No. 717,212. Patented Dec. 30, 1902.

W. KAISLING.

PROTECTIVE APPARATUS.

(Application filed Aug. 8, 1901.)

(No Model.)

Fig. 1.

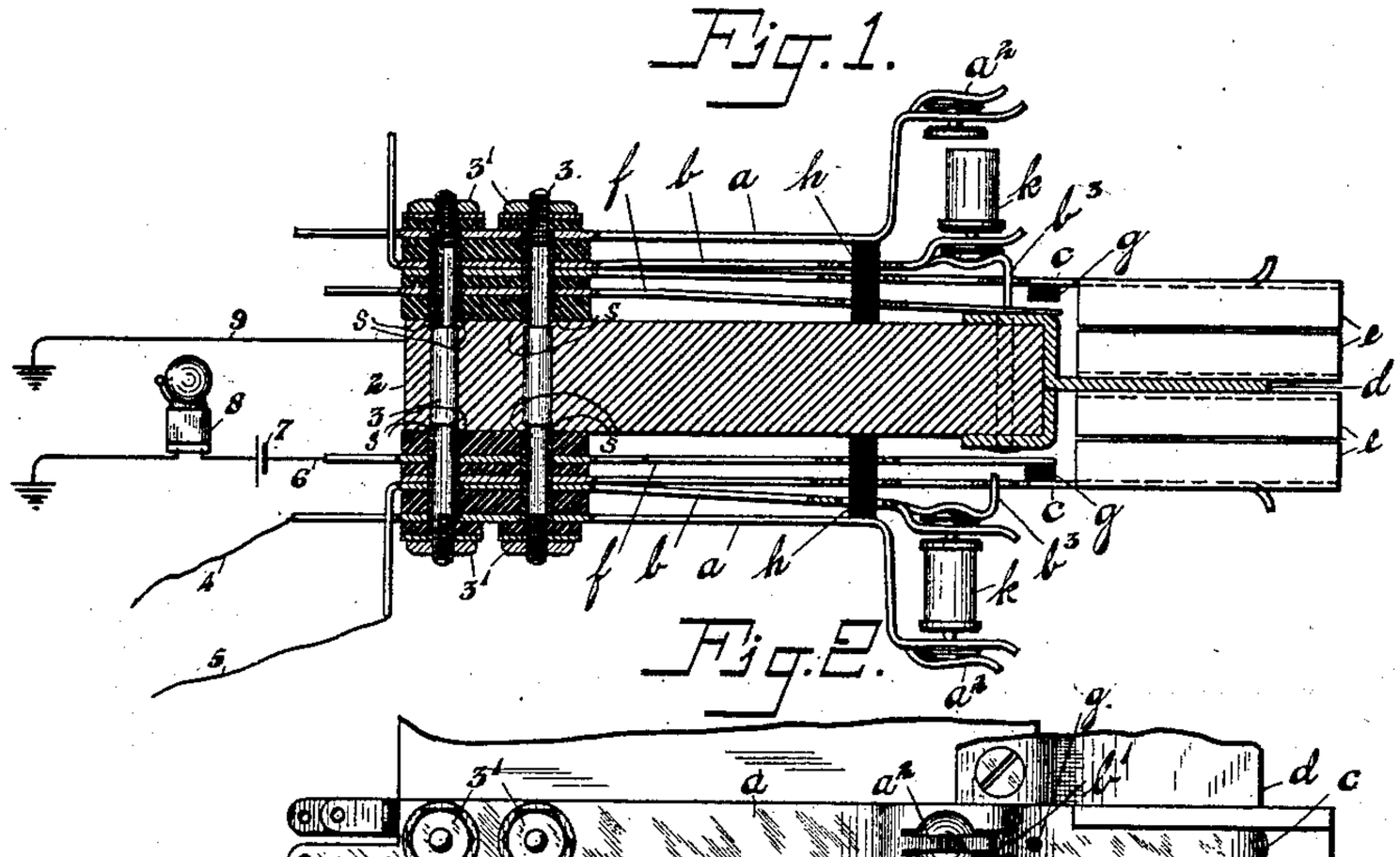

Fig. 2.

