F. M. LOCKE.

HIGH VOLTAGE INSULATOR.

APPLICATION FILED FEB. 26, 1907.

998,359.

Patented July 18, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

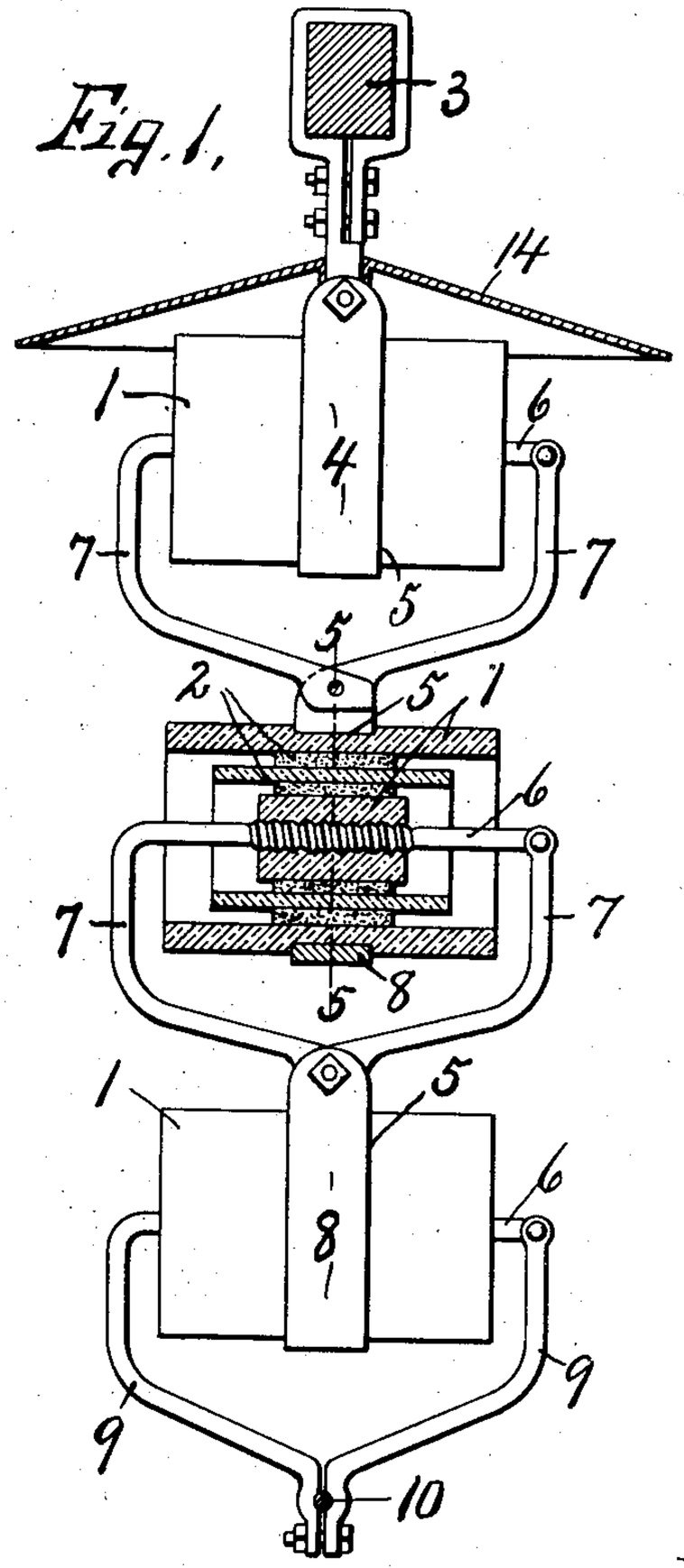


Fig. 2.

