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LONG DISTANCE HIGH POTENTIAL ELECTRIC POWER SYSTEM.

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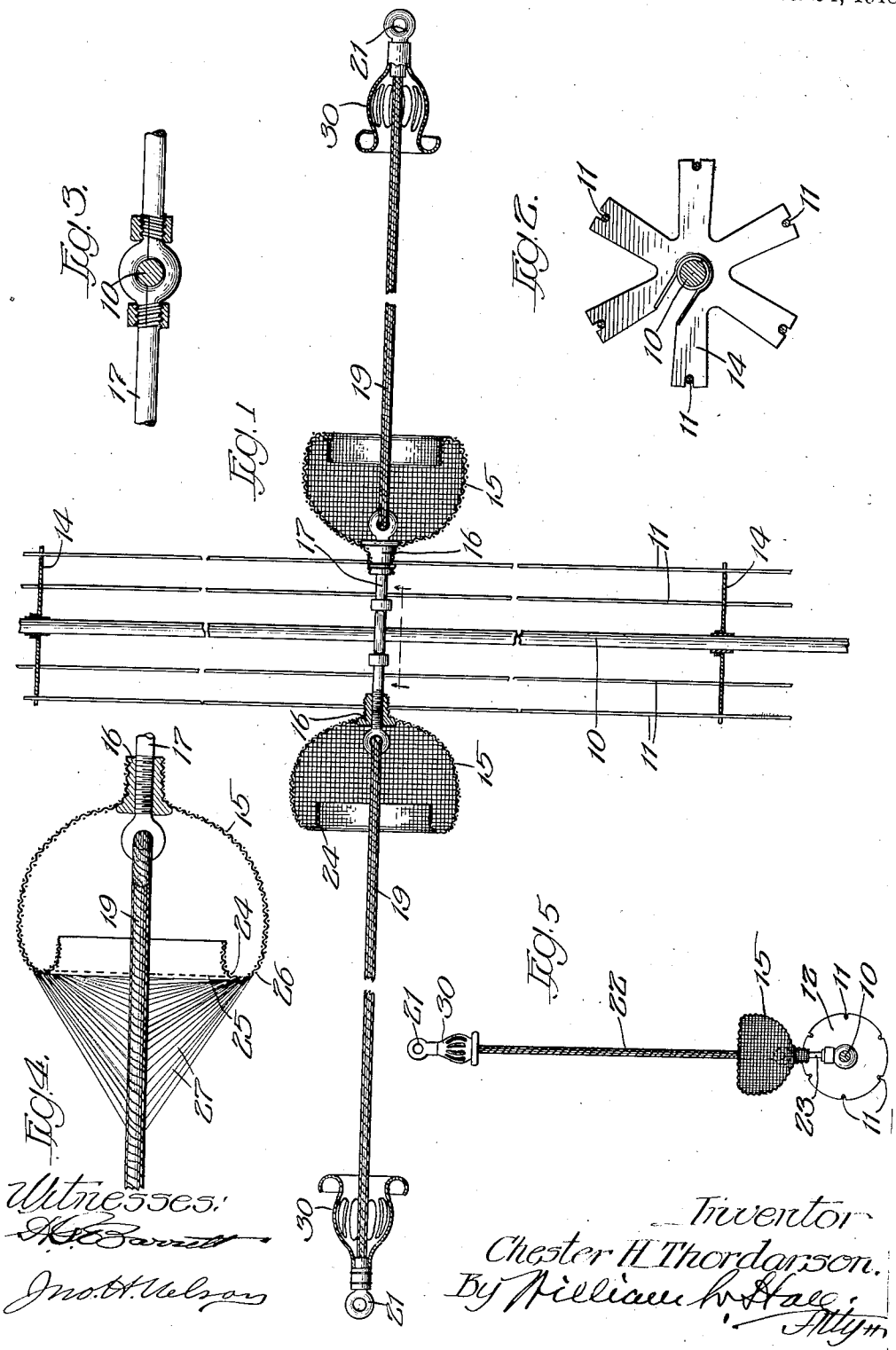
1,288,751.

Patented Dec. 24, 1918.



UNITED STATES PATENT OFFICE.

CHESTER H. THORDARSON, OF CHICAGO, ILLINOIS.

LONG-DISTANCE HIGH-POTENTIAL ELECTRIC-POWER SYSTEM.

1,288,751. Specification of Letters Patent. Patented Dec. 24, 1918.