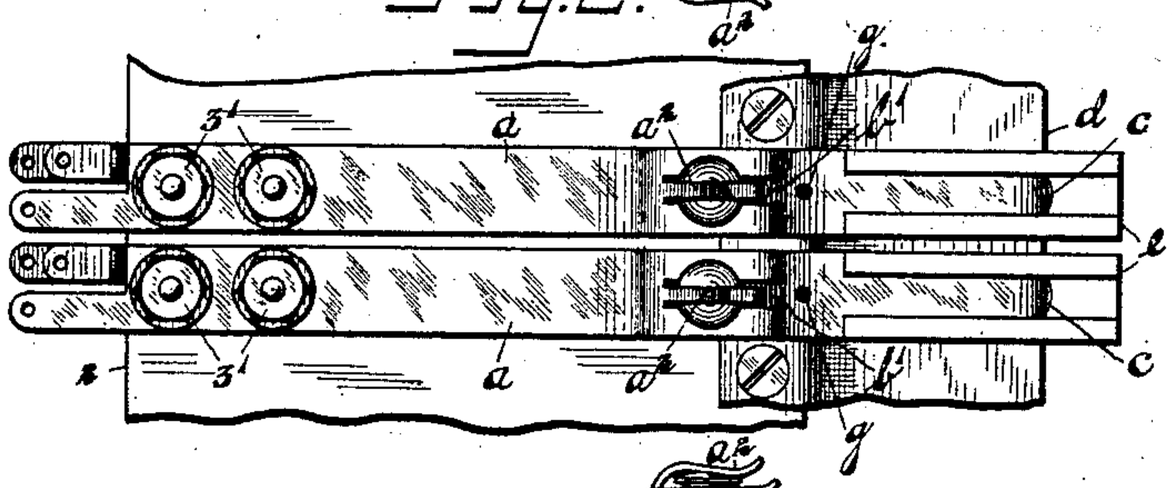

Fig. 3.

