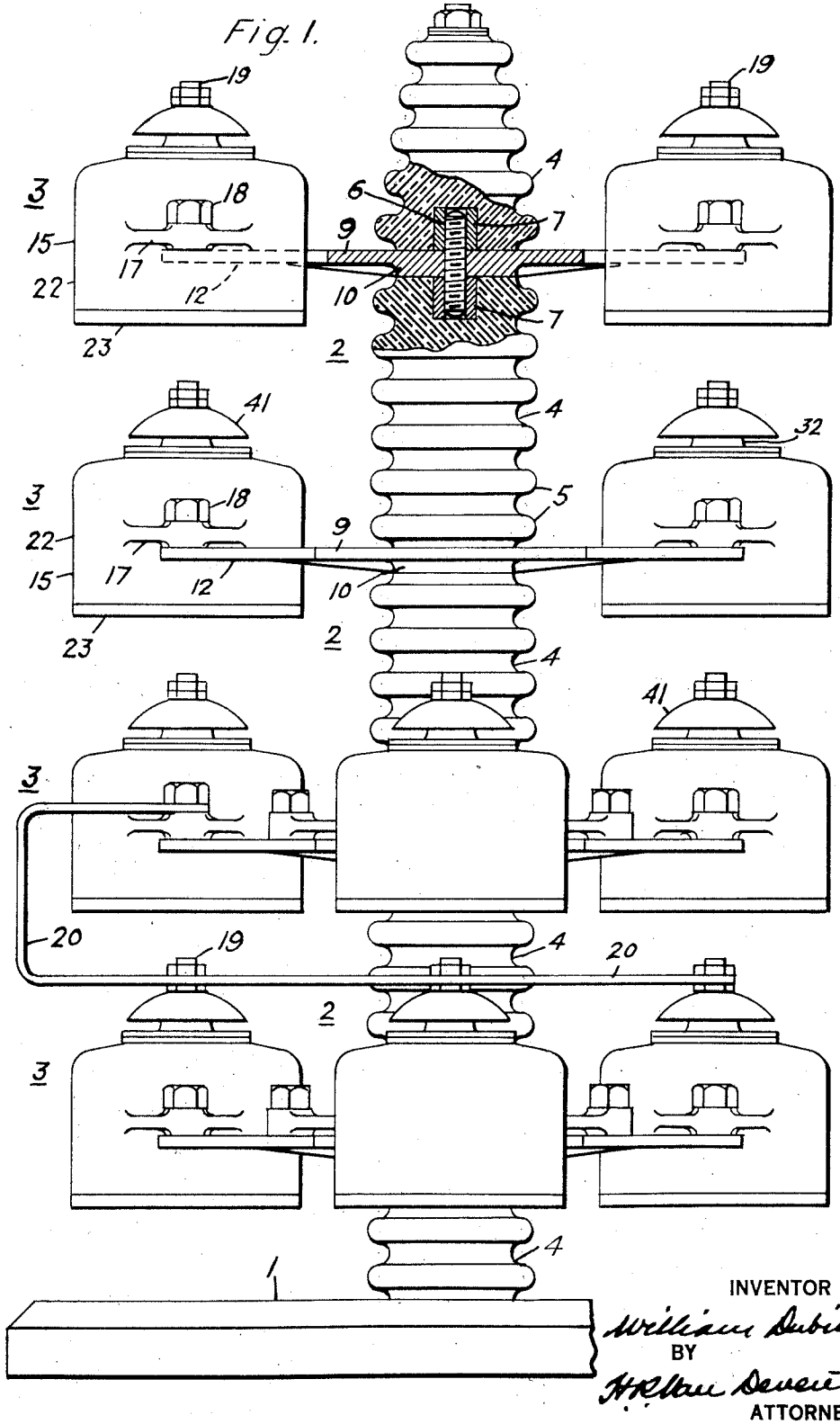
May 10, 1927. 1,628,627

W. DUBILIER

ELECTRICAL STRUCTURE

Filed June 30, 1923 4 Sheets-Sheet 1

Fig. 1.



