

July 14, 1925.

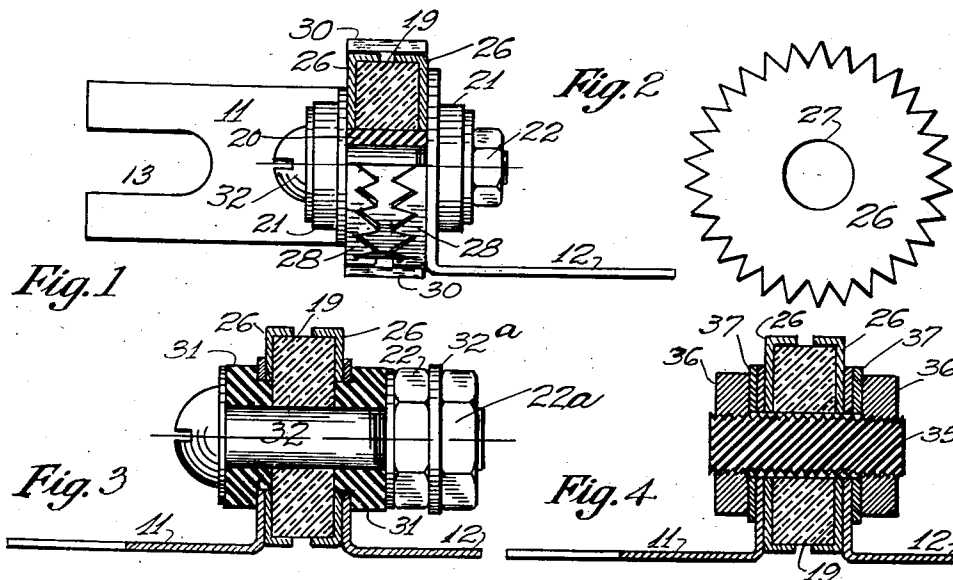
E. A. EVERETT ET AL

1,545,646

LIGHTNING ARRESTER

Filed July 16 . 1921

2 Sheets-Sheet 1



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Fig. 5

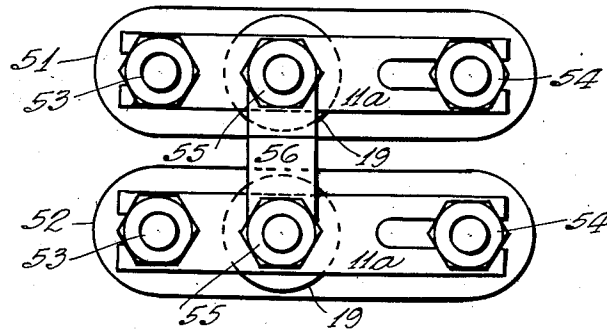


Fig. 6

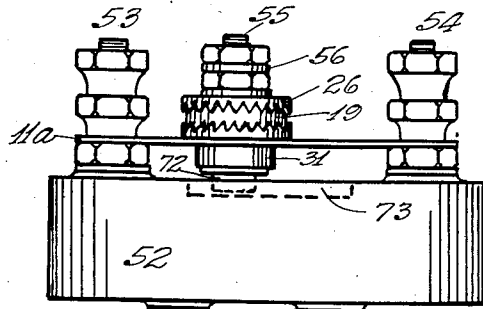


Fig. 7

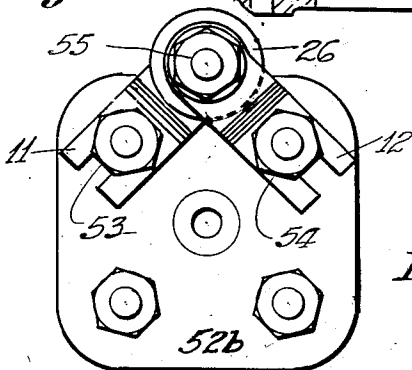
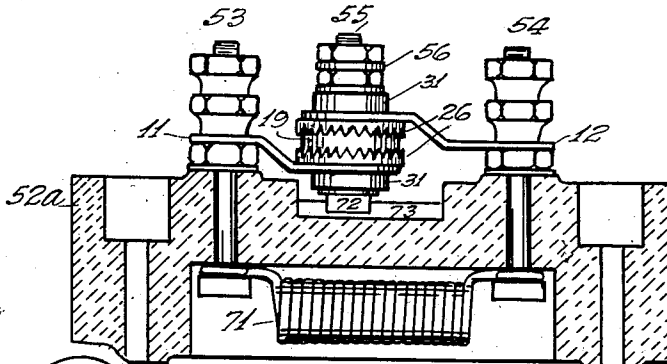


