No. 886,374. PATENTED MAY 5, 1908.

W. KAISLING.

HEAT COIL AND PROTECTOR UNIT.

APPLICATION FILED MAY 29, 1905.

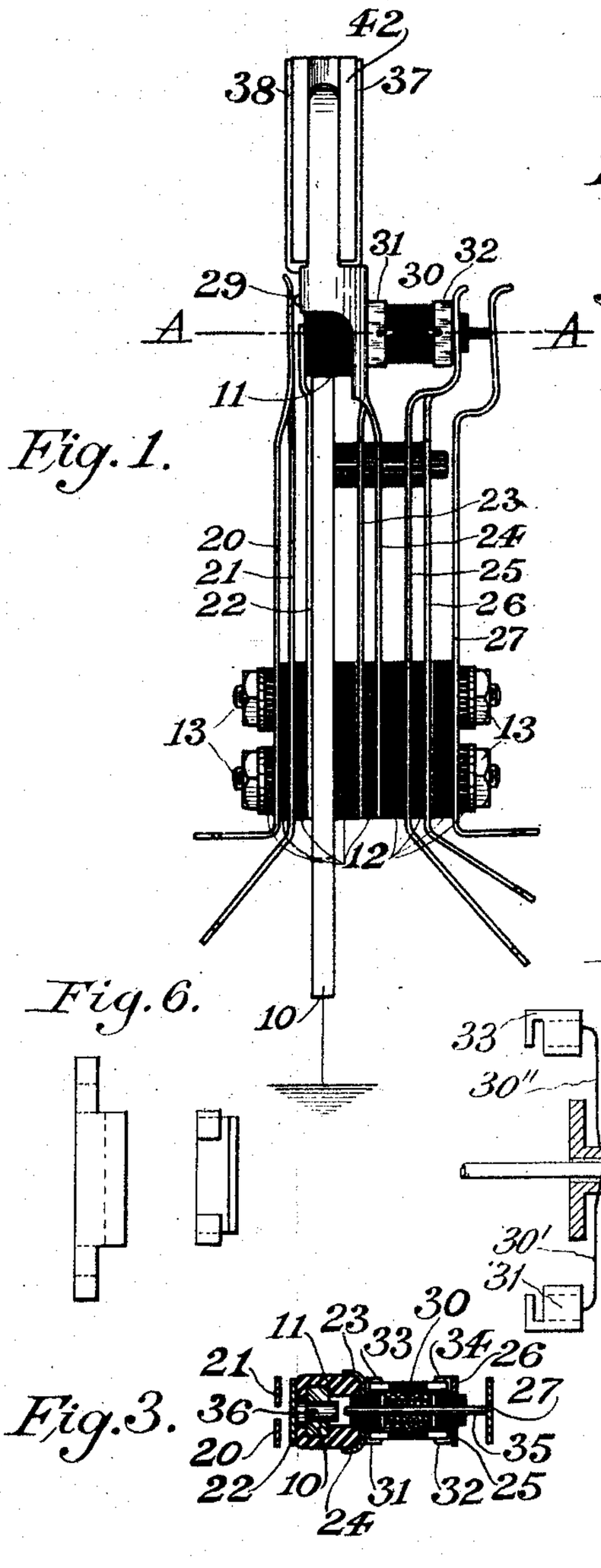

Fig. 1.

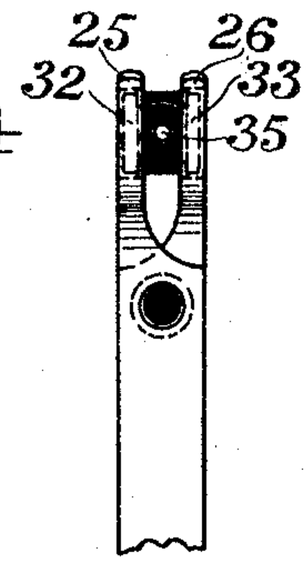

Fig. 5.