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ELECTRICAL STRUCTURE

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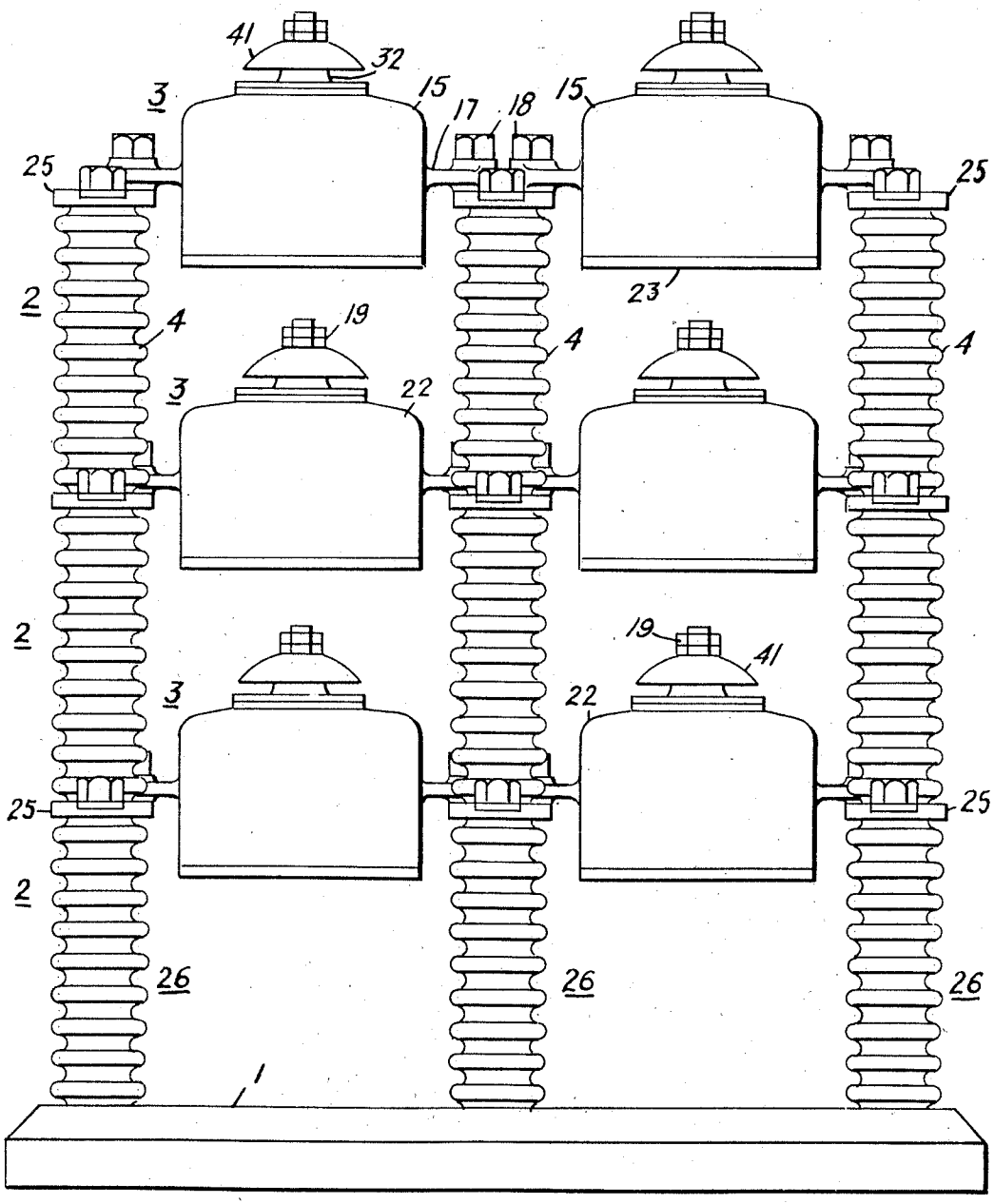
Fig. 2.



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ELECTRICAL STRUCTURE

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Fig. 3.