Fig. 8

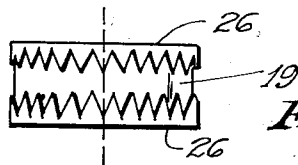


Fig. 9

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UNITED STATES PATENT OFFICE.

EDWARD A. EVERETT, OF LONG ISLAND CITY, NEW YORK, AND MILTON E. SMITH, OF EAST ORANGE, NEW JERSEY; SAID SMITH ASSIGNOR TO SAID EVERETT.

LIGHTNING ARRESTER.

Application filed July 16, 1921. Serial No. 485,223.

To all whom it may concern:

Be it known that we, EDWARD A. EVERETT, a resident of Long Island City, in the county of Queens and State of New York, and MILTON E. SMITH, a resident of East Orange, county of Essex, State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Lightning Arresters, of which the following is a specification.

This invention relates to lightning arresters and particularly to a type of lightning arrester for use on electric circuits, to protect the apparatus connected to these circuits and to discharge static electricity that may accumulate on these circuits from lightning or other causes, and it has for an object to provide an arrester of this type which is compact and rugged and which may be disassembled and reassembled without the possibility of impairing its efficiency. Another object is to provide a block of carborundum or other refractory material having a high dielectric strength and able to stand lightning discharges with a large number of spark gap points arranged on its surface; also it has for an object to provide a receptacle for a refractory block which will hold this block in place after it may have been accidentally broken. Another object is to provide a comparatively large metallic contact surface for the refractory material which is tightly secured to the metallic clips supporting the arrester and a further object is to provide an arrester of a comparatively small size which may be applied directly to electric instruments and terminals as now found in commercial use. These and other objects of this invention will be more fully understood from the following specification and the accompanying drawings in which Fig. 1 shows a lightning arrester, partly in section, embodying our invention, Fig. 2 is a detailed part for use with Fig. 1, Figs. 3 and 4 are sectional elevations showing modifications in the method of securing the various parts of the arrester together; Fig. 5 shows one application of this invention to the terminal blocks used in certain electric circuits, Fig. 6 is an elevation corresponding to Fig. 5, Fig. 7 shows the application of our invention to a type of lightning arrester provided with a choke coil, Fig. 8

shows an application that may be used where the wire terminals are close together and Fig. 9 shows how the spark gap may be adjusted.

This invention consists in providing a pair of strips for connecting to the terminals of an electric circuit and interposed between the ends of these strips is a block of carborundum or refractory material, preferably in the form of a circular wheel and around this block are arranged a number of saw teeth, producing a spark gap across the carborundum. Our invention resides in the detailed application of this idea and in the simplicity of construction, increased efficiency and the comparatively small and inexpensive arrangement adopted.

Referring to Fig. 1, 11 represents one terminal strip and 12 is the opposite terminal strip. The strip 11 may be provided with a slot 13 and the strip 12 may be provided with a similar slot whereby these strips may be inserted under the binding posts of a terminal to which the wires of the circuit to be protected are connected. The ends of the strips 11 and 12 are bent at right angles, these turned up ends being arranged opposite each other and enclosing between them a pair of saw toothed, cup-shaped discs into which the carborundum wheel 19 fits snugly, the discs being arranged with the saw teeth opposite. The disc for this purpose may be constructed as shown at 26, Fig. 2, having a hole 27 for the bushing 20 and from this blank the teeth are turned into a cup-shaped disc as indicated in Fig. 1, the teeth being arranged opposite each other as shown at 28. The construction shown contemplates a separate part for the discs 26. However, it should be understood that cup-shaped ends with saw teeth may be formed in the ends of the terminal strips 11 and 12 for the same purpose as the discs 26, when assembled, become electrically an integral part of the strips 11 and 12. When the carborundum wheel is enclosed in the discs 26, the ends of strips 11 and 12 are rounded as indicated in Fig. 1 and clamped against the discs 26 by the bolt 32. Attention is here called to the large contact area provided between the carborundum wheel and the discs and between the discs and the terminal strips and these surfaces are firmly and tightly held together by the bolt 32, nut 22 and in-