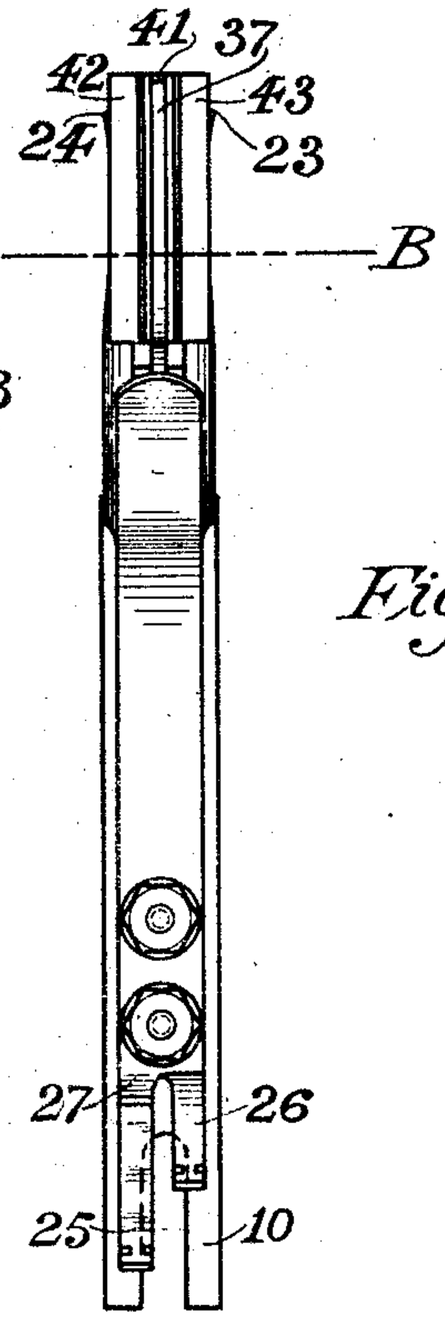

Fig. 2.

Fig. 6.

Fig. 7.

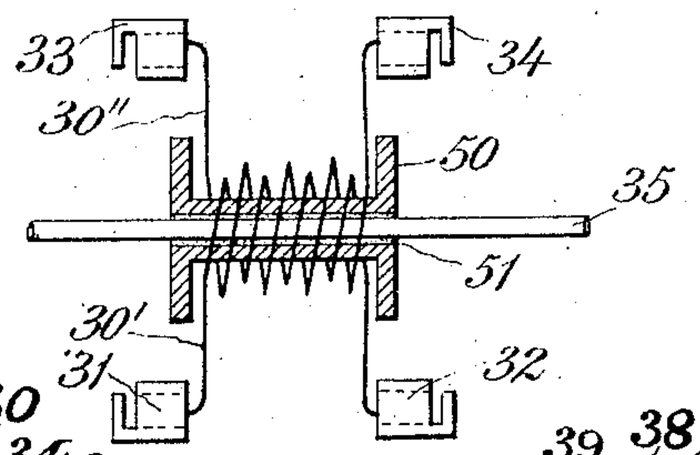

Fig. 3.

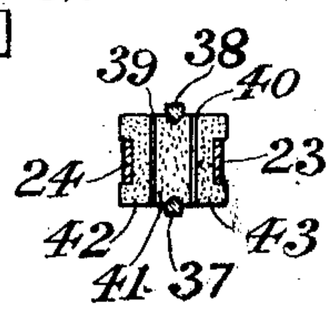

Fig. 4.

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UNITED STATES PATENT OFFICE.

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HEAT-COIL AND PROTECTOR UNIT.

No. 886,374. Specification of Letters Patent. Patented May 5, 1908.

Application filed May 29, 1905. Serial No. 262,717.

To all whom it may concern:

Be it known that I, WILLIAM KAISLING, a citizen of the United States of America, and resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Heat-Coils and Protector Units, of which the following is a specification.

My invention pertains to heat coils as used in telephone exchange systems, and refers to the manner of assembling the coil and circuits upon a mount, to details of the mounting of the assembled coil and springs, and to the circuits of the mounting springs and the heat coil itself, the latter with reference particularly to the conductors wound upon the heat-responsive portion of the heat coil.

In my invention I propose to use but one heat coil per telephone line, instead of using one per conductor as is the present custom, the two conductors of a metallic circuit telephone line being taken through the one heat coil, and either being effective to secure the operation of the heat coil in the event of excess current; I propose also to assemble the apparatus pertaining to a single telephone line as a complete unit, ready for the connection of the telephone-line conductors, and then to mount this complete unit upon such mounting plate as may be convenient, the assembly being in such groups of units as may be desired.