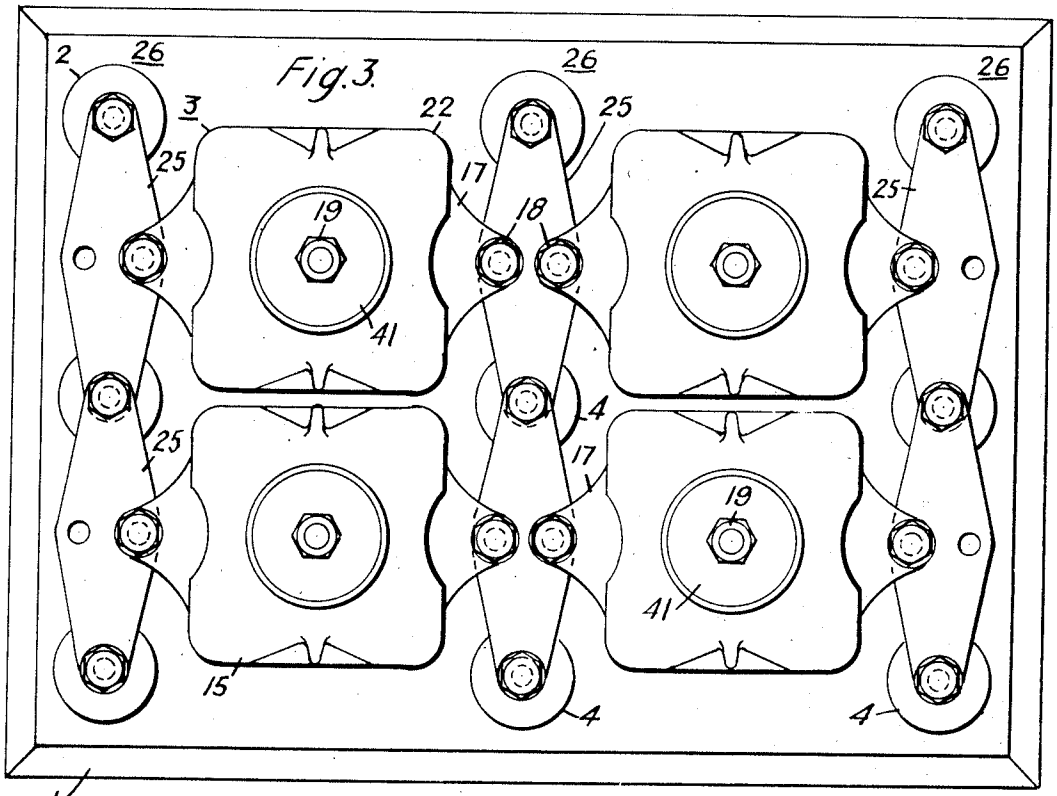
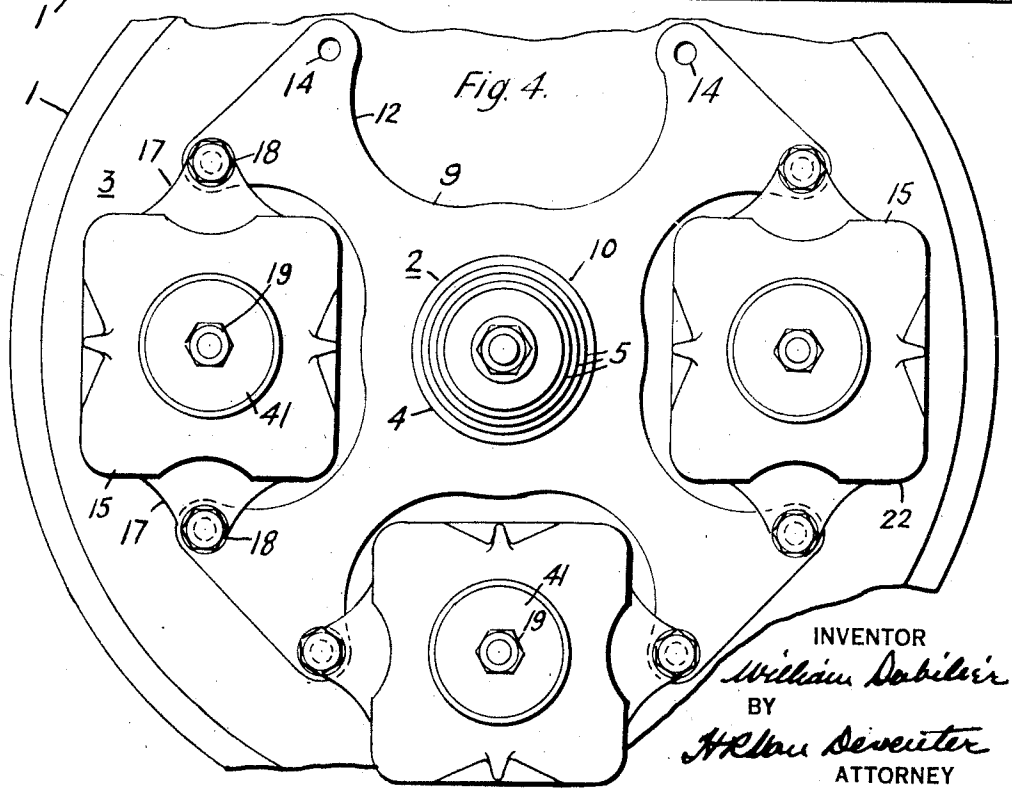


Fig. 4.