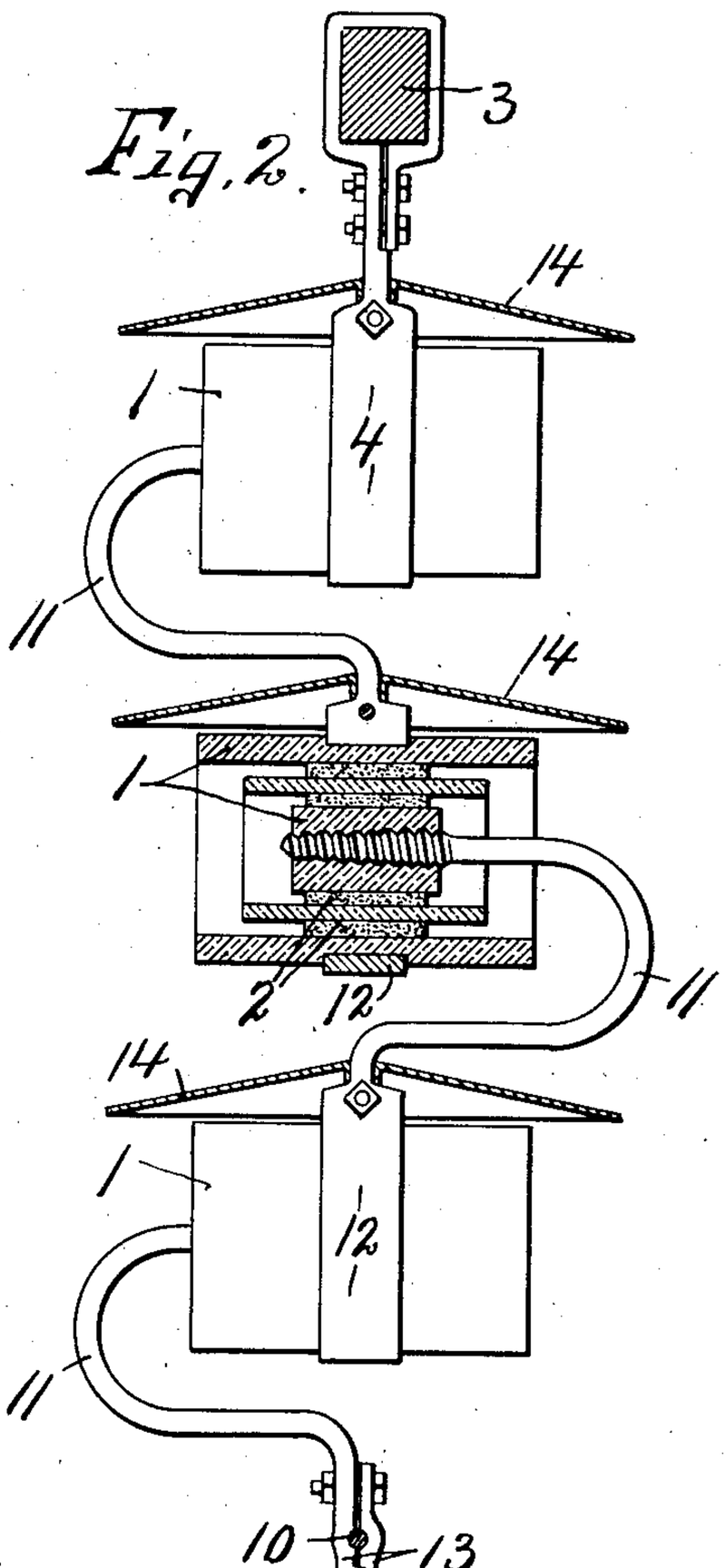
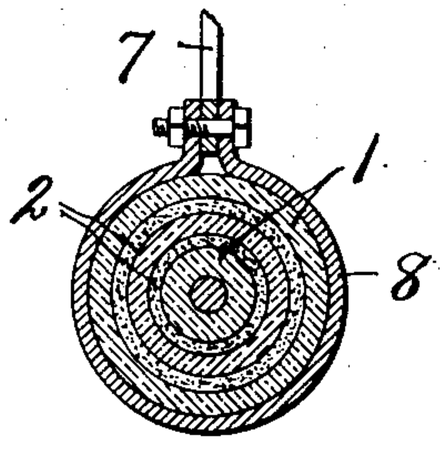


Fig. 5.



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2 SHEETS—SHEET 2.

Fig. 3.