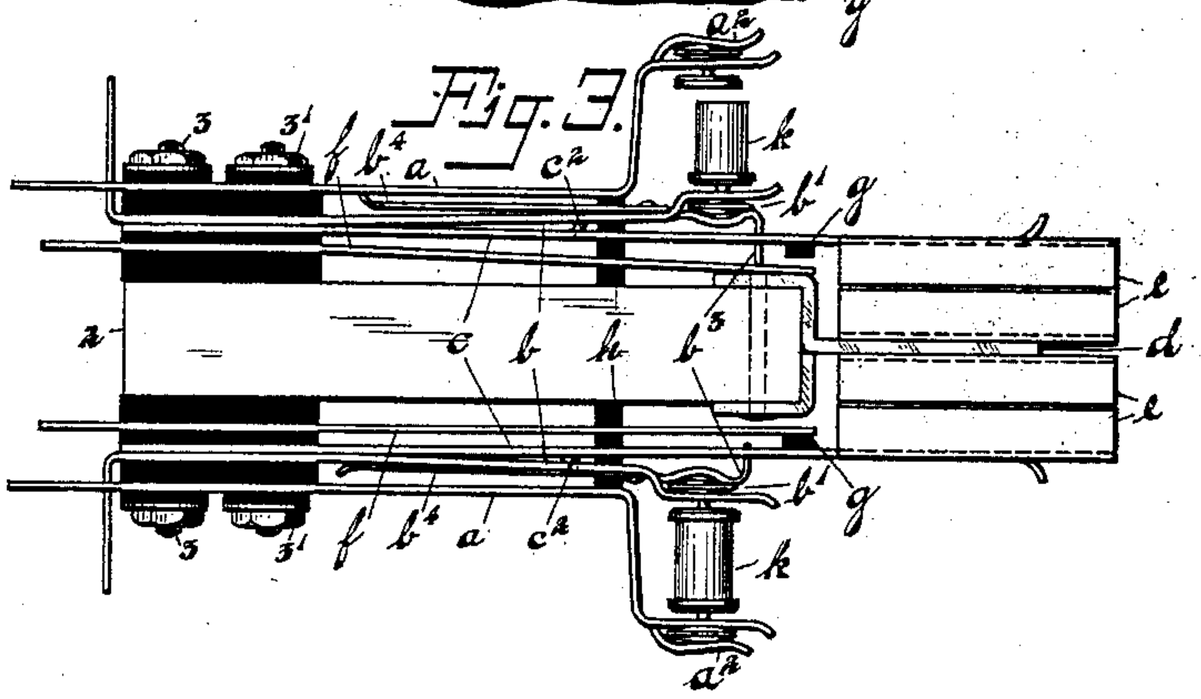

Fig. 6.

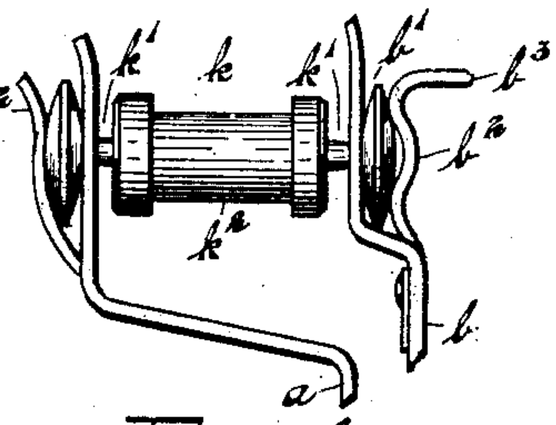

Fig. 4.

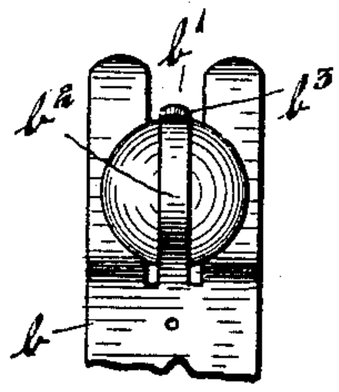

Fig. 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

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PROTECTIVE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 717,212, dated December 30, 1902.

Application filed August 8, 1901. Serial No. 71,313. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM KAISLING, 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 Protective Apparatus, of which the following is a specification.

In guarding against the destructive effects of abnormal currents in electric circuits the various classes of such currents must be guarded against by separate and distinctive apparatus, that used for lightning or other high-potential charges and discharges being taken care of by lightning-arresters of carbon and interposed mica strips in a ground branch, currents of either great intensity or volume by ordinary fuses placed in the circuit, while the weaker yet dangerous currents known as "sneak-currents," are guarded against by means of a so-called heat-coil, sneak-current, or thermal arrester.

This invention has to do with apparatus or means for conveniently holding the first and last named protective devices—viz., the lightning and sneak-current or thermal arresters—and comprises spring-supports for the several protective devices, which supports preferably form terminals of the line conductors and which when no arrester is in place sound an alarm and in some cases ground the lines, the support for the said springs being preferably an iron bar which is grounded and forms part of the framework of the said support.

Another feature of the invention is apparatus for grounding both terminals by the operation of the sneak-current or thermal arrester.

The invention also consists in the parts and combinations of parts hereinafter described, and particularly pointed out in the appended claims, reference being had to the accompanying drawings, forming a part hereof, in which the same reference characters designate like parts throughout the several views, and in which—

Figure 1 is a plan view of the invention, parts being shown in section. Fig. 2 is a side elevation of the same. Fig. 3 is a plan view of a modification. Figs. 4 and 5 are respectively side and end elevations of the sneak-current or thermal arrester and the terminal springs holding the same, and Fig. 6 is a sectional view of the grounding-spring shown in the modification.