sulating collars 21. With this arrangement the arrester can be taken apart and reassembled by means of bolt 32.

The cup-shaped enclosure for the carborundum wheel provides a metallic binder for this wheel which strengthens it and holds it in position if it should become broken, thereby guarding against the possibility of terminal strips 11 and 12 becoming short circuited or displaced under these conditions.

In Fig. 1 the terminal strip 11 is shown placed at right angles to the terminal strip 12. This is an attractive feature of the present construction as it enables the terminal strips to be placed at any angle with relation to each other as may be found convenient in making connections to the wire terminals.

Fig. 1 also shows a ring of glass or other suitable insulating material 30, held in position by strips 11 and 12, arranged to enclose the entire carborundum wheel and the spark gap points. This construction may be found desirable where an accumulation of dust is likely to deposit between the spark gap points. However, it is to be noted that with the circular construction shown, the tendency for dust to accumulate between the spark gap points is greatly lessened. Fig. 3 shows a modified arrangement for holding the parts together and includes a bolt which makes metallic contact with the carborundum wheel. In this construction it will be noted that the tubular bushing 20 is omitted and the collars 31 are provided with a shoulder which fits into an enlarged opening in the terminal strips 11 and 12 and the discs 26. The hole in the carborundum wheel is the same size as the bolt 32 and therefore makes contact with the bolt. The outer portion of the bolt may be provided with two nuts, 22 and 22^a as shown. These nuts engage a washer or a contact plate 32^a which may be used to electrically connect the carborundum wheels of adjacent arresters together by a link similar to the arrangement indicated at 56, Fig. 5.

The construction shown in Fig. 4 provides a bolt of insulating material 35, which may be made of bakelite or other suitable material and which has the end nuts 36 and washers 37 holding the several parts together as shown. This arrangement it will be noted, leaves only one possible metallic path connecting the strips 11 and 12, which is through the spark gaps of the discs 26. This non-metallic bolt has certain advantages when used on high tension circuits.

In practice carborundum has the property of damping out an electric arc that might develop between the spark gap points; whereas some other substances like carbon have a tendency to maintain the arc. If the arc is maintained a metallic path is eventu-

ally developed between the saw teeth of the arrester which grounds the circuit. With the construction shown this tendency is eliminated.

One method of applying our invention is illustrated in Figs. 5 and 6. This shows a terminal block as adopted by the Railway Signal Association and generally known as an R. S. A. terminal. The terminals are supported on porcelain blocks 51 and 52. The line wires are led to terminal 53 and terminal 54. The arrangement in Fig. 5 shows the application for two line circuits. The arrester element is embodied in the terminal strip 11^a, maintaining the circuit between the terminals 53 and 54 and in order that the discharge through the arrester may be grounded a connecting strip 56 is provided between the binding screws 55 as shown, this strip being continued between each of these terminals for a group and the last terminal connected to a ground wire. In this arrangement the carborundum wheel is placed horizontally on the top of the connecting strip 11^a from which it is insulated by the collar 31, similar to Fig. 3. The insulating collar 31 is omitted above the top disc 26 with the result that strip 56 connects directly to this disc as well as connecting with the carborundum wheel through bolt 55. This makes a grounded arrester tap to the conductors 11^a. Bolt 55 is provided with a square head 72 which fits a recess 73 in the top of the porcelain block 52, Fig. 6. This prevents the bolt from turning when the nuts are adjusted. From Fig. 5 it will be noted that the slotted openings in strips 11^a enable these strips to be removed from the binding posts without removing the nuts. The strip 11^a in Figs. 5 and 6 may of course be supported by only one terminal post, also the arrester may be applied to the projecting ends of strips 11^a where there is not sufficient space between the terminals for this purpose.