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ELECTRICAL STRUCTURE

Filed June 30, 1923 4 Sheets-Sheet 4

Fig. 5.

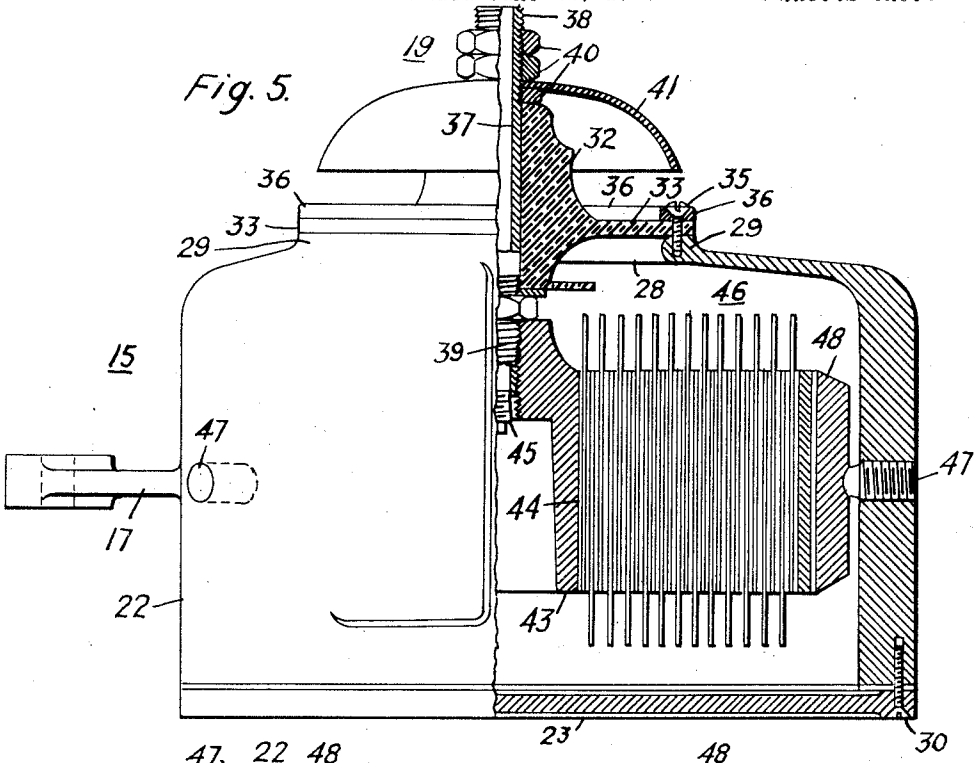
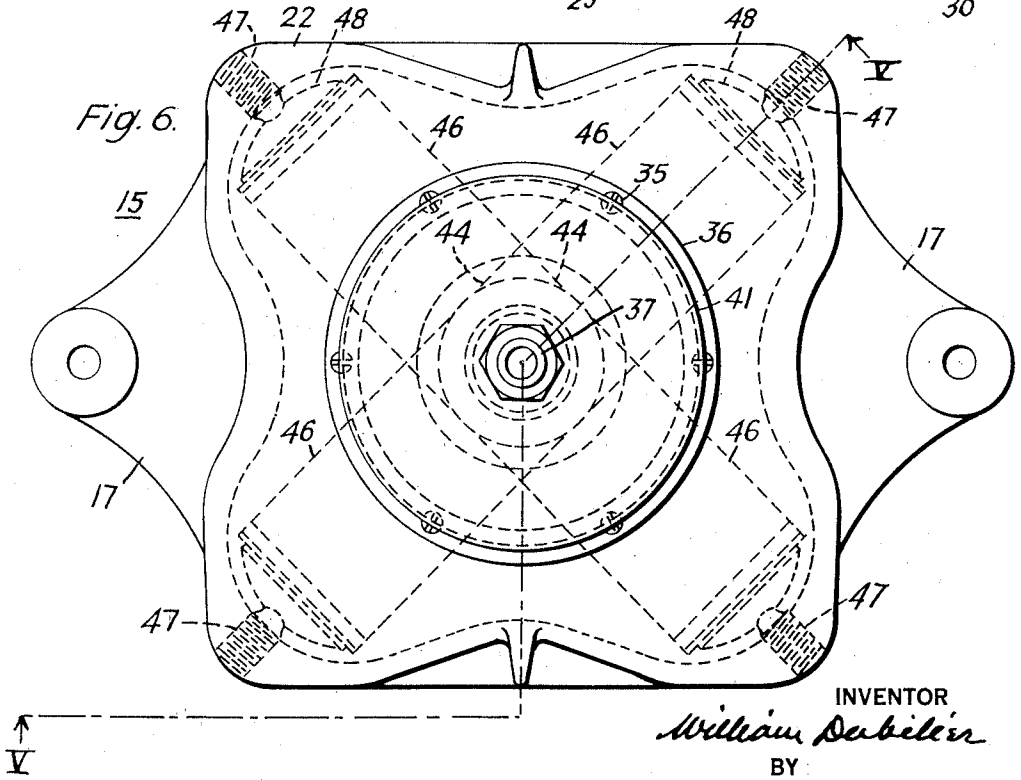