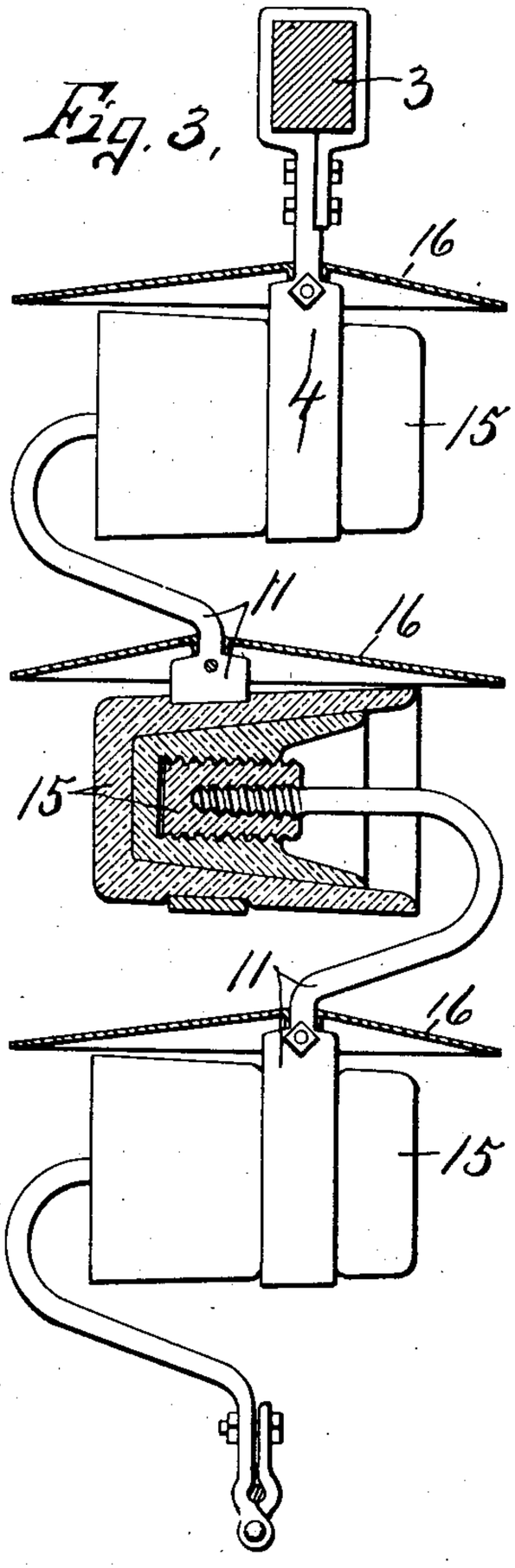
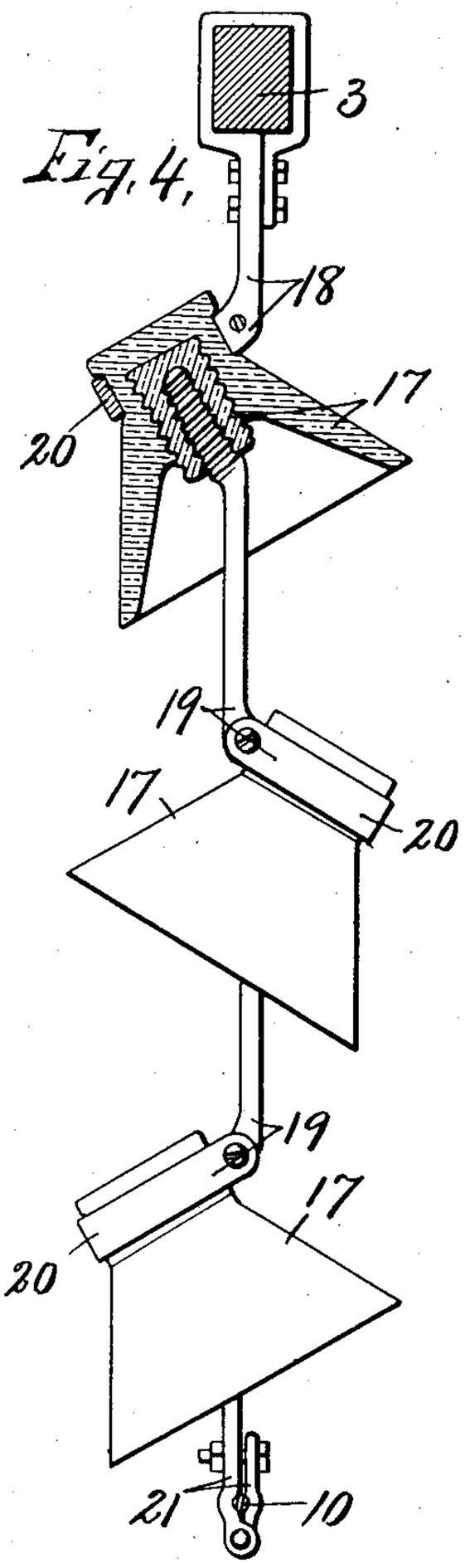


Fig. 4.



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HIGH-VOLTAGE INSULATOR.

998,359. Specification of Letters Patent. Patented July 18, 1911.

Application filed February 26, 1907. Serial No. 359,442.

To all whom it may concern:

Be it known that I, FRED M. LOCKE, of Victor, in the county of Ontario, in the State of New York, have invented new and useful Improvements in High-Voltage Insulators, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to an improved system of insulation for high voltage electric conductors in which a series of separate insulators are linked together suitable distances apart, in series, between the electric conductor and main support so that the number of insulators may be readily increased or diminished according to the voltage of the current carried by the conductor. In other words, I have sought to combine a number of insulators in such manner as to safely carry a conductor for extremely high voltage currents whereby I am enabled to use insulators of smaller and cheaper grades without liability of static discharges or leakages passing from the conductor to the cross arm or other main support.

