⅝	7¼	6⅝	6	4¼	4½	4¼	3¼	2½	2¼	2¼	2	1⅝	1⅝
Code word,		Tocho	Tojal	Toffy	Toddy	Toghe	Tomim	Tondu	Tonka	Tonte	Toron	Torvo	Togo	Total	Totem	Touro	Trabs	Trame	Trapu	Trata	Trago

IRON POLE-TOP BRACKETS

THESE brackets are particularly adapted for separable-thimble pins (sheet 6701), and solve the problem of providing a pole-top insulator support in which the pin structure will be uniform with cross-arm construction. The practice of securing a separable thimble to an iron pole-top pin by means of a stud is a makeshift, and does not permit of alignment of top insulator wire groove without unscrewing the insulator and thimble, thereby losing the strength of the pin.

These brackets are made of best malleable iron and are heavily reinforced at all stressed points and all sizes will fit 6-inch to 7-inch pole tops. Furnished plain, unless otherwise specified, and bolts for attaching to pole are not supplied as part of the bracket.

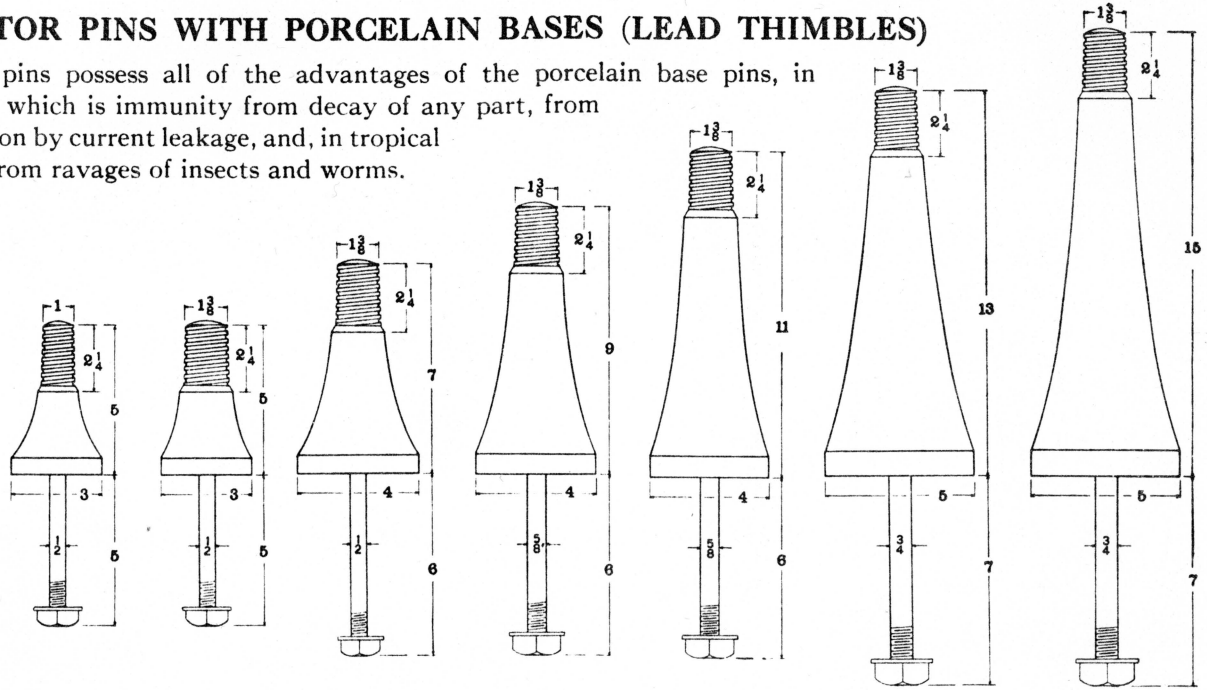


No. 2721 Pin Mounted on No. 3060 Bracket

Bracket No.	A	B	C	D	Used with Pin Nos.	Net Weight	Code Word
3060	9″	13″	5″	$\frac{7}{8}$″	2719, 2721, 2723	6¾ lbs.	Vesou
3061	7″	11″	4″	$\frac{7}{8}$″	2725, 2727, 3071	5 lbs.	Vesti
3062	6″	10″	3½″	$\frac{7}{8}$″	2729, 2731	3¾ lbs.	Vetir
3063	5″	9″	3½″	$\frac{5}{8}$″	2733, 2735, 3076, 3074	3 lbs.	Vices
3064	4″	8″	2¾″	$\frac{5}{8}$″	2737	2 lbs.	Vieja