A further provision in my protector unit is found in the provision for avoiding a destructive arc being formed across the break in the line made by the operation of the heat coil. In devices at present in use, the operation of the heat coil breaks the conductor and then grounds one side of the break; in my device, I provide for making the ground circuit before breaking the conductor, and thereby shunt the break with the ground circuit to prevent the formation of a destructive arc at the break before the ground shunt is put on.

In the drawings, Figure 1 shows a side elevation of my heat coil and mounting assembly; Fig. 2 shows another elevation at right angles to that of Fig. 1; Fig. 3 shows a section on the dotted line A—A of Fig. 1; Fig. 4 shows a section on the dotted line B—B of Fig. 2; Fig. 5 shows an elevation similar to that of Fig. 2, but with the spring 27 removed, to show clearly the relations existing between springs 25 and 26 and the heat coil 30, unnecessary parts of the protector unit being omitted from this figure. Fig. 6 shows details of the clip used as terminals 31 32 33 34, showing the sheet-metal blank and the completed formed part, and Fig. 7 shows detail of the two windings of the compound heat-coil unit.

Referring to Figs. 1 and 2, 10 is a strip of steel forming the mounting base for the assembly of the protector unit; Fig. 1 shows the edge of this strip of steel and Fig. 2 shows the side, showing that at the lower end the strip is bifurcated, while Fig. 1 shows that a considerable clearance is provided on each side of the bifurcated end of the strip; this construction permits a bolt or screw to be started in any desired position or location to mount the protector unit; then the bifurcated end of the steel mounting base 10 may be placed around the body of the screw and when the screw is tightened the assembled protector will be held securely in position; in a group of protectors thus mounted, any one may be removed by loosening its clamping screw, and a new protector unit may replace the one removed by being placed in position and then clamped by the same screw. In an installation of protectors, vacant positions may be provided for protector units for future needs, and the units may be added one by one as needed.

Upon the mounting base 10 are mounted springs adapted to receive and hold the heat coil and to furnish the necessary circuit requirements, the springs being held by the insulating block 11 upon the upper end of the steel mounting base 10, and by the series of insulating blocks and washers 12, held by the bolts and nuts 13, and clamping the lower ends of all of the long springs. Springs 20 and 21 are intended for direct connection to the conductors of the telephone line after entering the central office through fuses in the usual manner; springs 25 and 26 are intended for direct connection to the conductors leading to the switchboard; springs 23 and 24 form intermediate parts of the circuits of the telephone line passing through the protector unit; spring 22 is a grounding spring, in electrical contact with the mounting base 10, which is grounded in practice when the protector unit is installed for service; spring 27 is a simple tension spring required for the actuation of the operating parts of the heat coil, and forming also, if desired, a portion of an alarm circuit, as will be described later.

The heat coil 30 has four terminals, 31, 32, 33, 34, and two separate windings 30′ and 30″, indicated in the section of the coil in Fig. 3, these two windings being connected, respectively, between the terminals 31—32 and 33—34, and being so wound upon the core or spool 50 of the heat coil as to be cumulatively inductive when currents pass simultaneously from terminals 31 and 33 to terminals 32 and 34, and differentially inductive when currents pass simultaneously from terminals 32 to 31, and 33 to 34; the two windings are equal in turns, and therefore when differentially inductive they are practically non-inductive.

The heat coil 30 is held by four springs, 23, 24, 25, 26, in such manner that spring 24 makes electrical connection with terminal 31, spring 25 with terminal 32, spring 23 with terminal 33 and spring 26 with terminal 34. These connections and the mechanical details facilitating them are shown in Figs. 2, 3 and 5. It is noted that the heat coil 30 is square in cross section, to facilitate the proper connections between its terminals and the springs designed to hold it, by insuring a greater likelihood of register.

The circuit of the telephone line through the assembled and mounted protector unit is as follows: Entering the central office from the substation telephone, one limb of the line passes to spring 20, thence by contact at 29 to the upper end of spring 24, which is in contact with terminal 31 of the heat coil 30, through which heat coil the circuit passes by one of the windings to terminal 32 and thence by spring 25 to the switchboard conductor attached to spring 25; returning from the switchboard by the other limb of the line, the circuit passes to spring 26, terminal 34; through the remaining winding of the heat coil to terminal 33, thence by spring 23 and through a contact similar to 29, to spring 21 and thus to the remaining limb of the line connecting with the substation telephone.