Another object is to provide means for protecting the insulators against accumulations of moisture, thereby obviating in a measure static discharges and leakages over the surfaces of the insulators.

Other objects and uses will appear in the following description.

In the drawings—Figures 1, 2, 3 and 4 are elevations, partly in section, of modified systems of insulation embodying the features of my invention. Fig. 5 is a sectional view taken on line 5—5, Fig. 1.

It is well known that the extremely large insulators which are now manufactured to carry high potential electric conductors are very difficult and expensive to manufacture by reason of their size and difficult of testing their insulating properties, and that owing to the fact that the surface area necessarily increases materially with the size of the insulator it cannot be well protected from the elements, and therefore, exposes this large area to moisture, such as rain and snow, which unavoidably accumulates thereon, thereby affording more or less conducting area for static discharges and leakages of the current from the feed wire to the insulator support, so that it may be safely said that the liability of such static discharges increases with the area of the insulator, thereby reducing materially the insulating efficiency of the extremely large insulators out of proportion to their size. It is also well known that the size as well as the efficiency of these large insulators has now practically reached its limit, while the voltage carried by conductors which are adapted to be supported by insulators is gradually increasing at the same time it becomes necessary to conserve such energy by providing some means for properly insulating the high potential conductors at their supports. I have found by actual experiment that insulator supports may be effectively protected against such high voltage currents by providing a chain or series of comparatively small insulators linked together between the conductor and support, which are not only more economically manufactured, but possess greater mechanical strength and insulating efficiency, and also reduces the area exposed to the elements, at the time by installing insulators in this manner I am enabled to add any number which may be necessary to resist the leakage or static discharge of any current power. It is evident from the foregoing objects that these modifications may be multiplied indefinitely, and I have therefore shown only such forms as appear at this time to be practicable.

In Fig. 1 I have shown a series of tubular insulators —1— each made up of a plurality of cylindrical tubes of different lengths, arranged one within the other, and spaced apart by intervening fillers —2— of cement or other insulating material disposed substantially midway between the ends of the tubes, and serving not only to hold these tubes in fixed relation to each other, but also to form intervening air spaces between the ends of the tubes, thereby increasing the insulating efficiency of each separate insulator by increasing the arcing distance between the ends of the telescoping tubes. These insulators may be suspended from any suitable support, as a cross-arm —3—, the first insulator of the series nearest the cross-arm being carried by a metal clamp —4— which is rigidly secured to the cross-arm —3— and is fitted in an annular seat —5— in the periphery of the outer tubular

section of the insulator —1— midway between its ends or in transverse alinement with the annular fillings —2— where the insulator has the greatest mechanical strength.

A metal bar —6— is passed centrally through the inner tube of the first insulator nearest the support —3—, and its opposite ends are provided with pendant arms —7— some distance from the opposite ends of the insulator, and converge toward each other some distance under the first insulator where the converging ends are united to a second annular clamp —8—, which like the clamp —4—, is fitted in the annular seat —5— of the second insulator —1— midway between the ends of said insulator. This second insulator also carries a metal bar —6— which is passed centrally through the inner tube in the same manner as in the first insulator of the series, and its opposite ends are provided with pendant arms —7— converging some distance beneath the second insulator and united to a third clamping ring —8— by which the third insulator is supported; this latter insulator also carrying a metal bar —6— which is passed centrally through the inner tube and is formed with pendant arms —9— converging some distance beneath the lower insulator —1— and united to form a clamp for the electric conductor, as —10—.

It is now clear that the upper insulator of the series is suspended by the hanger —4— directly from the support —3—; that the second insulator is suspended from the first one of the series by the bar —6—, hanger-arm —7— and clamp —8—, and that the third insulator of the series is supported from the second one by a similar bar —6—, hanger-arm —7— and clamp —8—, while the electric conductor or wire —10— is suspended from the last or lower insulator of the series by the lengthwise rod —6— and hanger-arms —9—, considerable space being left between the several insulators of the series to prevent arcing of the current from one to the other. It is also clear that the number of insulators may be multiplied indefinitely, each one adding a definite resistance to the transmission of current from the feed-wire to the main support, as —3—, and therefore, I am enabled to transmit safely a current of the highest voltage through the feed-wire —10— without liability of static charges or leakages being transmitted to the main support. Another advantage of this system of insulation is that by attaching the wire to the lower one of the series a limited flexing action of the entire chain is afforded between the rigid support —3— and wire to compensate for unequal expansion and contraction of the portions of the wires between the several insulators which carry the wire.