In the figures the numeral 2 represents a plate constituting a part of the framework of the distributing-frame through which the circuits entering a telephone central office are connected before they terminate at the switchboard, or it may be a part of a terminal head or similar apparatus on which protective devices are adapted to be mounted. The protective devices are mounted upon each side of this plate 2 and comprise the line-conductor terminal springs or strips *a* and *b*. Lying alongside the latter spring or strip is another spring or strip *c*, which is extended beyond the end of the strip *b* and between which extended end and the face of the grounding-plate *d*, secured to and forming an extension of the plate 2, the lightning-arrester or carbon and interposed mica plates *e* are adapted to be placed, the plate *d* forming a convenient grounded branch. A lighter spring *f* is arranged between the other springs and the plate 2 and is adapted to have its free end brought into contact with the grounded plate 2 by the spring *c* when no arrester *e* is in place or by the adjacent line-spring *b* when it is not held away by some exterior means. A block of insulation *g* is placed between the spring *c* and the spring *f*. The outer spring *a* has its free end supported by an insulating-block *h*, resting between it and the plate 2 and preferably passing through apertures in the intermediate springs, as shown in section in Fig. 1. These springs are all secured to the plate 2 by double-ended bolts 3 and nuts 3′, the bolts preferably being secured to the plate 2 by closely fitting them in suitable apertures therein and upsetting or swaging the metal of the plate 2 about them, as intended to be shown at *s*. Strips of insulation are placed between the springs and the plate and between each other, except in the case of springs *b* and *c*, which are in contact. Provision is made to connect the circuit-conductors with the rigid ends of those springs, the line conductors 4 and 5 being connected

with the springs *a* and *b*, while the spring *f* is adapted to close an alarm-circuit when brought into contact with the grounded plate 2. The latter circuit is shown as including the conductor 6, the battery 7, and the signal-indicating device 8, a completed circuit being established through the ground, the conductor 9, and the plate 2 when the spring *f* is depressed.

It will be understood that the alarm-circuit may be formed in any desired way and may include any sort of signal-indicating device.

The line-springs *a* and *b* are adapted to receive a so-called "sneak-current" or thermal arrester K, which is preferably of the form shown in the drawings, the spring *a* having an outward bend given to its free end to furnish room between it and the end of the spring *b* for the arrester, which is provided with metallic end terminals having grooves *k'*, in which the fingers of the slotted ends of the line-springs *a* and *b* are adapted to engage. The metallic end caps are connected by alloy or solder or other material easily weakened under the influence of heat with a carbon or other relatively high resistance element k^2, so that when an abnormal current passes the latter will become heated and soften or weaken the solder or other material, so as to open the circuit. As shown in Figs. 2 and 5, these line-springs are slotted, as at *b'*, and the tongues a^2 and b^2 are formed to bind and hold the ends of the arrester *k* in place therein. The tongue b^2 of the spring *b* is extended outwardly, as at b^3, and is adapted to freely pass through an aperture in the spring *c* without touching the same and to contact with the spring *f* to press it against the plate 2 when the spring *b* is not held in tension by the arrester *k*, all as shown in section in Fig. 1. Under normal conditions the line-circuit is completed through conductor 4, spring *a*, the arrester *k*, spring *b*, and out over the conductor 5. When an abnormal current passes through this circuit and persists for a sufficient length of time, the arrester *k* is operated and the spring *b* is freed from the spring *a* and allowed to contact with the spring *f* and press it against the grounded plate *d*. This has the double function of closing the alarm-circuit and of grounding the spring *b* and line conductor 5. Should the lightning-arrester *e* be omitted, the tension of the spring *c* will close the spring *f* upon the grounded plate 2, and thus again close the alarm-circuit. It is therefore impossible to omit either the lightning arrester or the sneak-current arrester without the fact becoming known through the medium of the alarm. With this arrangement the inner spring *b*, or the pair of springs *a* and *b*, is held in a definite location with respect to the plate 2 regardless of the thickness of the lightning-arrester *e*, which is placed between the end of the spring *c* and the extension *d* of the plate 2.