INSULATOR PINS WITH PORCELAIN BASES (LEAD THIMBLES)

These pins possess all of the advantages of the porcelain base pins, in addition to which is immunity from decay of any part, from disintegration by current leakage, and, in tropical countries, from ravages of insects and worms.



Pin No. 2142 2143 2144 2145 2146 2147 2148

Pin No.	2142	2143	2144	2145	2146	2147	2148
Weight, net, per 1000	2500 lbs.	3500 lbs.	4500 lbs.	6000 lbs.	8250 lbs.	13250 lbs.	15000 lbs.
Weight, packed, per 1000	2700 lbs.	3820 lbs.	4900 lbs.	6550 lbs.	9000 lbs.	14600 lbs.	16600 lbs.
Code word	**Krediet**	**Kreditbank**	**Kreditiv**	**Kreditlos**	**Kreeften**	**Kreeftslak**	**Kreeftspin**

INSULATOR PINS WITH PORCELAIN BASES (WOOD THIMBLES)

ADVANTAGES

Mechanical Strength. These pins, under whatever strain, will not break. Under excessive strain the pin will bend, but will not allow insulator to drop. High carbon steel bolts are used.

Durability. The wood thimble is the only part subject to deterioration and this is thoroughly paraffined and when in use is completely enclosed and protected from weather and insects by the insulator and the porcelain base. The bolts are furnished galvanized if required, so that the pin and insulator are longer lived than the pole and arm.

Pin No.	Weight per 1000		Code Word
	Net	Packed	
1	1000 lbs.	1200 lbs.	**Kornernte**
2	1250 lbs.	1400 lbs.	**Kornetmuts**
3	1350 lbs.	1500 lbs.	**Kornetton**
4	1000 lbs.	1200 lbs.	**Kornfaeule**
5	1750 lbs.	1860 lbs.	**Kornfeld**
16	1800 lbs.	1900 lbs.	**Kornjahr**
17	2400 lbs.	2600 lbs.	**Kornjahres**
18	4250 lbs.	4550 lbs.	**Kornkrebs**
19	1350 lbs.	1600 lbs.	**Kornland**
20	1000 lbs.	1100 lbs.	**Kornlandes**
21	2000 lbs.	2200 lbs.	**Kornmade**
22	2500 lbs.	2650 lbs.	**Kornmangel**
23	3750 lbs.	4250 lbs.	**Kornmarkt**
24	1500 lbs.	2200 lbs.	**Kornmass**
25	1750 lbs.	1825 lbs.	**Kornmasses**
26	1000 lbs.	1050 lbs.	**Kornminze**
27	1000 lbs.	1150 lbs.	**Kornmohn**
28	3500 lbs.	4000 lbs.	**Kornmotte**
30	5000 lbs.	5750 lbs.	**Kornmulde**
42	6750 lbs.	7800 lbs.	**Kornsaat**

No. 311 Insulator mounted upon No. 22 pin

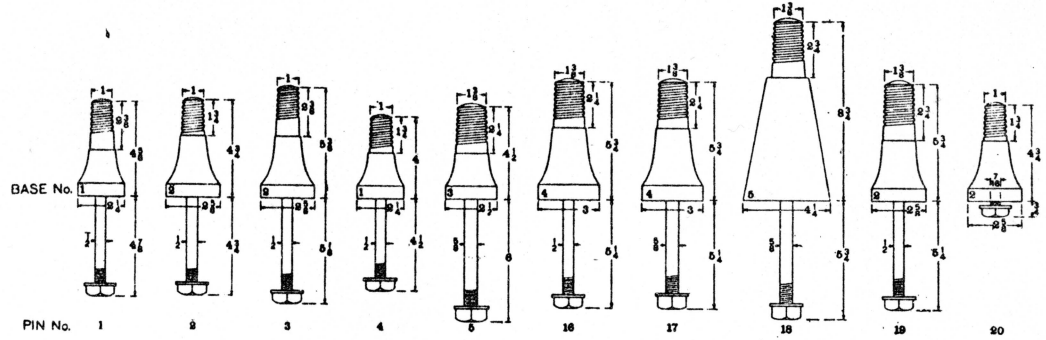
Strength of Cross-arm. Because of the small hole required in the cross-arm, nearly the full strength of cross-arm is preserved, while with wood pins at least 1½-inch or more often 2-inch hole is required.