Application filed October 18, 1915. Serial No. 56,453.

To all whom it may concern:

Be it known that I, CHESTER H. THORDARSON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Long-Distance High-Potential Electric-Power Systems; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in long distance high potential electric power transmission systems, and refers to a novel surge damping transmission line, and to insulating devices for supporting said line.

Among the objects of my invention is to provide a novel long distance transmission line for high tension electric current which is so constructed and arranged as to automatically balance thereon abnormal pressures, due to surges or other conditions which tend to burn out insulators, transformers and other translating devices on the line, and thereby render the system stable and dependable.

Other objects of the invention are to improve and simplify and to reduce the cost of long distance high potential electric power transmission systems, and the invention consists in the combination and arrangement of the parts shown in the drawings and described in the specification and is pointed out in the appended claims.

In the drawings:—

Figure 1 is a detail of a high tension line embodying my invention.

Fig. 2 is a cross section on the line 2—2 of Fig. 1.

Fig. 3 is a detail of the means for connecting the line to the rope insulators.

Fig. 4 is a diagrammatic view, illustrating the action of the protecting electrostatic shield shown in Fig. 1.

Fig. 5 illustrates the electrostatic shield applied to another form of insulating suspension device for high potential transmission lines.

In accordance with my invention, the transmission line comprises a main or central conductor 10 and a series of surrounding, annularly disposed smaller conductors 11 which are spaced from the central conductor 10 by a series of disks 12 spaced along the line, as shown in Fig. 5, or a series of spiders 14 as shown in Fig. 2. The function of the disks 12 or spiders 14 is that of separators to space the outer conductors from the central conductor. The wires 11 are considerably smaller than the main conductor and of metal of higher resistance. The said separators, 12, 14, are preferably of non-magnetic material and are mounted in any suitable manner upon the central conductor 10. The diameter of said separators is dependent upon the current pressure on the line, and they are spaced at such distance apart, depending upon their diameters, as to avoid any possible sagging of the outer conductors bringing them into contact with the main or central conductor 10. The said separators have good electrical contact with both the central conductor 10 and the outer concentric series of conductors 11 so as to make dependable contact between the outer and the inner conductors.

The purpose of arranging the conductors 11 parallel to and spaced from the central conductor is to steady the current flow on the line and to damp surges by transforming the energy of a surge into heat in the parallel conductors 11 so that the energy of the surge is not thrown upon insulators, transformers or like electrical devices connected in the high tension systems. A surge or wave having a steep front will travel along the outer conductors and expend a portion of its energy into heat, due to the much higher resistance of said outer or parallel conductors.

Any change in the magnetic field around the central conductor 10 which is not accompanied by a corresponding and proportionate change of potential on the line produces by induction a current flow in the outer or parallel conductors in a direction opposite to the flow in the main conductor, which induced current flows inwardly along the separators 12 and returns to the main or central conductor, thereby forming a closed circuit. These induced currents in the surge damping outer parallel conductors have the effect of maintaining a better phase relation between the current and potential wave.

The distance apart of the separators 12 will depend upon the line conditions and the potential of the current. Said separators, being in electrical contact as they are

with the inner and outer conductors, divide the transmission line into a plurality of sections, each of which is, in a sense, self controlling with respect to current flow variations. That is to say, each section thus formed, and including closed circuits through the outer conductors and separators, has its part in dissipating the energy of a surge, so as to prevent an accumulation of energy on the line due to inertia of current flow, such as would be dangerous to insulators and electrical devices in the transmission system. The line becomes, therefore, self balancing.

By the use of my improved transmission line, it becomes possible to transmit and control higher potential energy than has heretofore been practicable by known transmission systems. Furthermore my improvements greatly lessen the danger of burning out electrical devices and insulators in the system when operating at what is considered practical potentials in the present systems.