Fig. 6.



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Patented May 10, 1927. 1,628,627

UNITED STATES PATENT OFFICE.

WILLIAM DUBILIER, OF NEW YORK, N. Y., ASSIGNOR TO DUBILIER CONDENSER CORPORATION, A CORPORATION OF DELAWARE.

ELECTRICAL STRUCTURE.

Application filed June 30, 1923. Serial No. 648,848.

My invention relates to electrical structures and particularly to high-potential condenser structures.

One object of my invention is to provide a device of the above indicated character that shall be simple and durable in construction, economical to manufacture and effective in its operation.

Another object of my invention is to provide an electrical condenser structure that shall comprise units and sections of such character as to permit condensers for widely different voltages to be constructed from a relatively small number of stock parts, thereby economizing in the handling, storing, shipping and assembling of the parts and facilitating the replacement of damaged members.

Another object of my invention is to provide a unit high voltage condenser that shall be extremely flexible in the variety of combinations by which it may be adapted for circuits and conditions of different character.

Another object of my invention is to provide a high-potential condenser structure in which the electrostatic stresses shall be so distributed as to reduce the likelihood of injury from disruptive arcs and that shall permit the device to occupy a reduced space for a given voltage between its terminals.

Another object of my invention is to provide a high-potential condenser structure that shall be so constructed of sections alternately comprising a condenser unit or units and an insulator or insulators to support the same as to eliminate the necessity for a relatively large insulator having a voltage resisting strength equal to the voltage across the condenser.

In high-potential condensers, employed in wireless telegraph and other circuits, it has heretofore been usual to construct the same as single units, each having the desired voltage value between its terminals and a single insulator to support the same. A condenser of this construction has many disadvantages among which are the likelihood of injury or destruction from undue electrical stresses, the expense in handling and shipping, the necessity of having to practically rebuild the device when it is injured and the inadaptability thereof to different conditions.

The provision of a single insulator to withstand the very high voltages of such condensers also increases the cost and complicates the manufacture thereof, it being known to those versed in the art, that the cost of manufacture of the insulator does not increase in proportion to the voltages but that it increaess at a much greater rate than in simple proportion. For example, a ninety thousand volt insulator does not cost only three times as much as a thirty thousand volt insulator but many times more than three times as much. This is particularly true of refractory insulators, such as porcelain, wherein great care in the handling and firing of the insulators is necessary. It is also known that large porcelain insulators are more likely to be defective than smaller ones.

In practicing my invention, I provide an electrical structure, particularly adapted as a condenser, that is built up in the form of a rack or standard comprising spaced sections, alternate of which each embodies a plurality of unit electrical devices or condensers connected to the devices of the other sections to constitute a single high-voltage device or condenser and the intermediate sections of which comprise insulators for the support of the electrical sections.

Figure 1 of the accompanying drawings is a side elevational view of a device constructed in accordance with my invention, with a portion thereof in section,

Fig. 2 is a side elevational view of a modified form of device embodying my invention,

Fig. 3 is a plan view of the device shown in Fig. 2,

Fig. 4 is a partial plan view of the device shown in Fig. 1,

Fig. 5 is an enlarged detail view, partially in elevation and partially in section along the line V—V of Fig. 6, showing one of the condenser units illustrated in the other figures, and

Fig. 6 is a plan view of the device shown in Fig. 5.