Life of Cross-arm. The porcelain base on the top and the nut and washer on the bottom of the cross-arm practically seal the hole, preventing entrance of rain.

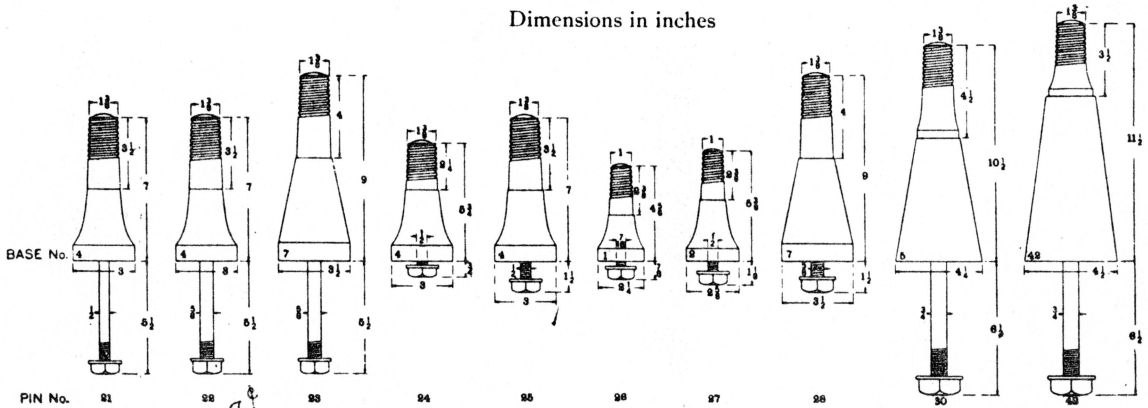
Electrical Advantage. The porcelain base, by preventing arc from lower petticoats of insulator direct to the pin, increases the striking distance of the insulator decidedly; also prevents burning off the pin.

Pins Nos. 20, 24, 25, 26, 27 and 28, having shorter bolts, can be used on angle or channel iron construction. All pins furnished plain unless galvanized specified. All porcelain bases glazed brown, unless specially ordered.

INSULATOR PINS WITH PORCELAIN BASES (WOOD THIMBLES)



Dimensions in inches



No. 22 pin

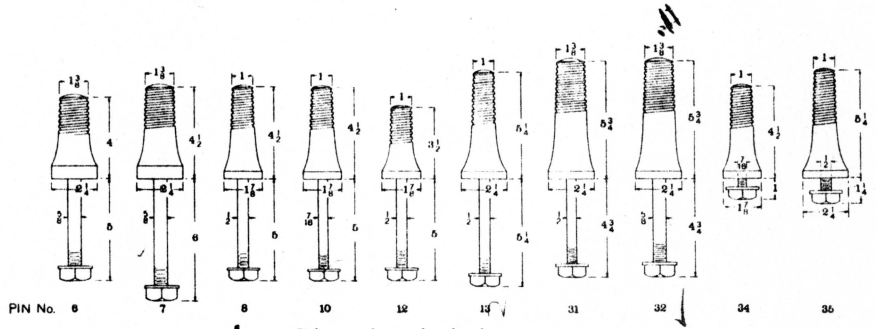
STEEL PINS WITH ALL WOOD TOPS

These pins consist of a high carbon bolt and a thoroughly paraffined wood top. They embody the mechanical advantages of the porcelain base pins, as to strength, durability, small hole in the cross arm, etc. They are furnished with either plain or galvanized bolt, complete with nut and washer.

