

931,408.

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LIGHTNING ARRESTER.
APPLICATION FILED JULY 24, 1908.

Patented Aug. 17, 1909.

Fig. 1.

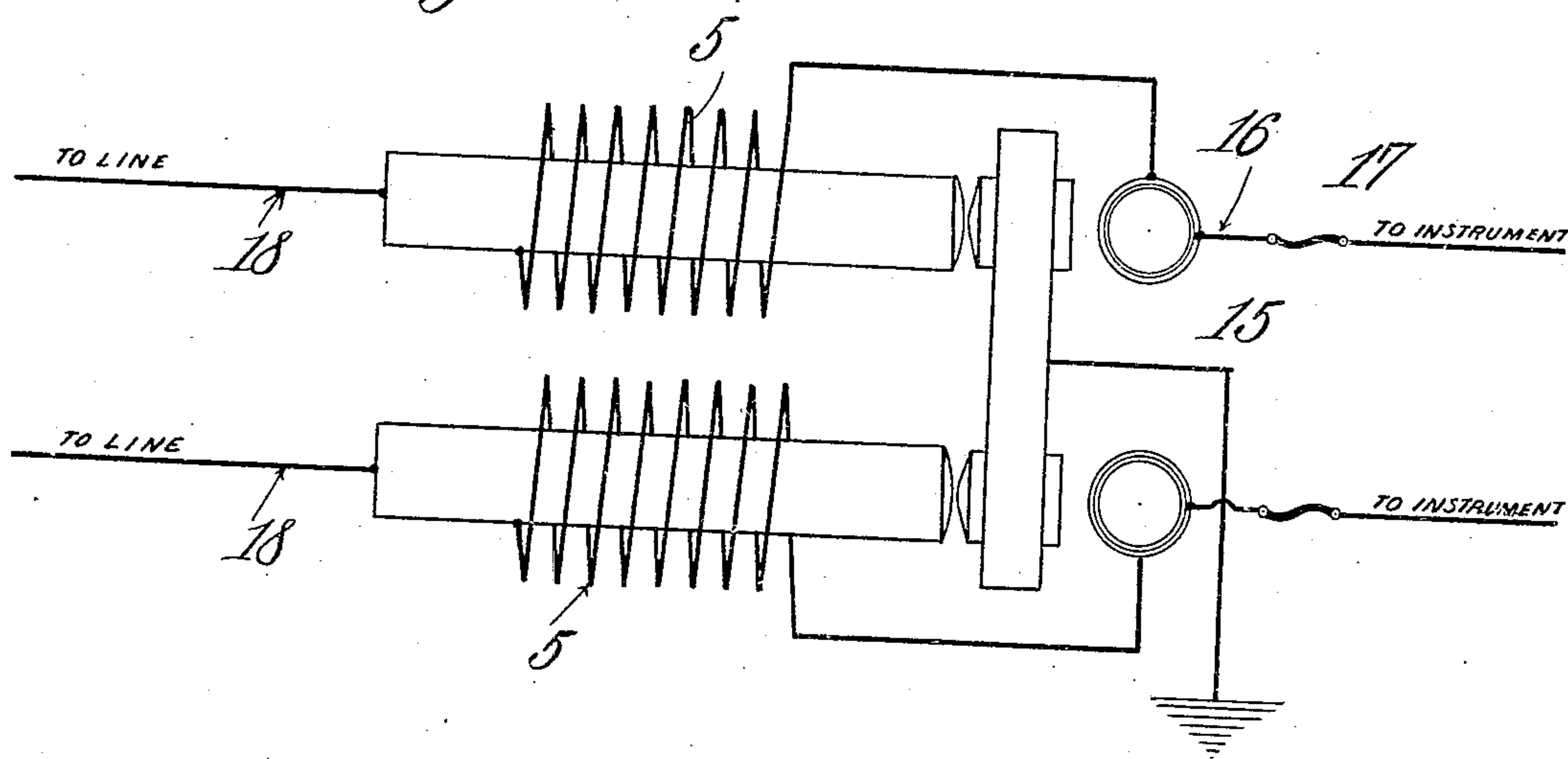
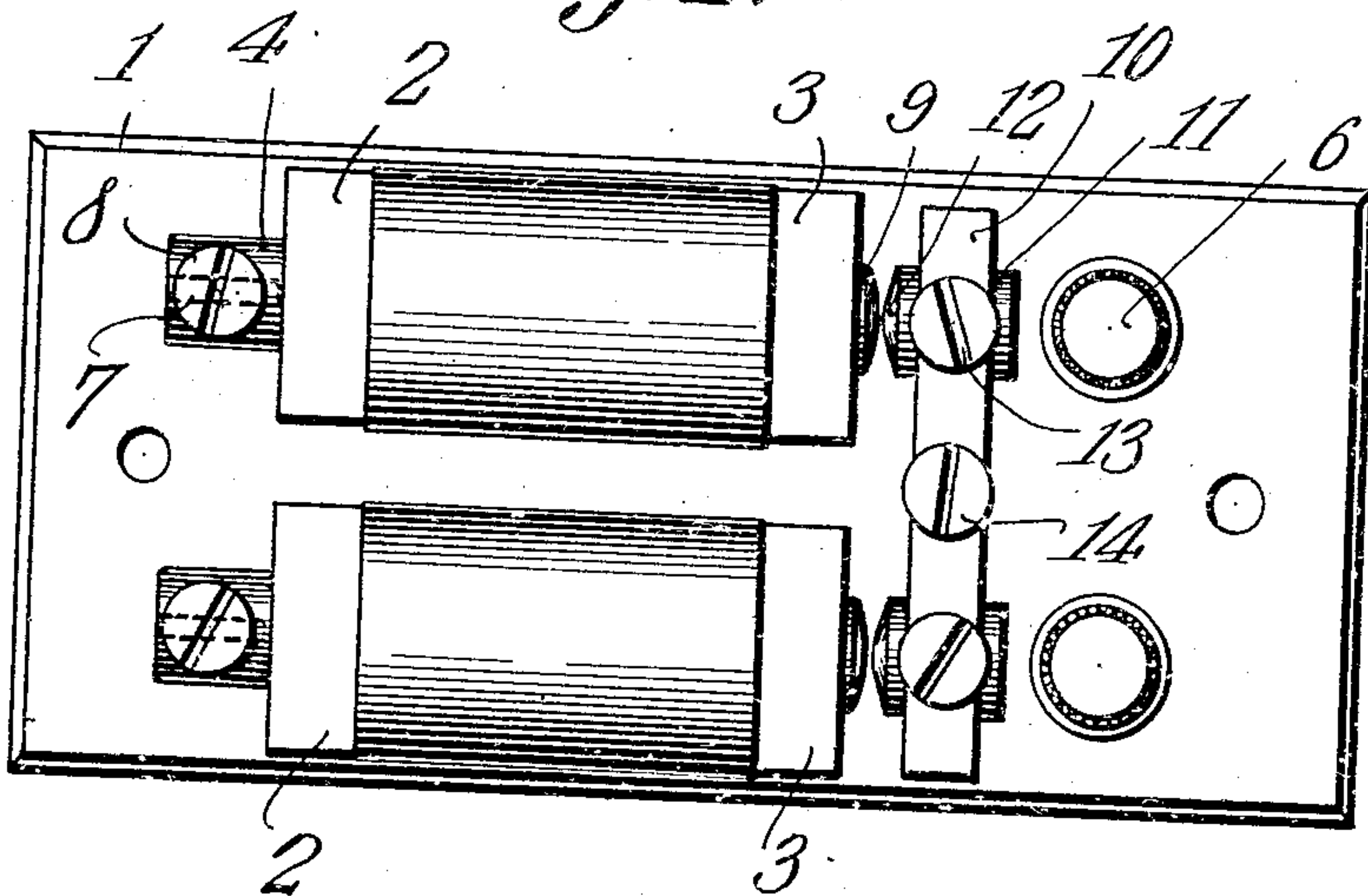


Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

WILLIAM GIFFORD, OF TRAVERSE CITY, MICHIGAN.

LIGHTNING-ARRESTER.

No. 931,408.

Specification of Letters Patent.

Patented Aug. 17, 1909.

Application filed July 24, 1908. Serial No. 445,215.

To all whom it may concern:

Be it known that I, WILLIAM GIFFORD, a citizen of the United States, residing at Traverse City, in the county of Grand Traverser and State of Michigan, have invented a new and useful Lightning-Arrester, of which the following is a specification.

This invention has reference to improvements in lightning arresters and is designed to provide a means whereby lightning or other high tension currents of like character are diverted from both the instruments to be protected and the fuses usually connected up with such instruments and led to ground by a path readily traversed by such currents.

The electrical discharge known as a lightning stroke is characterized by being of very high voltage and high frequency, and to such current a coiled conductor wound about a core of magnetic material presents great impedance, and the lightning will readily jump a considerable air gap rather than flow through such a coil.

The present invention is based upon this fact and consists in the introduction of such impedance coil between the incoming line and the instrument to be protected, while the ground connection and air gap is on the line side of said impedance coil. An air gap which will be absolutely impervious to telephonic or telegraphic currents is readily broken down by lightning, and an impedance coil in the circuit of the instruments to be protected, which coil will offer negligible impedance to the passage of the telephonic or telegraphic currents will become highly resistant to lightning or other currents of like character.

By the present invention the core of the impedance coil is utilized as a path for the lightning or other high tension current, and this path leads to an air gap, the other side of which is connected to ground in the usual way. Surrounding the core there is a suitable coil, one end of which is connected directly to the core, or to the line immediately adjacent to the core, and the other end of the coil leads to the instrument to be protected and on the instrument side of the coil the usual fuse may be included, or the fuses may be mounted directly on the base plate of the instrument if desired.

It is the common practice with lightning arresters to introduce the fuses between the line and the lightning arrester so that all lightning strokes must also pass through the

fuse, and oftentimes these fuses are burned out by the lightning. This is avoided entirely by the present invention and the instruments are not put out of service by a stroke of lightning or the passage of other high tension currents until a new fuse can be installed. The instruments are protected however from the effect of undue currents of such low intensity as to be unable to jump the air gap leading to ground, by the fuses in the circuit leading to the instrument. Such occurrences however, are rare and are due usually to the crossing of a telephone or telegraph line with power circuits and only on such comparatively rare occasions are the fuses destroyed.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings—

Figure 1 is a diagrammatic representation of the lightning arrester forming the subject matter of the present invention and the manner of installing the same in the circuits to be protected. Fig. 2 is a plan view of an instrument constructed in accordance with the present invention.

Referring first to Fig. 2 there is shown a base 1 which may be made of any suitable insulating material but preferably of refractory insulating material. Among materials which may be used for the base are slate, porcelain, marble, stone, or any other suitable material. Mounted upon the base are spaced insulating blocks or heads 2—3, each pair of heads carrying a core 4 of iron or other suitable magnetic material. In the particular instance shown there are two sets of heads 2—3 and two cores 4 one for each set of heads, both mounted on the base 1, this being the form where the lightning arrester is designed to be introduced in each of two line wires, but it will be understood that a single pair of heads 2—3 and a single core will be used where but one wire is to be protected, and a greater number of cores and heads will be provided where a greater number than two line wires or conductors are to be protected. Upon each core between the heads 2—3 and suitably insulated from the core as by the sleeve of insulating material in the usual manner, is a coil 5 of a suitable number of turns. This coil should be of such size wire as to offer negligible resistance to the passage of telephone or telegraph currents or any other

currents on the line and designed to do useful work, and the number of turns of this coil should be such as to offer negligible impedance to the working currents on the line. At the same time such a coil will offer great impedance to the current producing the lightning stroke or any current of great voltage and high frequency. One end of the coil 5 is connected by soldering or otherwise to the respective core 4, while the other end of the coil is carried preferably through the base 1 to a suitable binding post 6. The end of the core 4 to which the coil 5 is directly connected extends for a distance beyond the head 2 and is centrally bored as indicated in dotted lines at 7 to receive one end of a line conductor, and this core carries a set screw 8 by means of which the line conductor may be firmly clamped to the core. The other end of the core extends beyond the head 3 and is there slightly rounded as shown at 9. Mounted on the base a short distance from the head or heads 3 is a metallic support 10 suitably bored to receive a pin 11, in the shape of a cylindrical block of short length with the end 12 adjacent to the end 9 of the core 4 rounded similar to the end 9 of the said core 4. A set screw 13 extending through the support 10 serves to clamp the pin or block 11 in any adjusted position with its rounded edge 12 in close relation but out of contact with the rounded end 9 of the core 4. The rounded ends 9 and 12 serve to prevent the lodgment of dust between these two ends which constitute the air gap of the lightning arrester. The support 10 is also provided with a set screw 14 by means of which a suitable ground wire indicated at 15 in Fig. 1 may be attached to the block 10. Since in the structure illustrated in Fig. 2 there are shown two coils 5 each with its core 4, the support 10 is provided with two cylindrical blocks 11, but only one ground wire 15 is necessary. The structure of Fig. 2 also shows two binding posts 6, and each binding post is connected by a conductor 16 to a respective instrument or to a respective side of an instrument, and included in this conductor 16 beyond the binding post 6 and on the lightning arrester side of the instrument to be protected is a fuse 17 of any suitable type.