An electrical structure embodying my invention comprises, in general, a base member 1, a plurality of superposed insulator sections 2 and a plurality of supporting or conducting sections 3, alternating in position with respect to the insulator sections 2.

In the form of my invention illustrated in Figs. 1 and 4, the insulator sections 2 are

preferably built up in the form of a single vertical column between which the sections 3 are mounted and from which the sections 3 extend laterally or horizontally.

The sections 2 may comprise insulating and supporting members 4, of a well-known type having surface-creepage corrugations 5, that are connected to each other and to the base member 1 in any suitable manner, preferably as by screws 6 that co-operate with internally-threaded portions or sleeves 7 in the insulating members 4, as illustrated near the top of Fig. 1. This construction permits the sections 2 and 3 to be readily assembled and disassembled and to be removed or added, at will, to change the character of a structure already assembled.

As shown in Figs. 1 and 4, each section 3 preferably comprises a horizontal, substantially flat, plate-like metal member 9 having a central apertured portion 10 surrounding one of the screws 6 between the adjacent insulating members 4. Radial arms 12 extend from the central portion 10 and are provided, at the outer ends, with laterally extending portions having apertures 14 therein.

Condenser units or sub-units 15, to be hereinafter more fully described and that are shown more clearly in Figs. 5 and 6, are each provided with apertured laterally projecting lugs 17 by which, through the co-operation of bolts or screws 18, that extend through the lugs 17 and the openings 14, the condenser units are supported on the members 9 between the arms 12 thereof.

Each section 3 comprises a plurality of the condenser units 15 that are electrically connected to each other through the member 9 and the lugs 17 that constitute the low potential terminals of the units 15.

High-potential terminals 19 of the units 15 of each section may be connected to each other and to the low potential terminals of the units of the section 3 next above, as by conductors 20, one of which is shown in Fig. 1, to thereby connect all of the condenser units 15 in multiple series relation. This arrangement causes the structure, as a whole, to constitute a single high-voltage condenser unit comprising the sub-units 15. The latter being grouped, as shown, so divides the total voltage across the main structure into lower potential zones or sections as to require the insulator 4 to be only of a size sufficient to withstand the lower potential drop across the lower potential zones. Thus, instead of one large expensive insulator sufficient to withstand the total voltage drop across the structure as a whole, several relatively small inexpensive insulators may be employed.

The members 9 are preferably similar, as are the condenser units 15, so that, with a relatively small variety of standard interchangeable parts, almost any size or kind of main condenser structure may be readily constructed therefrom.

The condenser units of each section 3 are enclosed in metal casings 22 having bottom plate members 23 that are disposed in substantially the same plane. This construction provides a relatively broad expanse of metallic surface under each section 3, adjacent to which the potential gradient is relatively low. In other words, the electrostatic stresses between the sections 3 are widely distributed. This relatively wide distribution of the electrostatic stresses is furthered by the construction and relation of the plate like members 9. These members, while of slightly different potential gradient, adjacent to the surfaces thereof, than the plates 23, will however, not only distribute the electrostatic stresses widely therebetween but will cause the distribution to be substantially uniform.

In the form of my invention illustrated in Figs. 2 and 3, in which corresponding parts are designated by corresponding reference characters, the insulator sections 2, instead of being constructed as a single column, as in the above described form, are constructed of a plurality of similar columns arranged in the form of a framework or rack in which the sections 3 constitute the lateral braces or members. In this form, where the condenser sub-units 15 are of the same size and number as the same units in the single-column structure, the insulators 4 may be much smaller than in that structure.

As shown in Figs. 2 and 3, instead of the members 9 of the first-described structure, the units 15 of each section are supported between cross-members 25 that extend between the respective insulators 4 of each of several groups 26 of the insulators 4. In this form of my invention, each group 26 comprises three columns of the insulators 4 symmetrically related and disposed on the base member 1 to constitute a substantially rectangular framework. The condensers 15 may be connected in multiple series, as in the form of my invention shown in Figs. 1 and 4, or be otherwise arranged.

