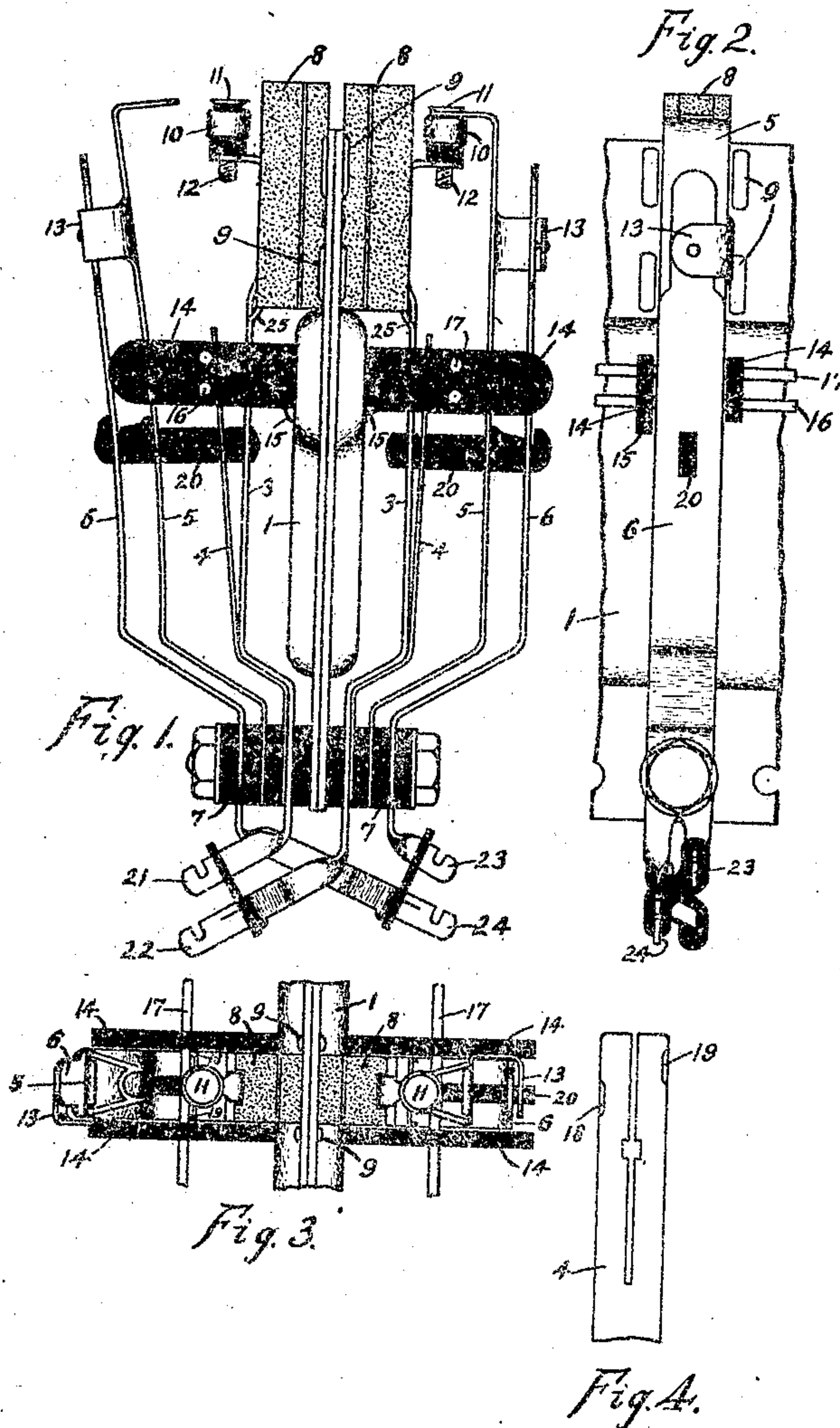


F. B. COOK.
ELECTRICAL PROTECTIVE APPARATUS.
APPLICATION FILED MAR. 8, 1906.

903.812.

Patented Nov. 10, 1908.

2 SHEETS—SHEET 1.



WITNESSES:

Frederick R. Parker.
J. W. Vandee.