Note that pins Nos. 34 and 35 can be used with channel or angle iron for switchboard, or smiilar work, or for iron cross-arms. Special lengths of bolts can be promptly furnish ed.

No. 8 pin

Pin No.	Weight per 1000		Code Word
	Net	Packed	
6	1200 lbs.	1350 lbs.	**Kornfelder**
7	1400 lbs.	1450 lbs.	**Kornfliege**
8	750 lbs.	800 lbs.	**Kornfrucht**
10	625 lbs.	700 lbs.	**Kornhammer**
12	750 lbs.	800 lbs.	**Kornhof**
13	875 lbs.	1000 lbs.	**Kornhuegel**
31	875 lbs.	1150 lbs.	**Kornmutter**
32	1350 lbs.	1600 lbs.	**Kornnelke**
34	500 lbs.	530 lbs.	**Kornpflege**
35	625 lbs.	700 lbs.	**Kornprobe**

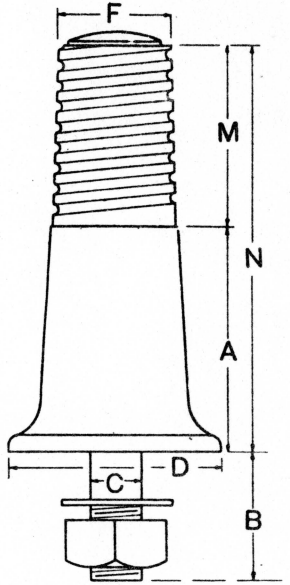


Dimensions in inches

METAL BASE PINS WITH WOOD THIMBLES

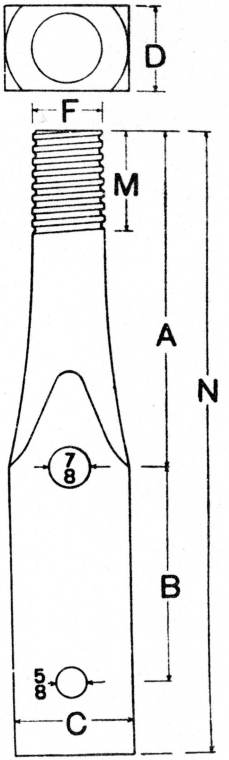
The bases are cast iron, thimble paraffined and bolts and bases furnished plain unless sherardized specified.

No.	3174	3175	3176	3177	3178	3179	3180	3181	3182	3183	33	14
A	4	4	2¾	2¾	2¾	2¾	2⅛	2⅛	2⅛	2⅛	2⅛	2⅛
B	6	1	6¼	1¼	5½	1½	6⅛	1⅛	5	1	4¾	¾
C	⅝	⅝	⅝	⅝	⅝	⅝	⅝	⅝	½	½	7/16	7/16
D	3¾	3¾	2⅝	2⅝	2⅝	2⅝	2	2	2	2	2	2
F	1⅜	1⅜	1⅜	1⅜	1⅜	1⅜	1⅜	1⅜	1	1	1	1
M	2½	2½	3½	3½	2¼	2¼	2¼	2¼	2⅜	2⅜	2⅝	2⅝
N	6½	6½	6¼	6¼	5	5	4⅜	4⅜	4½	4½	4¾	4¾
Net weight, lbs.	2¾	2½	2⅛	1¾	1⅞	1⅝	1⅜	1	1	¾	⅞	⅝
Packed weight, lbs.	3⅛	2⅞	2½	2	2¼	1⅞	1⅝	1¼	1¼	⅞	1⅛	¾
Code word	Lodka	Lofio	Lofty	Logro	Loket	Lomia	Lompo	Lonja	Lopas	Lorry	Loser	Loste