Referring to Figs. 5 and 6, in which one of the condenser units 15 is illustrated in detail, the casing 22 is of substantially box-shape having a relatively small central circular upper opening 28, around which a flange 29 is disposed and a lower relatively large opening over which the plate 23 is secured, as by screws 30.

An insulating bushing 32, disposed in the opening 28, is provided with an annular flange portion 33 that is secured to the flange 29 of the casing 22 by screws 35 which extend through a ring 36, disposed over the insulating flange 33, and through

the latter into the flange 29. A conducting lead, in the form of a tube 37 and constituting the high potential terminal of the device, extends through the bushing 32 and is provided, at its outer and inner ends, respectively with screw-threaded portions 38 and 39. Nuts 40 serve to secure the conductors 20, see Fig. 1, and an arcing member 41 in position on the upper threaded end 38 of the lead 37.

A block or compression member 43 is threaded to the lower end 39 of the lead 37 and is provided with vertical flat surfaces 44 that are disposed in planes normal to the horizontal diagonal axes of the casing 22.

A slightly tapered screw threaded plug 45 is fitted into the lower end of the tubular lead 37. This arrangement closes the tube 37 against the admission of foreign matter and serves to so expand the lower end of the tube as to lock the block 43 in position.

Condenser sets or units 46, built up of alternate conducting and insulating plates in a usual and well-known manner, extend between the surfaces 44 of the block 43 and diagonally opposite points adjacent to the inner corners of the casing 22 wherein screws 47 are disposed. The latter coact between the casing 22 and the condenser sets 46, through compression plates 48, to compress the sets 46 against the block or terminal member 43.

With the above described construction, wherein the high-potential ends of the condenser sets 46 engage the central terminal block 43 and the outer or low-potential ends of the sets 46 are in electrical connection with the casing 22, the amount of insulation required is relatively small, there is minimum danger of failure at the high-potential terminal and the electrical stresses on the casing 22 are uniformly distributed. A condenser device somewhat similar to that of the above described form but lacking many of the improved features thereof is fully shown and described in my co-pending application, Serial No. 281,183, filed March 7, 1919, to which reference may be had for a better understanding of this feature of my present invention.

It is to be understood that the forms and constructions herein set forth are merely generally illustrative of my invention and that many changes may be effected therein without departing from the spirit and scope of my invention, as set forth in the appended claims.

I claim as my invention:

1. An electrical structure built up to constitute a supporting rack or standard and comprising a plurality of superposed spaced apart sections, each including a condenser connected to a condenser of another of said sections, and insulating members between the sections to separate and support same and render the structure a single high-voltage condenser unit.

2. An electrical structure comprising a plurality of superposed spaced apart sections, each including a plurality of electrical devices connected in series-multiple relation to the electrical devices of another of said sections and insulating members between the sections to separate and support same.

3. An electrical structure comprising a plurality of electrical devices and built up of spaced apart sections, each section including a plurality of said electrical devices, and insulating members between the sections to separate and support same.

4. An electrical structure comprising a plurality of electrical devices and built up of spaced apart sections, each section including a plurality of said electrical devices and insulating members between the sections to separate and support same, said electrical devices being connected in series-multiple relation.

5. An electrical structure comprising a plurality of conducting members and built up of spaced apart sections each section including one of said conducting members and a plurality of electrical devices supported and electrically connected by the conducting member thereof, and insulating members between the sections to separate and support same.

6. An electrical structure comprising a plurality of conducting members and built up of spaced apart sections, each section including one of said conducting members and a plurality of electrical devices supported by the conducting member thereof, the electrical devices of each section being electrically connected to each other, and insulating members between the sections to separate and support same.

7. An electrical structure comprising a plurality of conducting members and built up of spaced apart sections, each section including one of said conducting members and a plurality of electrical devices supported by the conducting member thereof, the electrical devices of each section being electrically connected by said conducting members in multiple, and being connected in series to the electrical devices of the other sections, and insulating members between the sections to separate and support same.

8. An electrical structure comprising a plurality of supporting members and built up of spaced apart sections, each section including one of said supporting members, said supporting members extending laterally of said structure, electrical devices mounted on said supporting members, and insulating members between the sections to separate and support same.

9. An electrical structure comprising a plurality of supporting members and built up of spaced apart sections, each section including one of said supporting members, said supporting-members extending laterally of said structure, electrical devices adapted to be interchangeably mounted on said supporting members, and insulating members between the sections to separate and support the same.

