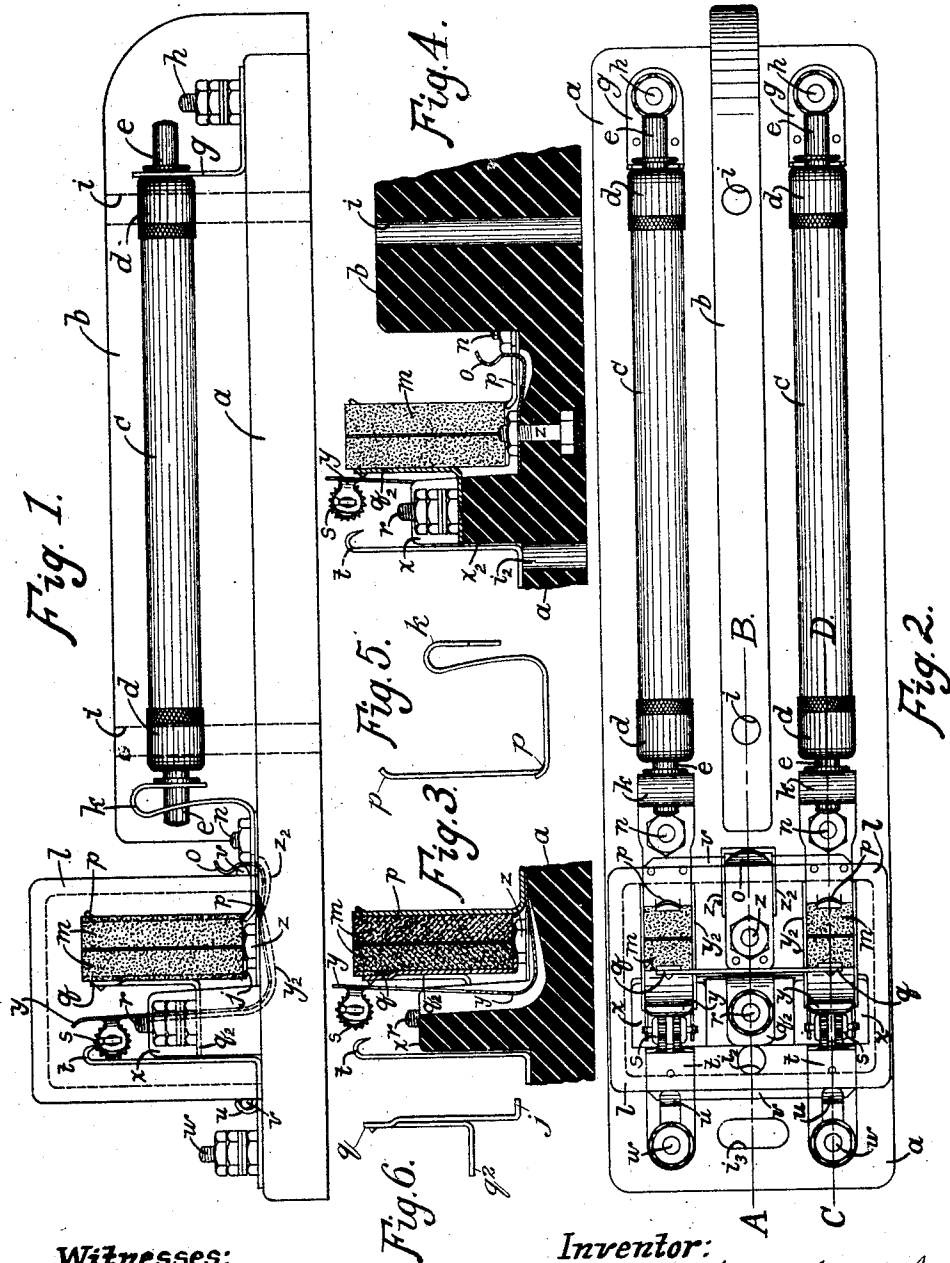


No. 842,628.

PATENTED JAN. 29, 1907.

F. B. COOK.
SUBSTATION PROTECTOR.
APPLICATION FILED MAR. 12, 1906.



Witnesses:

Frederick R. Parker.
J. W. Pardee

Inventor:

Frank B. Cook.

UNITED STATES PATENT OFFICE.

FRANK B. COOK, OF CHICAGO, ILLINOIS.

SUBSTATION-PROTECTOR.

No. 842,628.

Specification of Letters Patent.

Patented Jan. 29, 1907.

Application filed March 12, 1906. Serial No. 305,599.

To all whom it may concern:

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

10 My invention relates to a protector comprising a number of protective devices of different character arranged to protect an electrical circuit and the apparatus thereof from all forms of injurious currents or charges of
15 electricity.