In the modification shown in Fig. 3 the spring *b* is provided with a tongue b^4, riveted thereto at the outer end and with an aperture b^5, (see Fig. 6,) through which a lug or projection c^2, formed on the spring *c*, is adapted to extend. When the arrester *k* is operated in this form of the invention, the spring *b*, owing to its resiliency, moves toward the plate 2, with the result that the lug c^2 presses the spring b^4 against the outer spring *a*, as shown in the upper part of Fig. 3, and thus also grounds the said spring *a*. This construction and operation is shown more clearly in Fig. 6; otherwise the construction and operation of the form shown in Figs. 3 and 6 is the same as in the other form of the invention.

It will be understood that the inner spring is connected with the line conductor, while the outer spring is associated with the switch-board-conductor. In case of a metallic circuit opposite sets of springs on the grounded plate 2 are used for both sides of the same circuit.

The particular thermal arrester shown is the invention of William A. Taylor and is shown, described, and claimed in his application for current protective devices, Serial No. 70,820, filed August 3, 1901. It is manifest that it may be replaced by any other suitable arrester adapted to be held by the springs and actuated thereby in a similar manner.

It will thus be seen that an efficient and economical construction is provided and one that will be durable under all conditions of use.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a protective apparatus, the combination with a pair of superposed line-conductor terminal springs or strips, of a grounded plate upon which the said pair of springs or strips are mounted flatwise and from which they are insulated, a block of insulation between the face of the plate and the forward end of the outer spring or strip to hold it stationary, the inner spring or strip being free to move, a device between said springs forming part of the circuit and held in a state of stress thereby, and means for grounding one of the line conductors by said inner spring or strip actuated upon the giving away of said device, substantially as described.

2. In a protective apparatus, the combination with two line-terminal springs, the outer spring being stationary and the inner spring having one end free to move, of a grounded plate upon the face of which said springs are mounted and from which they are insulated, a third strip adjacent to the inner strip having an aperture therein, a lightning-arrester between the latter strip and an extension of the grounded plate, a projection on said inner strip passing freely through said aperture in the said third strip, a "sneak-current" arrester held in a state of stress between the two first-mentioned strips and adapted to hold

the projection of the inner strip out of contact with the grounded plate, but adapted to be actuated upon the passing of an abnormal current to open the circuit between the line-springs and to ground the inner strip by means of its projection, substantially as described.

3. In a protective apparatus, the combination with line-terminal strips, a grounded plate upon the face of which said strips are mounted and from which they are insulated, a third strip lying alongside the inner strip, the ends of said line-strips being slotted and provided with central tongues, a "sneak-current" arrester having portions adapted to fit within said slots in the ends of said strips and against which the said tongues bear to hold the same in position, an extended end of the tongue of the inner strip being adapted to pass freely through an aperture in said third strip, whereby when the "sneak-current" arrester is operated, the extended end of the tongue of the inner strip engages the grounded plate, substantially as described.

4. In a protective apparatus, the combination with line-springs and a third spring in connection with one of the line-springs, of a fourth spring adapted to close an alarm-circuit, a grounded plate upon the face of which said springs are mounted and from which they are insulated, a lightning-arrester held between an extension of the grounded plate and the third spring, a "sneak-current" arrester between the free ends of the line-springs, and means whereby when the lightning-arrester is removed or the "sneak-current" arrester removed or operated, the alarm-spring is actuated to close the alarm-circuit, substantially as described.

5. In a protective apparatus, the combination with a pair of superposed springs or strips forming line-conductor terminals, of a supporting-plate upon the face of which said springs are mounted flatwise, said springs being insulated from each other and from the plate, a block of insulation between the face of the plate and the outer spring or strip of the pair near its forward end to hold the same stationary with reference to the plate, the corresponding end of the inner strip being free to move and tending to contact with the said plate when unrestrained, the forward ends of said springs being adapted to receive a protective device and to hold the same in a state of stress, substantially as described.

6. In a protective apparatus, the combination with a plurality of superposed springs or strips, of a supporting-plate upon the face of which said springs are mounted flatwise, said springs being insulated from each other and from the plate, an insulating-pin between the face of the plate and the outer spring or strip of the set near its forward end and passing through suitable apertures in the inner springs, the said pin serving to hold the outer spring stationary with reference to the plate, and the corresponding ends of the inner strips being free to move and tending to spring toward the plate when unrestrained, the forward ends of the two outer springs being adapted to receive a protective device and to hold the same in a state of stress, substantially as described.