I have found that when operating at very high potentials, as for instance from two hundred thousand volts and upward, a most satisfactory form of insulator is like that shown in my pending application for U. S. Letters Patent, Serial No. 691,801, wherein the insulating support consists of a rope saturated with tar or other waterproofing or insulating material, or otherwise constructed to produce a water-proof insulating device. In the higher potentials, however, it become necessary, in order to avoid burning the rope at its point of anchorage with the line, to provide a special construction, in the nature of a protector or shield at the part of the rope where it is secured to the high tension line. Said shield is indicated at 15 in Figs. 1, 4 and 5. It preferably has the form of a wire basket-like structure which is open at its side remote from the line. At its other closed side it is provided with a metallic bushing or ferrule 16 which is fitted closely in metal to metal contact over an anchor bar 17 which directly engages the central conductor of the transmission line, being fastened to said conductor in any suitable manner. Said bushing may be screw threaded to the anchor bar. The anchor bar extends into the basket and is provided therein with an eye to receive the rope 19 which constitutes the insulating and suspension element. As shown in Figs. 1, and 2 the rope insulators 19 are disposed horizontally at each side of the line and are adapted to be attached at their outer ends by fittings 21 to poles or other supports. As shown in Fig. 5 the insulating and suspension rope 22 is disposed vertically from an overhead support to sustain the transmission line.

The anchor fitting 23 shown in Fig. 5 is attached to the basket in the same general manner as the anchor bar 17, said fitting extending into the basket and provided therein with an eye to which the rope is attached.

The edge 24 of the basket 15 around the opening therein, and through which the rope extends, is curved inwardly, thereby making the radius of the opening shorter than the length of the rope from its attachment to the anchor bar to a point in the plane of the outer edge of the basket, indicated by the dotted line 25 in Fig. 4. As herein shown the edge of the basket is turned some distance backwardly thereinto from its mouth to produce a rather broad flange-like terminal. However, this particular configuration need not necessarily be followed, the point being to constrict the opening or mouth of the basket. The basket is rounded at the portion thereof which is turned inwardly as indicated at 26 to avoid abrupt corners and to prevent sharp brush discharges.

Within the plane of the outer edge of the basket there is a neutral or balanced electrostatic field, as indicated in Fig. 4, which figure is a true representation of the glow or brush discharge as visible under electrostatic stress when the surface of the rope has been thoroughly moistened with rain water. This brush discharge quickly blows off all surface moisture and maintains the rope as a good insulator. The air space between the rope and the inturned flange 24 of the basket acts, in connection with the curved surface 26, as an electrostatic cushion to maintain a uniform and outwardly graded electrostatic stress on the surface of the rope as indicated by the lines 27 in Fig. 4. Thereby the brush discharge or creepage is prevented from burning into the ends of the rope, as would occur under high potentials if the protector 15 were not present.

The anchor fittings 21 by which the ropes are attached to the line supports may be provided with bell shaped perforated shields 30 which extend inwardly for a distance over the rope and act to protect the rope at its outer anchorage in the same general manner as the basket-like protector 15.

It will be understood that the structural details of the illustrated embodiment of my invention are capable of variation within the spirit and scope of the claims hereto appended and that it is the intent to claim all of inherent novelty shown in the drawings and described in the specification.

The basket-like shields shown are not herein claimed, but are claimed in a divisional application filed by me on the 23rd day of April, 1917, Serial No. 163,867.

I claim as my invention:—

1. In long distance electric power transmission systems, a main transmission line, and auxiliary lines radially spaced from and electrically connected to the main line

at points throughout its length to divide the main line into surge damping sections.

2. A long distance electric transmission line, comprising a central conductor and surrounding parallel, relatively high resistance conductors connected in multiple with the central conductor for current flowing in normal direction and connected to said central conductor to form relatively short closed circuits therewith for current induced in the high resistance wires by the magnetic field of the central conductor.

3. A transmission line for electric power transmission systems comprising a main conductor and an outer, radially spaced parallel conductor of relatively high resistance and current conducting spacers between the conductors at intervals along the line.

4. A transmission line for electric power transmission systems comprising a central conductor, a series of parallel, relatively high resistance conductors surrounding the central conductor and current conducting spacers between and in contact with the central and outer conductors at intervals along the line.

5. A transmission line for electric power transmission systems comprising a central conductor, a series of parallel, relatively high resistance conductors surrounding the central conductor and non-magnetic metallic spacers arranged at intervals along the line between the central and surrounding conductors and constituting electrical connections therebetween.

6. The method of balancing high tension currents on long distance transmission lines which consists in establishing at intervals along the line closed circuits through outer parallel conductors that lie in the magnetic field of the line.

7. The method of balancing high tension currents on long distance transmission lines which consists in arranging about the line a series of parallel conductors and electrically connecting said conductors to the line at intervals therealong.

In testimony that I claim the foregoing as my invention I affix my signature, in the presence of two witnesses, this 15th day of October, A. D. 1915.

CHESTER H. THORDARSON.

Witnesses:
W. L. HALL,
RUTH E. ZETTERVALL.