The arrangement shown in Fig. 7 includes a type of lighting arrester provided with a choke coil and to which the construction of the present invention is adapted. This consists of an enlarged base 52^a having a recess in the bottom to house the choke coil 71 which provides continuity for the circuit between terminals 53 and 54. The construction of the arrester is similar to Fig. 3 in which the bolt 55 makes contact with the wheel 19 and is insulated from the metallic parts by the collars 31—31. Connecting strip 56 thus provides an independent connection to the carborundum wheel which is ultimately grounded as in Fig. 5.

In Fig. 8 our invention is shown applied to a terminal block 52^b where the wire terminals 53 and 54 are comparatively close together. The construction of the arrester for this adaption is similar to Fig. 7, the ter-

5 minial strips 11 and 12 being angularly positioned in a scissors form to fit the wire terminals. The central bolt 55 which holds the arrester elements together makes this construction possible.

10 In Fig. 9 one arrangement is illustrated for varying the spark gap of the arrester simply by displacing the spark gap teeth in the upper and lower discs 26, relative to each other. These discs turn on the centre bolt and when the teeth are opposite the spark gap is at a minimum and when they are staggered to the fullest extent the spark gap is at a maximum, thus providing a simple and effective means for adjusting the spark gap by a very fine adjustment.

15 It is found in practice that this form of arrester has several points of superiority over other spark gap type of arresters heretofore used. The large metallic area surrounding the carborundum wheel seems to relieve the greater part of the electric discharge directly through the carborundum while the surges of the current are discharged by comparatively small sparks between the saw teeth across the spark gap and these sparks in themselves apparently pass over the surface of the carborundum. Considerable attention has been given in the present invention to making an arrester which could be quickly assembled and disassembled so that the parts may be inspected and when necessary, cleaned and reassembled in the same condition as a new arrester and without the possibility of changing the relative operating parts of the device. Moreover, the arrester will stand considerable hard usage without breakage or damage to its parts. This arrester can be adapted without change to existing commercial apparatus having various dimensions.

20 Having thus described our invention, we claim:

45 1. In a device of the class described, a pair of terminal strips with upwardly turned ends, a refractory wheel, a cup-shaped metallic plate on each side of said wheel, the edges of said plates provided with saw teeth and means through the centre of said wheel for pivotally clamping said ends and plates together.

50 2. In a device of the class described, a pair of terminal strips, a refractory block, a pair

of similar metallic plates enclosing said block on the sides and partially enclosing it on the edges, said terminal strips placed adjacent said plates, a bolt for clamping said parts together, said bolt making electrical contact with said refractory block and insulated from the metallic parts of said device whereby a connection may be made to said block independently of said metallic plates.

3. A lightning arrester of the class described including a carborundum block, a row of spark gap points surrounding the edge of said block, a terminal strip connected with said spark gap points, a bolt through the centre of said block clamping said parts together and means including said bolt whereby an electrical connection may be made to said block independently of said terminal strip.

4. In a lightning arrester, the combination of a central refractory block, a pair of similar contact plates arranged one on each side of said block, a terminal strip connected with one of said plates, an insulating bushing for each plate and a clamping bolt passing through said bushings and said block for holding the parts together, said bolt making electrical connection with said block whereby an independent circuit may be connected with said block.

5. A device of the class described including a circular block of refractory material, a cup-shaped disc having saw toothed edges on each side of said block and enclosing said block and means whereby one of said discs may be turned on its axis so as to position the teeth of one disc relative to the teeth of the other disc.

6. A device of the class described including a wheel of refractory material, a pair of cup-shaped discs having saw toothed edges enclosing said wheel with the saw teeth projecting across the periphery of said wheel, said discs being secured to said wheel by a bolt passing through the centre of said wheel.

Signed at New York in the county of New York and State of New York, this 12th day of July, 1921.

EDWARD A. EVERETT.
MILTON E. SMITH.