INVENTOR:

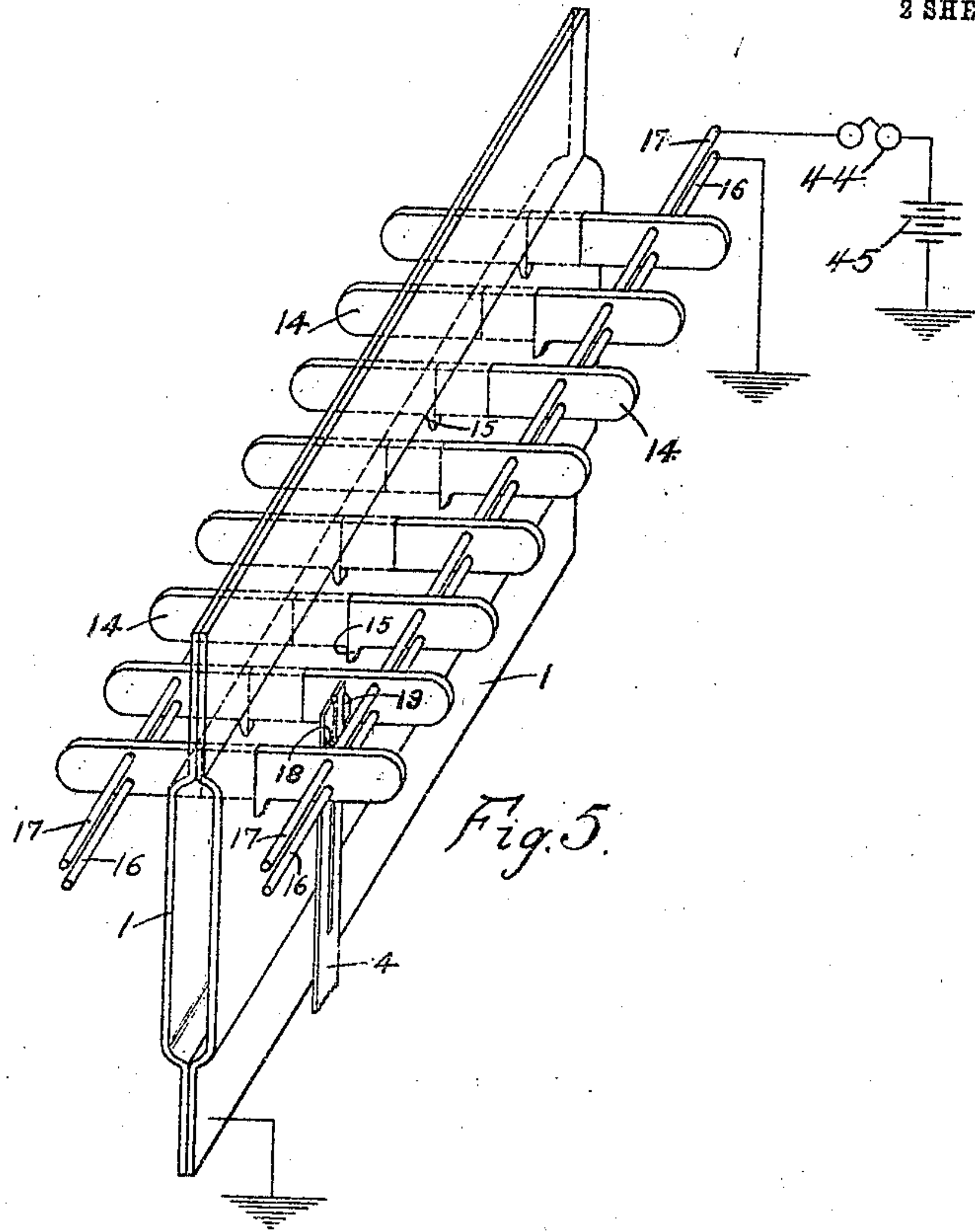
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UNITED STATES PATENT OFFICE

FRANK B. COOK, OF CHICAGO, ILLINOIS.

ELECTRICAL PROTECTIVE APPARATUS.

No. 903,812.

Specification of Letters Patent.

Patented Nov. 10, 1908.

Application filed March 8, 1906. Serial No. 304,929.