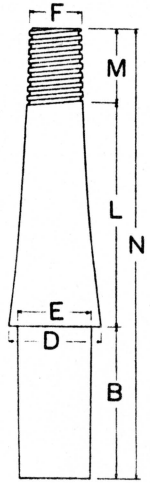


LOCUST POLE TOP INSULATOR PINS

Pin No.	Dimensions in Inches							Weight per 1000		Code Word
	A	B	C	D	F	M	N	Net	Packed	
2163	7	6	2½	1¾	1	2¼	14½	1990 lbs.	2000 lbs.	Kranzsims
2164	7	6	2½	1¾	1⅜	2¼	14½	1990 lbs.	2000 lbs.	Krapjes
2165	9	8	2¾	2	1⅜	2¼	18½	2580 lbs.	2600 lbs.	Krappartig
2166	11	10	2¾	2	1⅜	2¼	22½	3180 lbs.	3200 lbs.	Krappeln
2167	13	12	3	2¼	1⅜	2¼	26½	4975 lbs.	5000 lbs.	Kranzholz
2168	15	14	3	2¼	1⅜	2¼	30½	5375 lbs.	5400 lbs.	Kranzlampe
2169	17	16	3¼	2½	1⅜	2¼	34½	7400 lbs.	7500 lbs.	Kranzleist



These pole top pins are furnished of plain locust when not otherwise specified, but will be treated with linseed oil or paraffined when so ordered.



LOCUST CROSS-ARM PINS

Pin No.	Dimensions in Inches							Weight per 1000		Code Word
	B	D	E	F	L	M	N	Net	Packed	
80	4	1¾	1½	1	2¾	2¼	9	415 lbs.	425 lbs.	Korthalzig
81	4¼	2	1½	1	5	2¼	11½	690 lbs.	700 lbs.	Kortharig
82	4¼	2	1½	1⅜	5	2¼	11½	730 lbs.	740 lbs.	Kortheid
83	4¼	2¼	1¾	1⅜	5	2¼	11½	885 lbs.	900 lbs.	Kortholt
84	6	2⅛	1¾	1⅜	7¼	2¼	15½	1180 lbs.	1200 lbs.	Korting
85	4	1¾	1½	1⅜	2¾	2¼	9	480 lbs.	490 lbs.	Kortingen
2160	5	2	1¾	1⅜	8¾	2¼	16	1235 lbs.	1250 lbs.	Kranzreif
2161	7	2¼	2	1⅜	10¾	2¼	20	2060 lbs.	2100 lbs.	Kranzritt
2162	7	2¾	2½	1⅜	12¾	2¼	22	3550 lbs.	3600 lbs.	Kranzrolle

These pins are furnished of plain locust when not otherwise specified. They will be furnished treated with either linseed oil or paraffine when so ordered.

IRON INSULATOR PINS FOR POLE TOPS

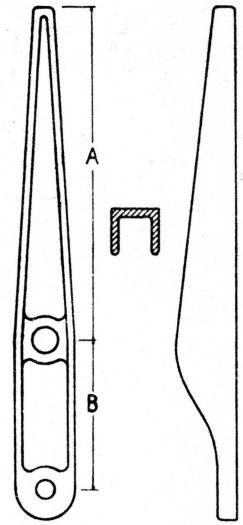
THESE pins are made of first-grade malleable iron, furnished plain unless sherardizing is specified.

Nos. 125, 127, 2704 and 2751 are cemented into the insulators in the field.

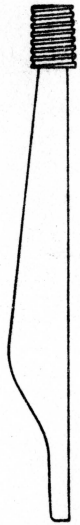
Nos. 2751 can be cemented into 1-inch or larger diameter pin-hole; the other styles into $1\frac{3}{8}$-inch, or larger holes.

Pin No. 2751 can be supplied with either 1-inch or $1\frac{3}{8}$-inch lead thimble cast on the tip, while Nos. 125, 2704, and 127 can be supplied with $1\frac{3}{8}$-inch lead thimble.

The bolt holes in No. 2751 are both $\frac{5}{8}$-inch diameter; in all other sizes the top hole is $\frac{7}{8}$-inch and bottom hole $\frac{3}{4}$-inch diameter, for reception of bolts or lags, for attaching to pole.



Nos. 125, 127, 2704, and 2751.


Showing $1\frac{3}{8}$-inch lead thimble cast on No. 125 Pin.