In Fig. 1 the line wires are indicated at 18, and are shown as two in number. It will be understood however that there may be but one line wire, in which instance the protected instrument would be grounded or there may be two line wires in which case the instrument may be included in a complete metallic circuit or a number of lightning arresters may be grouped upon one base with a common ground connection 15, and each line wire may lead to an individual instrument which may in turn be grounded or have a common return of any kind. If it be as-

sumed that the line wire or conductor 18 be a telephone conductor or a conductor in a telegraph circuit, or in any circuit in which useful currents are flowing, then in the case of direct current, the coil 5 will offer no impedance whatsoever and negligible ohmic resistance. In the case of telephone currents the coil 5 may offer some slight impedance, but this will be so slight as to be negligible. Should a heavy direct current be thrown upon the conductor 18 then the fuse 17 will be blown and the instrument saved in this manner. If however, the conductor 18 should receive a lightning discharge, or an artificial current of like nature, then immediately the counter-electromotive force set up by the coil 5 will offer great resistance to the passage of such lightning stroke. The lightning however has a path from the conductor 18 through the core 4 and by the air gap between the ends 9 and 12 of the core 4 and block 11, respectively, to the ground. The air gap of course, offers a resistance to the passage of the lightning stroke, but this resistance is very small as compared with the impedance offered by the coil 5. The path to ground therefore, is the path chosen by the lightning stroke or by any current of like character. The impedance offered by the coil 5 and also by the instruments themselves, is such that the current of the lightning stroke or other such currents are choked back and prevented from reaching the instrument either entirely or with sufficient strength to do any harm to such instrument. In fact the coil 5 so increases the impedance of the line on the instrument side of the core 4, that a much greater air gap may be used on the ground side of the instrument, than is possible with lightning arresters of the ordinary type, and this without danger to the instruments to be protected. The air gap is readily adjusted by moving the block 11 with its rounded end 12 closer to or farther from the rounded end 9 of the core 4. Since no magnetic effect is desired in the block 11, it may be made of other than magnetic material if desired, or it may be made of magnetic material like the core 4.

The invention is not limited to the exact structure shown nor to the exact arrangement of parts illustrated, and described but in these respects the embodiment of the invention may be variously modified as may be necessary under commercial conditions.

What is claimed is:

1. A lightning arrester having an impedance coil provided with a core of magnetic material, said core being included in the circuit between the line and the instrument to be protected, and an air gap included in a ground branch connected to the line on the line side of the impedance coil.

2. A lightning arrester having an impedance coil provided with a core of magnetic

material to which one end of the coil is connected, means for connecting one end of the said core to line, means for connecting the other end of the coil to the instrument to be protected, and an air gap and ground at the end of the core remote from the line end.

3. A lightning arrester having an impedance coil provided with a core of magnetic material to which one end of the coil is connected, an air gap and ground connection at the other end of said core to that which the coil is connected, means for connecting the other end of the coil to the instrument to be protected, and a fuse included in the connections between the coil and protected instrument.

4. A lightning arrester comprising a coil, a core of magnetic material for the same adapted to be connected to the line and at the line end of which the coil is connected, means for coupling the other end of the coil to the instrument to be protected, and an adjustable air gap in coactive relation to the

end of the core remote from its connection to line.

5. In a lightning arrester, an impedance coil adapted to be connected between the line and the instrument to be protected and provided with a core of magnetic material, and a ground connection or path for the lightning through the core of said impedance coil.

6. In a lightning arrester comprising an impedance coil adapted to be connected at one end to line and at the other end to instruments to be protected and provided with a core of magnetic material, and ground connection for the line through the core of the coil and an interposed air gap.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

WILLIAM GIFFORD.

Witnesses:

MARION F. PIERCE,
C. G. SHERWOOD.