To all whom it may concern:

Be it known that I, FRANK B. COOK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Electrical Protective Apparatus, of which the following is a specification, reference being had to the accompanying drawings, illustrating same.

My invention relates to protective apparatus comprising protective devices for protecting delicate electrical circuits and apparatus thereof, such as telephone, telegraph or fire alarm circuit and apparatus, from injury from abnormally large currents of electricity from electric light, trolley or power circuits, or the like, these currents being generally termed "sneak currents", in combination with protective devices adapted to protect the delicate circuits and apparatus thereof from high-potential electricity such as lightning.

The principal objects of this invention are to provide simplicity of construction in apparatus of the character specified; to provide an arrangement of such apparatus which is very efficient and thoroughly reliable in its operation; to provide means to permit of resetting and resealing the apparatus in reset operative position after operation, whereby the apparatus is tested preparatory for another operation; to provide improved means to permit of testing the several circuits through the apparatus without removing any portion thereof; to provide improved means for grounding certain circuits when the apparatus operates, and for controlling suitable alarm circuits to indicate the operation of the devices; and to provide improved means for holding the parts of the apparatus in alinement to improve the serviceability of same.

In the accompanying drawings illustrating the preferred form of my invention, Figure 1 illustrates a pair of protective apparatus mounted on opposite sides of a ground plate, the apparatus on the right hand side being shown in a set position ready for operation, and the apparatus on the left hand side being shown in an operated position. Fig. 2 is an edge view of Fig. 1. Fig. 3 is a top end view of Fig. 1. Fig. 4 shows in detail the spring 4 of Fig. 1. Fig. 5 is a perspective view of the protector mounting plate with the insulating strips 14 14 and the alarm circuit and grounding

rods carried thereby, showing the strips 14 14 inserted alternately from opposite sides of the mounting plate, and the alarm circuit, ground connection, and switching means for the said rods.

Like characters refer to like parts in the several figures.

Referring to the drawings, 1 is a ground plate, preferably made of two formed pieces of sheet metal secured together, upon which are mounted spring members 3 3, 4 4, 5 5, and 6 6, suitably insulated from each other by insulation 7. Springs 3 3 are preferably the line springs and are adapted to hold the lightning arresters 8 8 in place against the ground plate 1, preferably as shown, between projections 9 9 on the ground plate which hold the pairs of lightning arresters apart. Ground plate 1 may be of any desirable length to accommodate a series of pairs of the protective apparatus. The free ends of line springs 3 3 are preferably adapted to receive the thermal protector devices 10 10, which are preferably connected to springs 3 3 by screw connection as shown. When the apparatus is set for operation, the free end of each spring 5 is preferably connected with and soldered to the corresponding thermal protector 10, by an easily-fusible solder, as shown on the right hand side of Fig. 1. The thermal protector 10 is preferably constructed with an inclosing shell electrically connected with the terminal end 11 and insulated from the screw end 12. The shell of the protector 10 incloses the heat producing means which is connected in a series circuit with the terminal end 11 and the screw 12.

The particular thermal protector herein shown forms the subject matter of my co-pending application for Letters Patent on electro-thermal protector, Serial No. 316,153, filed May 10, 1906.

Each spring 5 is provided with a contact portion 13 adapted to engage a contact on the switchboard spring 6, to form a separable contact adapted to receive a test plug for opening the circuit between the switchboard and the line for testing. This contact at 13 is preferably made of platinum so as not to corrode. The line circuit through any set of the protective apparatus is from the line, through line spring 3, the thermal protector 10, the free end of spring 5, contact portion 13, and switchboard spring 6, to the switchboard. Insulating strips 14 14,