Pin No.	125	127	2704	2751
A,	11″	$20\frac{1}{4}$″	$14\frac{1}{4}$″	8″
B,	5″	6″	6″	5″
Net weight,	5 lbs.	10 lbs.	$8\frac{1}{2}$ lbs.	$3\frac{1}{2}$ lbs.
Packed weight,	$5\frac{1}{2}$ lbs.	$10\frac{3}{4}$ lbs.	9 lbs.	$3\frac{3}{4}$ lbs.
Code word,	KORYBANTEN	KORTKISTEN	TIRES	TIRIO

RIDGE IRONS FOR POLE TOPS

Nos. 28, 38, 48, 58, 88, 98 and 108

Nos. 68 and 78

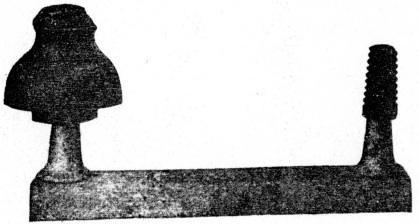
No. 27

THESE ridge irons are readily secured to the pole top by lag screws or spikes. Nos. 68 and 78 are fitted with wood top pins, No. 27 with iron base pin, and Nos. 28, 38, 48, 58, 88, 98, and 108 with porcelain base pins; and for convenience in reference we give in the table below the catalog No. of the cross-arm pin corresponding to the pins of these ridge irons.

There are four 7-16″ holes in all sizes for attaching. The ridge irons having porcelain base pins are supplied with a fibre washer under the porcelain base. The angle between the sides of the pole top roof should be 50°. These ridge irons supplied galvanized only unless specially ordered plain.

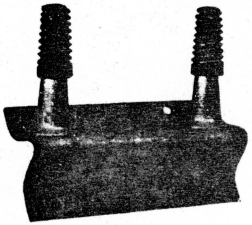
No.	Dimensions in Inches				Catalog No. of Pins only	Catalog No. of Corresponding Cross-arm Pin	Weight per 1000		Code Word
	Height Over All	Height of Iron only	Between Legs	Size Iron			Net	Packed	
27	11½	7	6	⅜ x 2½	14	33	2000 lbs.	2200 lbs.	KORNTAUFE
28	11½	7	6	⅜ x 2½	20	2	2350 lbs.	2440 lbs.	KORNUITEN
38	12½	7	6	⅜ x 2½	27	3	2500 lbs.	2600 lbs.	KORNVOGEL
48	13½	8	7	⅜ x 2½	24	16	4300 lbs.	4600 lbs.	KORNWAGE
58	15	8	7	⅜ x 2½	25	21	4500 lbs.	5000 lbs.	KORNWEDEL
68	11½	7	6	⅜ x 2½	34	8	1875 lbs.	2000 lbs.	KORNWICKE
78	13½	8	7	⅜ x 2½	35	13	3375 lbs.	4000 lbs.	KORNWOLFES
88	12½	8	7	⅜ x 2½	20	2	3750 lbs.	4100 lbs.	KORNZAHN
98	13½	8	7	⅜ x 2½	27	3	3750 lbs.	4300 lbs.	KORNZAPFEN
108	17	8	7	⅜ x 2½	28	23	6250 lbs.	6600 lbs.	KORNZINSES

SIDE BRACKETS AND BREAK-ARMS

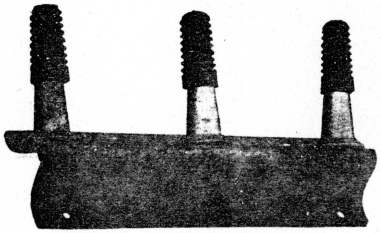


No. 20—Break-arm

No. 22—Side Bracket



No. 23—Side Bracket



No. 24—Side Bracket

No. 25—Side Bracket

No. 26—Side Bracket

These brackets and break-arms are supplied complete with our No. 14 pins, ready for insulators. Forged of heavy stock and *will not break*. Furnished galvanized only.