7. In a protective apparatus, the combination with a pair of superposed springs or strips forming line-conductor terminals, of an alarm-spring, a supporting-plate upon the face of which said springs are mounted flatwise, said springs being insulated from each other and from the plate, the outer ends of said pair of springs being formed to receive a protective device, and the inner spring of the pair being adapted when released by said protective device to press against the alarm-spring and cause it to contact with the supporting-plate, substantially as described.

8. In a protective apparatus, the combination with a pair of superposed springs or strips forming line-conductor terminals, of an alarm-spring, a supporting-plate upon the face of which said springs are mounted flatwise, said springs being insulated from each other and from the plate, the outer ends of said pair of springs being formed to receive a protective device and the inner spring of the pair being adapted when released by said protective device to press against the alarm-spring, and an alarm-circuit closed by such action of the inner spring, substantially as described.

9. In a protective apparatus, the combination with a supporting-plate, of a set of superposed springs or strips mounted flatwise upon the face of said plate, said springs or strips being insulated from each other where necessary and from the plate, the two outer springs forming line-conductor terminals and adapted to receive a protective device between their free ends, an extension of said supporting-plate between the face of which and the free end of the third spring of the set a lightning-arrester is adapted to be placed, the fourth spring of said set being normally out of contact with the plate, but adapted to be pressed into electrical contact therewith by the said third spring when the lightning-arrester is not in place, or by the inner spring when released from the said device, substantially as described.

10. The combination with a pair of line-springs, a "sneak-current" arrester between the ends of said springs, and held in a state of stress thereby, a leaf-spring lying between said springs and secured at one end to one of said springs, an aperture in said latter spring and a projection adapted to extend through said aperture and press against the leaf-spring to throw it into contact with the other spring when the arrester gives away, whereby both springs are grounded, substantially as described.

11. In a protective device, the combination with a supporting-plate, opposed sets of superposed springs mounted upon opposite sides of said plate, double-ended bolts extend-

ing through said plate and through the sets of springs, nuts upon both ends of the bolts to secure the sets of springs in place, the metal of said plate being upset about the said bolts to hold them securely in position therein whereby each set may be assembled independently, substantially as described.

12. In a protective apparatus, the combination with two line-terminal springs, the inner spring having one end free to move, of a grounded plate upon the face of which said springs are mounted and from which they are insulated, a third strip or spring adjacent to the inner spring having an aperture therein, a lightning-arrester between the latter strip or spring and an extension to the grounded plate, a projection on said inner spring passing freely through the said aperture in the said third strip, a "sneak-current" arrester held in a state of stress between the two first-mentioned springs and adapted to hold the projection of the inner spring out of contact with the grounded plate but adapted to be actuated upon the passing of an abnormal current to open the circuit between the line-springs and to ground the inner spring by means of its projection, substantially as described.

13. In a protective apparatus, the combination with two line-terminal springs, the inner spring having one end free to move, of a grounded plate upon the face of which said springs are mounted and from which they are insulated, a third spring adjacent to the inner spring and in electrical contact therewith, said third spring having an aperture therein, a lightning-arrester between the latter spring and an extension of the grounded plate, a projection on said inner spring passing freely through said aperture in the said third spring, a "sneak-current" arrester held in a state of stress between the two first-mentioned springs and adapted to hold the projection of the inner spring out of contact with the grounded plate, but adapted to be actuated upon the passing of an abnormal current to open the circuit between the line-springs and to ground the inner spring by means of its projection, substantially as described.

14. In a protective apparatus, the combination with superposed line-terminal springs, a grounded plate upon the face of which said springs are mounted flatwise and from which they are insulated, a third spring lying alongside the inner spring and in electrical contact therewith, a lightning-arrester between the latter spring and an extension of the grounded plate, a "sneak-current" arrester received and held in a state of stress by the ends of said line-springs, a lug carried by the inner spring of said line-terminal springs and adapted to engage the grounded plate without hindrance from said third spring when the "sneak-current" arrester is operated whereby said inner spring is grounded upon the operation of the said arrester, substantially as described.