The principal object of my invention is to provide a compact, durable, readily-accessible, and highly-efficient arrangement of the parts of such a device by which electrical circuits and apparatus may be protected from strong currents, "sneak-currents," and high-voltage currents or charges, such as lightning, the said arrangement being adapted for use in various circuits and under various conditions. Protectors of this character generally in use protect electrical circuits and apparatus against only one or two forms of injurious currents; but it is very essential to protect certain instruments and apparatus
30 from all of the different forms of injurious currents or charges at the same time. One instrument in particular which needs protection from all forms of electric currents not intended for its use is the telephone, and I
35 have adapted the arrangement of this present invention more particularly for use in this connection.

In the accompanying drawings, illustrating the preferred form of my invention, Figure
40 1 is a side elevation of the device of the invention. Fig. 2 is a plan view of Fig. 1. Fig. 3 is a cross-section of a portion of the device of the invention, taken on line C D of Fig. 2, with portions shown in elevation. Fig. 4 is a
45 cross-section of a portion of the device of the invention, taken on line A B of Fig. 2, with portions shown in elevation. Figs. 5 and 6 are views showing details of springs *p* and *q*, respectively, as shown in Fig. 1.

50 Like characters refer to like parts in the several figures.

The tubular fuses *c c*, lightning-arresters *m m*, and heat-coils *s s* are all suitably mounted on the insulating-base *a* preferably of
55 porcelain, by suitable contact-springs. Between the fuses *c c* is a rib *b*, of insulating ma-

terial, preferably a part of the base *a*, adapted to prevent an arc from jumping between conducting portions on opposite sides thereof. The glass cover *l*, provided with ears *v v* at its base, is placed over the lightning-arresters *m m* and thermal protectors *s s* and is preferably held in place by lugs *u u* and spring-catch *o*, as shown, so as to completely inclose the protective devices, and thereby
65 prevent dust and foreign particles from accumulating thereupon and also prevent the danger occasioned by conducting parts and combustible substances coming in contact with the said devices during their operation
70 or upon the passage of a high-potential current or discharge through a lightning-arrester.

Each spring *k* is secured to base *a* by a bolt *n*, is provided with a curved portion *k*, adapted to automatically clamp one end of the fuse *c* in place, and with a narrow tongue portion *p*, adapted to fit in a groove of a lightning-arrester *m* to hold same in place. Each spring *g* is secured to base *a* by a bolt *h* and is adapted to automatically clamp one end of the fuse in place when same is inserted therein. When fuse *c* is put in place, one spindle *e* thereof is first inserted through two holes in spring *k*; and then the other spindle *e* is depressed into a slot in
85 spring *g*. Spring *k* exerts a torsional stress on its spindle *e*, which clamps same to spring *k* and gives an end thrust to the fuse *c*, and thereby causes same to make good contact between an end cap *d* and the spring *g*, which
90 latter spring also grips the spindle *e* in a slot to assist in clamping the fuse in place. The action of these clamping-springs *k* and *g* on the fuse is described and claimed in my Patent No. 802,736, on electric fuse. Each
95 spring *y* is held in place by a bolt *n* and is adapted at its free end to carry a heat-coil *s*. The base *a* is cut away, as at *y*, to accommodate spring *y*, which is conductively connected with spring *k*. The base *a* is preferably provided with a transverse rib *x*, and posts *x x* contiguous therewith to prevent surface leakage between the conducting parts, each post *x* being cut away to accommodate a spring *y*, as shown in Fig. 3. The
105 ground-spring *q* is mounted on rib *x* by bolt *r* and is provided with narrow portions *q q*, each adapted to fit in a groove in a lightning-arrester, and thereby hold same in place. Each portion *q* of spring *q* is bent, as at *j*, Fig. 1, to form a stop for the lightning-arrester. It will be noticed that the

free ends of springs *p* and *q* are at opposite ends of the lightning-arrester *m* to provide spring-pressure on both ends of the arrester to firmly hold the parts thereof together.

5 Each spring *t* is mounted on base *a* by bolt *w* and is adapted to engage a heat-coil *s* when same is in a set position, as shown in Figs. 1 and 2. The lugs *u u* are preferably formed out of springs *t t*, respectively.

10 Spring *o* is mounted on base *a* by bolt *z*, Fig. 4, the base *a* being cut away, as at *z*, Figs. 1 and 2, to accommodate spring *o*. All of the bolts *h h*, *n n*, *z*, *r*, *w*, and *w* are preferably inserted through the base *a* from the bottom thereof and have their heads covered by an insulating-wax, as shown at bolt *z* in Fig. 4.

15 The rib *b* and base *a* are preferably provided with holes *i i*, extending therethrough for mounting the protector to a suitable support.