No.	Distance between pins	Length over all	Weight		Code Word
			Net	Packed	
20	12″	14¼″	4 lbs.	4¼ lbs.	**Kornsackes**
22		5″	2 lbs.	2⅛ lbs.	**Kornsichel**
23	6½″	9″	3½ lbs.	4 lbs.	**Kornsieb**
24	6″	14″	5½ lbs.	6 lbs.	**Kornsiebes**
25	8″	16″	3¾ lbs.	4¼ lbs.	**Kornsperre**
26	8″	32″	7 lbs.	8½ lbs.	**Kornsporn**
2078	8″	24″	5¼ lbs.	6½ lbs.	**Liter**

No. 2078 is 3 pin bracket, same design as Nos. 25 and 26

GENERAL INDEX

INDEX OF CATALOG NUMBERS

Cat No.		Sheet
16	Pin	6900
17	Pin	6900
17A	Insulator	6300
18	Insulator	6300
18	Pin	6900
19	Insulator	6300
19	Pin	6900
20	Bracket	8100
20	Insulator	6300
20	Pin	6900
21	Insulator	6300
21	Pin	6900
22	Bracket	8100
22	Insulator	6300
22	Pin	6900
23	Bracket	8100
23	Insulator	6300
23	Pin	6900
24	Bracket	8100
24	Pin	6900
25	Bracket	8100
25	Pin	6900
26	Bracket	8100
26	Insulator	6300
26	Pin	6900
27	Pin	6900
27	Ridge Iron	7901
28	Pin	6900
28	Ridge Iron	7901
30	Pin	6900
31-32		7200
33		7501
34-35		7200
38		7901
42		6900
44-47		2800
48	Insulator	6300
48	Ridge Iron	7901
50-52		630
55		2800
58		7901

Cat No.		Sheet
60		2800
61		3400
62	Insulator	2800
62	Pin	3400
63	Insulator	2800
63	Pin	3400
64	Insulator	2800
64-68	Pins	3400
68	Ridge Irons	7901
70-74	Pins	3400
78		7901
80-85		7500
88-98		7901
99		6701
100	Insulator	2500
100	Pin	6701
100A-107		2500
108-127		7901
200-201		6701
205		2350
220-269		5600
296-303		2800
311-319		2200
320		2350
332-6		1900
340-1		1200
347		900
351-2		1500
359		900
360		1200
362		1900
364		1200
365		900
380		1900
396		2800
400-405A		2500
403		2800
406-406B		2800
407-9		2500
418-19		2500
504		3800

Cat No.		Sheet
599		3400
600		3600
601-6		3400
650-6		4700
661-6		4400
672-6		5000
2012		2500
2018		2200
2019		2350
2051		1200
2057		2500
2078		8100
2088		3100
2092		1500
2097		3800
2099		4000
2101		2800
2103		1500
2104-5		4000
2115		2350
2117		5600
2133		6701
2137		3600
2142-8		6900
2160-9		7500
2170		5600
2172		6701
2179		5600
2182		2350
2195		2350
2218		3600
2228		2350
2230		3600
2232		2800
2233-46		2350
2235		2800
2297-8		545
2335A		536
2400		900
2421		2800
2438		3100

Cat No.		Sheet
2541-53		4100
2569A		680
2578		2080
2628		4100
2632-8		4300
2643		2350
2655		550
2670-1		680
2672		540
2681		680
2695-9		550
2704		7901
2708-11		680
2718-37		6701
2751		7901
2755		4100
2793-2832		550
2937		680
2942-9		4350
2984		540
3019		680
3029		545
3032-4		555
3039		540
3043		536
3045		550
3047		680
3048-55		555
3056-9		550
3060-4		6720
3066		540
3071-6		6701
3077-83		4300
3084		680
3085-6		550
3088-95		4350
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CODE WORD INDEX