15. In a protective apparatus, the combination with a pair of superposed line-springs, a grounded plate upon the face of which said springs are mounted flatwise and from which they are insulated, a "sneak-current" arrester held in a state of stress between the ends of said springs, and means to ground both of said springs by the movement of one of them when the said arrester is operated by the passing of an abnormal current over the circuit including said springs and arrester, substantially as described.

16. In a protective apparatus, the combination with a supporting-plate, of a pair of springs or strips forming line-conductor terminals mounted upon said plate and insulated therefrom, a protective device adapted to be received and held by said springs in a state of stress and maintained thereby in a definite location with respect to said mounting-plate, one spring or strip of said pair being stationary, an auxiliary spring or strip electrically united with one of said line-springs and adapted to receive and hold a lightning-arrester supported independently from the two said line-springs, and means for opening the line-circuit and grounding said line when the said protective device operates, substantially as described.

17. In a protective apparatus, the combination with a mounting-plate, of a pair of springs or strips forming line-conductor terminals mounted upon said mounting-plate and insulated therefrom, said springs being provided with suitable means for receiving and holding a protective device in a state of stress and maintaining the same in a definite location with respect to said mounting-plate, an auxiliary spring or strip electrically united with one of said springs and adapted to hold a lightning-arrester independently of the two said line-springs, and means for opening the line-circuit and grounding both sides of the said line when the said protective device operates, substantially as described.

18. In a protective apparatus, the combination with a mounting-plate, of a pair of springs or strips forming line-conductor terminals mounted upon said mounting-plate and insulated therefrom, said springs being provided with suitable means for receving and holding a protective device in a state of stress and maintaining the same in a definite location with respect to the said mounting-plate, an auxiliary spring or strip electrically united with one of said line-springs and adapted to hold a lightning-arrester independent of the two said line-springs, and an alarm independently actuated when the said protective device operates, or the said lightning-arrester is removed, substantially as described.

19. In a protective apparatus, the combination with a mounting-plate, of a pair of superposed springs or strips forming line-conductor terminals mounted upon one face of said mounting-plate and insulated therefrom, said springs being provided with suitable means

for receiving and holding a protective device in a state of stress and maintaining the same in a definite location with respect to the said mounting-plate, an auxiliary spring or strip mounted adjacent to the inner spring of said pair and adapted to hold a lightning-arrester between the same and an extension of the mounting-plate and independent of the said pair of line-springs, and means for opening the line-circuit and grounding the same when the said protective device operates, substantially as described.

20. In a protective apparatus, the combination with a mounting-plate, of a pair of superposed springs forming line-conductor terminals mounted upon one face of said mounting-plate and insulated therefrom, said springs being provided with suitable means for receiving and holding a protective device in a state of stress and maintaining the same in a definite location with respect to the said mounting-plate, an auxiliary spring or strip mounted adjacent the inner spring of said pair and adapted to hold a lightning-arrester independently of said two line-springs, said latter spring having an aperture therein and said inner spring being provided with a lug or projection adapted to pass freely through said aperture, whereby when the said protective device is operated by an abnormal current passing over the circuit, the lug upon the inner spring passes through said aperture and causes the mounting-plate to ground said spring, substantially as described.

21. In a protective apparatus, the combination with a supporting-plate, opposed sets of superposed springs mounted flatwise upon opposite sides of said plate and adapted to support protective devices at their free ends, double-ended bolts extending through said plate and through the sets of springs, nuts upon both ends of the bolts to secure the sets of springs in place, means to fixedly secure the bodies of said bolts in position in said plate to permit each set of springs to be independently assembled and secured in place upon the ends thereof, substantially as described.

In witness whereof I hereunto subscribe my name in the presence of two witnesses.

WILLIAM KAISLING.

Witnesses:

JOSEPH C. BELDEN,

ROBERT LEWIS AMES.