In the construction seen in Fig. 2, I have shown a series of insulators —1— similar to those seen in Fig. 1, but instead of extending the hanger rods entirely through the inner tube, I employ U-shape hangers —11—, each having one arm inserted into the center tube of its corresponding insulator and its other arm provided with an annular clamp —12— which encircles the central portion of the underlying insulator, the first insulator of the series nearest the cross-arm —3— being substantially the same as that shown in Fig. 1. The anchor arms —11— shown in Fig. 2, of successive insulators project from opposite ends thereof the lower hanger-arm being provided with a suitable wire clamp —13—; otherwise the device is quite similar to that shown in Fig. 1.

In order to protect the insulators from accumulations of moisture, such as rain and snow, I cover the first one of the series with a suitable sheet metal hood —14— of sufficient diameter to protect the entire series, but in Fig. 2 I have shown each separate insulator as covered by a similar hood or shield —14—.

In Fig. 3 I have shown a system of insulators —15— as suspended from a suitable support —3—, the first one of the series being held in place by a clamp —4— similar to that shown in Figs. 1 and 2, while the remaining insulators are suspended from the one above it by hangers —11— similar to those shown in Fig. 2, the only difference between this construction and that shown in Fig. 2, being that the insulators are made up of a series of bell-shape sections nested one within the other, but in each of these three forms of chain insulators just described, each insulator is held in place by a clamp attached thereto substantially midway between its ends although the clamps in Fig. 3 are disposed nearer the smaller ends of the insulators, each insulator being protected from the other by a superposed hood or shield —16— similar to the shield —14— seen in Figs. 1 and 2.

In Fig. 4 I have shown a series of bell-shape insulators —17—, as carried by a suitable support —3— and hangers —18— and 19—, the hanger —18— being secured directly to the support 3 and is provided at its lower end with an obliquely inclined clamp —20— secured to the head of the upper insulator —17—. Each of these hangers —18— is centrally secured in the superposed insulator —17— and has its lower end provided with an oblique or inclined clamp —20— which is secured to the head of the next underlying insulator so that each insulator is disposed obliquely, successive insulators being inclined in opposite directions, each insulator supporting the next one below it through the medium of one of the

anchors —19— while the lower insulator supports a central hanger —21— having a suitable clamp for the feed wire —10—.

It will be seen from the foregoing description that in all of these modifications a series of insulators are suspended between the main support and feed wire, and that the number of insulators may be varied at will to correspond with any change of voltage of the current carried by the wire; that is, if the voltage is excessively high the number of insulators between the feed wire and support may be increased and I am enabled to use smaller and cheaper grades of insulators without liability of diverting any part of the current from the wire to the main support, whereas, if a single insulator were built up of any number of sections, nested one within the other, or the size of the insulator increased as the voltage is increased there would always be a strong probability of puncturing the nested insulators sufficient to carry the full force of the current to the cross arm.

In the use of insulators arranged and mounted as described in the several modifications, if the last insulator of the series nearest the electric conductor should be broken it would have to arc from this insulator over to the nest, and so on through the several insulators of the series, the liability of puncture or disintegration by static discharges or leakage of the current becomes less, and if it is found that the voltage is too high for the insulator the number of insulators may be increased.

What I claim is:

1. An insulator for high voltage electric conductors comprising, a series of insulators arranged in sequence, separate metal hangers, each secured to the center of one insulator and passing around the edge thereof and secured to the next adjacent insulator of the series.

2. An insulator for high voltage electric conductors comprising, a series of insulators arranged in sequence some distance apart and each composed of sections nested together one within the other, the center section having a socket, connections between said insulators holding them a fixed distance apart, each of said connections extending around one edge of one insulator having a portion thereof entering the socket of said insulator and another portion embracing the periphery of the outer section of the adjacent insulator, a support and connections between the support and first insulator of the series.

3. In an insulator for high voltage electric conductors the combination with a plurality of insulating units each open at one end arranged with their open ends extending in opposite directions, of bent hangers leading from the center of one unit and embracing the exterior of the adjacent unit.

4. In an insulator for high voltage electric conductors, the combination with a plurality of cup-shaped units open at one end and disposed one beneath the other with their open ends projecting in opposite directions, of U shaped hangers leading from the center of one unit and embracing the adjacent unit.

In witness whereof I have hereunto set my hand this 19th day of February 1907.

FRED M. LOCKE.

Witnesses:
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GEO. W. ATWELL.