preferably made of hard rubber, are preferably inserted through the ground plate 1 between pairs of the protective apparatus, to keep the several springs of each set in
 5 alinement, and to separate the springs of each pair from the springs of the adjacent pairs. These insulating strips 14 are each provided with a shoulder 15 adapted to rest
 10 against the ground plate 1. The strips 14 14, taken in a series, are alternately inserted through the plate 1 in opposite directions, as shown in Fig. 5, so that the shoulders 15 on
 15 the first, third, fifth etc. bear against the plate 1 on one side thereof, and those on the second, fourth, sixth, etc. bear against the plate 1 on the opposite side thereof. The
 20 strips 14 14 are bound together by contact rods 16 and 17 which extend through the series. When the strips 14 14 are thus bound together they are rigidly held in
 25 place, due to the shoulders 15 15 on opposite sides of plate 1. One of the rods 16 or 17 may be connected in circuit with an alarm 44 and battery 45, one terminal of the battery
 30 being connected to ground in a manner well understood, and the other rod 16 or 17 may be connected direct to ground. When the protective apparatus operates, as shown on
 35 the left of Fig. 1, contacts 18 and 19 of spring 4, engage the rods 16 and 17, respectively, independently, due to spring 4 being split as shown. An insulator 20 extends
 40 through springs 3, 4, 5, and 6 of each set and is arranged so that the operation of springs 5 and 6 controls the operation of
 45 spring 4, thereby causing contacts 18 and 19 of spring 4 to firmly engage rods 16 and 17. Spring 4 engaging rods 16 and 17 also limits the extent of the operation of springs 5 and
 50 6. Spring 4 is normally out of contact with rods 16 and 17, as shown on the right of Fig. 1. Line springs 3 3 terminate in line terminals 21 22, and switchboard springs 6 6
 55 terminate in switchboard terminals 23 24, terminals 22 and 24 being crossed over as shown, to arrange line terminals 21 and 22 together and switchboard terminals 23 and 24 together. The line conductors are preferably
 60 connected to terminals 21 22 and conductors leading to the central station switchboard, in telephone systems or the like, are preferably connected to terminals 23 24. Line springs 3 3 are provided with projections 25 25 thereon to form stops for the
 65 outer carbon blocks of the lightning arresters 8 8, to correspond with the stops formed by the ground plate 1 for the inner carbon blocks of the lightning arresters.

The operation of the protective apparatus is as follows: When an abnormally large current traverses a thermal protector for a
 70 sufficient length of time, this current generally coming from a line conductor through line spring 3, it heats the protector and
 75 finally softens or melts the heat-susceptible

material securing the free end of spring 5 to the protector 10, and thereby allows spring 5 to release from the protector and
 80 operate with switchboard spring 6 to the position shown on the left hand side of Fig. 1, thus opening the circuit between the
 85 line and switchboard and thereby protecting the switchboard circuit and apparatus from the abnormally large current. Then length of time required to operate the thermal pro-
 90 tector depends upon the strength of current traversing same. When springs 5, and 6 operate as just described, the movement of insulator 20 allows spring 4 to operate to
 95 the position shown on the left hand side of Fig. 1, so that contacts 18 and 19 thereof engage the conducting rods 16 and 17 and thereby ground the line spring 3 and close
 100 the alarm circuit between the said rods to actuate an alarm in the usual manner to indicate the operation of the protective apparatus. It will be seen that the line is now
 105 grounded through line spring 3, spring 4 and ground rod 16, thus diverting the objectionable current to earth. In case a high-
 110 potential charge or current of electricity comes in over a line wire, it will jump through the carbon lightning arrester 8 to the ground plate 1, in the usual manner. This open-circuit path to earth through the
 115 lightning arrester 8 protects the switchboard and apparatus thereof from the high-potential current or charge. When spring 5 leaves the thermal protector, the solder in the annular
 120 recess at end 11 of the protector is disarranged to some extent and partially fills up the annular recess, becoming cool and solid in this position.

When it is desired to reset the protector for another operation, the free end of spring 5 is depressed into the annular recess at
 125 end 11 of the protector and soldered therein as originally. This resoldering may be accomplished in various ways, preferably, however, by an automatic resoldering device
 130 such as that forming the subject matter of my copending application Serial No. 373,140, filed May 11, 1907, which is a division of this present application. The operation and
 135 resetting of the thermal protector may be repeated as many times as desired.

I do not wish to limit this invention to the exact details of construction as herein shown and described, as many modifications and
 140 changes may be made therein without departing from the scope of the appended claims.

The accompanying drawings simply illustrate one particular form of thermal protector and apparatus therefor for carrying
 145 out my invention.

What I claim as my invention, is:

1. In protective apparatus of the character described, a mounting plate, insulating
 150 strips inserted transversely through the

mounting plate and carrying conducting rods, a pair of spring members suitably mounted on the said plate, a thermal protector connected in circuit with the said spring members, a third spring member mounted between the said pair of springs and normally out of contact with the said rods, and means whereby the operation of the protector causes the said third spring member to engage the said rods.