20 The line conductors are preferably connected to binding-posts *h h*, respectively, the conductors from the instrument or apparatus to be protected are connected to binding-posts *w w*, respectively, preferably passing

25 through hole *i*, in base *a*, and the ground conductor is connected to binding-post *r*, preferably passing through hole *i*, in base *a*.

The circuit through one side of the apparatus is from binding-post *w*, through spring

30 *t*, thermal protector *s*, spring *y*, spring *k*, fuse *c*, and spring *g* to binding-post *h*, the circuit through the other side being similar.

The circuit through either lightning-arrester is from spring *k*, through the portion *p* of

35 spring *k*, the carbon blocks and dielectric of the lightning-arrester, portion *q* of spring *q*, and spring *q* to binding-post *r*, and thence to ground.

When a strong current comes in over a

40 line conductor, it blows the fuse *c*, and thereby opens the circuit between the instrument to be protected and the line.

When a sneak-current comes in over a line conductor, it causes the thermal protector

45 *s* to operate and take the position shown in Figs. 3 and 4, due to the tension in spring *y*, thereby disconnecting spring *t* from spring *y* and grounding the latter against the ground-plate *g*. It will be seen

50 that the operation of the thermal protector cuts the instrument to be protected from the line and connects the objectionable current to ground. A high-potential current coming in over the line arcs through the dielectric of the lightning-arrester to earth and is

55 thereby diverted from the instrument to be protected. It will thus be seen that the instrument is protected from all classes of injurious currents and charges of electricity.

60 While I have shown and described particular types of fuses, heat-coils, and lightning-arresters in this invention and particular details of construction, I do not wish to limit same to such particular protective devices or

65 details.

What I claim as my invention is—

1. An arrangement of electrical protective apparatus comprising an insulating-base, a pair of fuses mounted parallel on the base, suitable spring clamping devices for the fuses adapted to automatically clamp same in place, a pair of lightning-arresters mounted in line with the respective fuses, suitable contact-springs for the lightning-arresters, a pair of thermal protectors mounted in line with the fuses and lightning-arresters, suitable contact-springs for the thermal protectors, a rib of insulating material between the fuses and extending parallel therewith, a suitable cover for the thermal protectors and lightning-arresters, and means for connecting the apparatus as a protector for electrical apparatus, substantially as described.

2. An arrangement of electrical protective apparatus comprising an insulating-base, a tubular fuse mounted horizontally on the base, suitable spring clamping devices for the fuse, a thermal protector mounted on the base in line with the fuse and in circuit therewith, suitable contact-springs for the thermal protector, a lightning-arrester mounted vertically on the base and in line with the fuse and thermal protector, a contact-spring and a ground-terminal for the lightning-arrester, the contact-spring being connected to the circuit of the fuse and thermal protector and the ground-terminal being adapted to ground the circuit of the fuse when the thermal protector operates, and suitable connection-terminals for the circuit-conductors, substantially as described.

3. In apparatus of the class specified, the combination of an insulating-base, a fuse, lightning-arrester, and thermal protector mounted in line on the base in the order mentioned, suitable contact-springs for the several protectors, the free ends of the contact-springs for the lightning-arrester being at respective opposite ends of the latter, the fuse being mounted so that when it is not in place in the circuit the latter is opened for the entire length of the fuse, and suitable connection-terminals for the several circuit-conductors, substantially as described.

4. An arrangement of electrical protective apparatus, comprising an insulating-base, tubular fuses mounted horizontally on the base, suitable spring clamping devices for the fuses, thermal protectors mounted on the base in line with the respective fuses and in circuit therewith, suitable contact-springs for the thermal protectors, lightning-arresters mounted vertically on the base and in line with the respective lines of fuses and thermal protectors, contact-springs and a ground-plate for the lightning-arresters, the contact-springs being connected to the respective circuits of the fuses and thermal protectors and the ground-plate being adapted to ground the circuits of the fuses when the

thermal protectors operate, and suitable connection-terminals for the circuit-conductors, substantially as described.

5 5. In apparatus of the class specified, the combination of an insulating-base, fuses, lightning-arresters, and thermal protectors mounted in duplicate lines on the base and in the order mentioned, suitable contact-springs for the several protectors, the free
10 ends of the contact-springs for each lightning-arrester being at respective opposite ends of the latter, the fuses being mounted so that when they are not in place in the circuits the latter are opened for the entire lengths of the

fuses, an insulating-rib between the fuses, a 15 suitable cover for the thermal protectors and lightning-arresters, and suitable connection-terminals for the several circuit-conductors, substantially as described.

As inventor of the foregoing I hereunto 20 subscribe my name, in the presence of two subscribing witnesses, this 10th day of March 1906.

FRANK B. COOK.

Witnesses:

FREDERICK R. PARKER,
F. W. PARDEE.