	Sheet No.		Sheet No.		Sheet No.		Sheet No.		Sheet No.		Sheet No.
KRANZLEIST	7501	LAMPE	6004	LOSER	7501	TOTAL	6701	USUAL	540	VIGNA	4350
KRANZREIF	7501	LANCE	6004	LOSTE	7501	TOTEM	6701	UTILE	680	VILLA	4350
KRANZRITT	7501	LAPUZ	6004	SONNE	545	TOURO	6701	UVADA	540	VIMOS	4350
KRANZROLLE	7501	LARME	6004	SORAT	545	TRABS	6701	UVATE	680	VIOLE	6004
KRANZSIMS	7501	LASHA	6004	SORLO	545	TRAME	6701	UVERO	680	VIRAN	6004
KRAPJES	7501	LATHY	6004	STAUB	540	TRAPU	6701	UXAMA	536	VIRIL	6004
KRAPPARTIG	7501	LAXOS	6004	STROH	550	TRATA	6701	UZEMA	550	VIRUS	6004
KRAPPBAD	5600	LAZUR	6004	STUFE	550	TRAZO	6701	UZZAH	550	VISOR	6004
KRAPPELN	7501	LAZZI	6004	SUOLA	4100	TREJA	4100	VACUO	550	VIVDA	6004
KREDIET	6900	LEARN	6004	SUPPE	4100	TUIEZ	2800	VAECO	680	VIXEN	6004
KREDITBANK	6900	LEMAS	6004	SUPRA	4100	TUONS	3100	VAGEM	680	VIZIR	6004
KREDITIV	6900	LEMBG	6004	SURYA	680	UNFUG	4350	VALID	6701	VLAAG	6004
KREDITLOS	6900	LEMON	6004	SUSUM	680	UNIDA	4350	VALSO	6701	VLIEG	6004
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KREEFTSLAK	6900	LENCO	6004	SYMKA	680	UNONA	4350	VAPOS	6701	VOCAL	6004
KREEFTSPIN	6900	LENZA	6004	SYRMA	680	UNPEG	4350	VARDA	6701	VODKA	6004
KREEKJE	5600	LEPRA	6004	THIGH	4300	UNSAY	4350	VARON	6701	VOEUX	6004
KREGELIG	2350	LESAO	6004	THOUM	4300	UNXIA	4350	VAZIO	6701	VOICE	6004
KREGELKOP	2350	LEUTE	6004	THRIA	4300	UPIDE	4350	VELOZ	6701	VOILA	6004
KREIDEFELS	2350	LEWAT	6004	THRON	4300	UPSET	555	VENGO	4300	VOJET	6004
KREIDELN	2350	LEXIS	6004	TIARA	4300	UPUPA	555	VENZO	4300	VOLOP	6004
KREIDEWAND	2350	LEZEN	6004	TIBNI	4300	URACA	555	VERAZ	4300	VOLPE	6004
KREISAMT	2350	LICHT	6004	TIEDE	4300	URANE	555	VERBO	4300	VOMER	6004
KROCH	6004	LINDE	6004	TIRES	7901	URDES	555	VERSE	4300	VOOGD	6004
KRONE	6004	LINFA	6004	TIRIO	7901	URICO	536	VERTU	4300	VOSSO	6004
KUBUS	6004	LOASE	2800	TOCHO	6701	URJAS	550	VESCE	4300	VOTIF	6004
KUGEL	6004	LODAO	540	TODDY	6701	URPEX	550	VESOU	6720	VOTUM	6004
KUNST	6004	LODKA	7501	TOFFY	6701	URSON	550	VESTI	6720	VOYOU	6004
KYLON	6004	LOFIO	7501	TOGHE	6701	URUNT	550	VETIR	6720	VOZNO	6004
LAARS	6004	LOFTY	7501	TOJAL	6701	URUXI	550	VEUVE	4350	VREES	6004
LABEO	6004	LOGRO	7501	TOMIM	6701	URZAL	550	VIACA	4350	VROUW	6004
LABRY	6004	LOKET	7501	TONDU	6701	USABA	555	VIAJO	4350	VUIST	6004
LACCA	6004	LOMIA	7501	TONKA	6701	USBEG	555	VIBRE	4350	VURMO	6004
LAGER	6004	LOMPO	7501	TONTE	6701	USINE	555	VICES	6720	VYASA	6004
LAHAD	6004	LONJA	7501	TORON	6701	USIPE	555	VIEJA	6720	WAARE	6004
LAITY	6004	LOPAS	7501	TORVO	6701	USONS	555	VIGIO	4350	WAFER	6004
LAKUM	6004	LORRY	7501	TOSCO	6701	USTED	555				