2. In apparatus of the class specified, a mounting plate, insulating strips carried by the said plate, a plurality of conducting rods on one side of the said plate and carried by the said insulating strips, a thermal protector associated with the apparatus for operation, and a spring member arranged to engage the said rods when the protector operates.

3. Apparatus comprising a thermal protector, circuit-controlling means operable upon abnormal current conditions in the protector, a plurality of conducting rods associated with the apparatus, and a spring member for engaging the said rods upon the operation of the apparatus.

4. Protective apparatus comprising a thermal protector and a plurality of conducting rods associated therewith, means for operating the protector upon abnormal current conditions, and a circuit-controlling member for engaging the said rods upon the operation of the protector.

5. Apparatus of the class specified comprising thermal protectors, a mounting plate therefor, means for suitably operating the protectors, a plurality of conducting rods arranged parallel with the said plate, and a series of spring members normally held out of contact with the said rods by the said operating means and each arranged to engage the said rods upon the operation of the corresponding thermal protector.

6. An electrothermal protector comprising a conducting member, a heat cartridge removably mounted on the said conducting member, an operable spring member, and easily fusible metallic solder normally holding the said spring member under tension and connecting same with the heat cartridge for purposes substantially as described.

7. In apparatus of the class specified, a pair of spring members, a heat cartridge electrically connected to one of the spring members by a screw connection and to the other spring member by a solder connection, and a third spring member normally connected with one of the spring members of the pair by a separable contact.

8. Electrical protective apparatus comprising a pair of conducting members and a thermal protector connected to one said conducting member by a screw connection and to the other by a solder connection, and a third conducting member normally elec-

trically connected with one member of the said pair by a separable contact.

9. Electrical protective apparatus comprising a thermal protector electrically connected in circuit with a plurality of conducting members and having a screw connection between the protector and one of the said conducting members, and another conducting member normally electrically connected with one of the said plurality of conducting members by a separable contact.

10. In apparatus of the class specified, a mounting plate, a pair of spring members mounted thereon, a thermal protector electrically connected with one spring member by a screw connection and with the other spring member by a solder connection adapted to be opened upon the operation of the device, and a third spring member normally connected with the outer spring of the pair by a separable contact, adapted to stay closed upon the operation of the device.

11. In apparatus of the class specified, a mounting plate, conducting rods extending parallel with the said plate, a spring member carrying a thermal protector, a second spring member normally out of contact with the said rods, a third spring member normally soldered to the thermal protector, a fourth spring member normally in contact with the said third spring member, the said third and fourth spring members operating away from the mounting plate under abnormal conditions in the protector, and an insulating member cooperating with the said spring members to cause the said second spring member to engage the said rods upon the operation of the apparatus.

12. In apparatus of the class specified, a mounting plate, a series of strips of insulation each provided with a shoulder to bear against the said plate and alternately inserted through same in opposite directions, a pair of conducting rods on each side of the mounting plate carried by the said insulating strips, suitable protective apparatus mounted in a series on each side of the mounting plate, and a series of spring members on each side of the mounting plate each arranged to engage the corresponding pair of conducting rods upon the operation of the protective apparatus.

13. Apparatus of the class specified comprising a spring member and a thermal protector cooperating therewith, and a second spring member engaging the first at a contact openable by pressing one spring member toward the other.

14. In apparatus of the class specified, a pair of spring members, a thermal protector connected to one spring member by a solder connection, a third spring member mounted outside of the pair, and a suitable contact between the said third spring and a spring of the pair adapted to be opened by

pressing the said third spring toward the pair.

15. A mounting plate carrying a series of sets of protective apparatus, a pair of conducting rods arranged parallel with the said plate, and a spring member in each set to engage the pair of rods upon the operation of the apparatus, the said rods and spring member constituting part of an alarm circuit.

As inventor of the foregoing, I hereunto 10
subscribe my name in the presence of two
subscribing witnesses this 5th day of March,
1906.

FRANK B. COOK.

Witnesses:

FREDERICK R. PARKER.

F. W. PARDEE.