10. An electrical structure comprising a plurality of supporting members and built up of spaced apart sections, each section including one of said supporting members, said supporting members extending laterally of said structure and a plurality of electrical devices mounted on each of said supporting-members, and insulating members between the sections to separate and support same.

11. An electrical structure comprising a plurality of electrical devices and insulators and built up of spaced apart sections, each section including a plurality of said electrical devices, the electrical devices of each section thereof being interchangeable one with another, the insulators being between and separating the electrical devices of adjacent sections.

12. An electrical structure comprising a plurality of condensers and supporting members and built up of superposed spaced apart sections, each section including a group of said condensers, a casing for each of said condensers, and insulating members between the sections to separate and support same.

13. An electrical structure comprising a plurality of condensers and supporting members and built up of superposed spaced apart sections, each section including a group of said condensers, a casing for each of said condensers, said members connecting the condensers of each section, and insulating members between the sections to separate and support the same.

14. An electrical structure comprising a plurality of condensers and supporting members and built up of superposed spaced apart sections, each section including a group of condensers, and a casing for each of said condensers, each member constituting a common terminal for the condensers of the respective group, the condensers of each section being electrically connected to each other by said members, and insulating members between the sections to separate and support same.

15. An electrical structure comprising a plurality of conducting members and built up of superposed spaced apart sections, each section including a plurality of condenser devices, and a casing for each of said condenser devices constituting a terminal therefor, the casings of each section being electrically connected to each other by said conducting members, and insulating members between the sections to separate and support same.

16. An electrical structure comprising a column of superposed insulating members, spaced apart condenser-supporting members, supported between said insulating members, each supporting member having a portion extending laterally of said structure, and a condenser mounted on each of said laterally-extending portions.

17. An electrical structure comprising a column of superposed insulating members, a condenser-supporting member of conducting material supported between adjacent of said insulating members and having a portion extending laterally relative thereto, and a plurality of condensers mounted on each of said laterally-extending portions and electrically connected thereby, the condenser supporting members to be spaced apart by the insulating members.

18. An electrical structure comprising a plurality of superposed spaced apart sections, each including a conducting condenser-supporting member and a condenser device embodying an outer conducting member, the supporting member of each section co-operating with the outer conducting member of its corresponding condenser to distribute electrostatic stresses between said sections, and insulating supporting members between the conducting members to space the latter apart.

19. An electrical structure comprising a plurality of superposed spaced apart sections each including a condenser, and means for relatively widely distributing electrostatic stresses between the sections, said means having the condensers mounted thereon, and insulating members between the sections to separate and support same.

20. An electrical structure comprising a plurality of superposed spaced apart sections each including a condenser, and means for uniformly distributing electrostatic stresses between portions of adjacent sections, said means having the condensers mounted thereon, and insulating members between the sections to separate and support same.

21. An electrical structure comprising a support including a plurality of superposed sections, each section comprising condensers extending transversely of the support, and insulating members between the sections to support the sections and space the same apart, said sections also including conducting members attached to and mounting the condensers, and having portions engaging the insulating members and supported thereby.

22. An electrical structure comprising a supporting column including transverse conducting members and intervening insulating members, the conducting members being spaced apart by the insulating members, each

of the conducting members having one or more condensers mounted thereon, and providing a common connection for said condensers, the condensers of one section being united to those of the adjacent sections.

23. An electrical structure comprising a rack consisting of a plurality of superposed spaced apart sections, each section comprising several condensers arranged in a plane transverse to the rack, conducting members joining terminals of the condensers of each section, the condensers of each section being connected to the condensers of adjacent sections, and insulation between said conducting members.

24. An electrical structure comprising a support including a plurality of superposed spaced apart sections, each section comprising several condensers arranged in a plane transverse to the support, conducting members joining terminals of the condensers of each section, the condensers of each section being connected to the condensers of the adjacent sections, and insulating members between the conducting members, said insulating members being placed upon one another in vertical alignment.

25. An electrical structure comprising a rack consisting of a plurality of superposed spaced apart sections, each section comprising several condensers arranged in a plane transverse to the rack, conducting members in the form of plates joining the terminals of the condensers of each section and supporting same, the condensers of each section being connected to the condensers of the adjacent sections, and insulating members between said plates mounted one upon another to form a column and supporting said plates and condensers.

In testimony whereof, I have hereunto subscribed my name this 28th day of April 1923.

WILLIAM DUBILIER.