The heat coil 30 contains a pin 35 passing through the core of the heat coil and pressed inwardly by the tension spring 27, and held against an inward motion by some function of the heat coil 30 so that excess heat within the heat coil 30 would cause the pin 35 to be released and would permit motion of the pin 35 under the influence of the spring 27; this function is well known in the art, and may be obtained by the use of a fusible metal or solder as shown at 51 in Fig. 7 melting under undue heat, or a wax connection which may be softened by heat to permit a yielding, or any other possible or preferred method. The plunger 36 is supported by the steel mounting base 10 and is adapted to be engaged and propelled by the pin 35 when that pin is released by the action of heat in the heat coil 30 and then propelled by the spring 27. The spring 22, grounded by contact with the mounting base 10, lies adjacent to the plunger 36, and is adapted to be actuated by that plunger when the plunger is propelled by the pin 35 under pressure from spring 27.

The operation of the assembled protector unit is as follows: If, now, the currents flowing in the windings of the heat coil 30, or in either of them, become so great as to cause an undue heat to be generated within the heat coil, then the pin 35 will be released, will be propelled inwardly by the spring 27, will engage the plunger 36, will cause that plunger to lift the spring 22 into engagement with both springs 20 and 21 (see Fig. 3) and thus will ground both limbs of the telephone line on the side of the heat coil toward the substation telephone; continuing in its motion, spring 22 then will lift spring 20 from spring 24, breaking the contact at 29, and also will lift spring 21 from spring 23, breaking a similar contact; thus the line leading to the substation telephone is first grounded and then disconnected from the central office equipment.

The circuit through the heat coil 30, through which current flowed to heat the coil to cause the action above described, now is interrupted, regardless of what might have been the source of that current; the terminals 31 and 33 of the heat coil are still in electrical connection with springs 23 and 24, but springs 23 and 24 are isolated from other conductors. The currents through the heat coil therefore are interrupted, and the heat coil cools; the length of pin 35 is so gaged that the cooled heat coil is adaptable for use again by reversing its position in the springs.

A carbon arrester, with air gap to ground, is a part of the modern telephone protective system, and in my improved assembly of protector unit it is provided for by attaching to the mounting base 10 a forked extension, which may if desired be an integral part of the mounting base 10, comprising the two fork members 37 and 38; these two members clasp a carbon block, 41; two additional carbon blocks 42 and 43, are adapted to make electrical connection with the line conductor springs 23 and 24, which conductor springs tend to press the carbon blocks 42 and 43 into contact with 41, but two mica separators 39 and 40 are interposed in the manner usual in telephone practice.

I do not wish to limit myself in all respects to the details herein given, as for instance to the use of steel as the metal for the base mounting 10, nor to the use of a square heat coil; I am well aware that many modifications may be made departing from the description here given without being outside the scope of my invention.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a protector unit, a mounting base, con-

ductor springs insulatingly held upon said mounting base, a heat coil held by said springs, carbon blocks and separators held by said springs, the whole forming heat coil and carbon arrester protection for one telephone line, and means in connection with said mounting base for mounting the protector unit upon a supporting member independently of similar protector units, substantially as described.

2. In a protector unit, a mounting base having a bifurcated end adapted to be clamped by a bolt or screw, and protective devices mounted upon said mounting base adapted to furnish complete equipment of heat coil and carbon arrester protection for one telephone line independently of other similar units, substantially as described.

3. In a protector unit, a pair of fixed conductor elements, a pair of movable conductor elements normally in contact with said fixed elements and forming with said fixed elements parts of the continuous limbs of a telephone line; a heat-coil element; a grounding spring; and means controlling said grounding spring when said heat-coil element operates and causing said grounding spring to engage and ground said movable conductor elements and to lift said movable conductor elements from said fixed conductor elements, substantially as described.

4. In a protector unit, a fixed line-conductor element; a movable line conductor element normally in contact with said fixed line-conductor element; a heat-coil element; a grounding spring; and means controlling said grounding spring when said heat-coil element operates, and causing said grounding spring first to engage said movable line-conductor element and then to break the contact normally existing between said line-conductor elements, substantially as described.

5. In a protector unit, a heat coil having two windings; clamping conductor springs sustaining and holding said heat coil in position and making electrical contact with the terminals of the windings of the heat coil; circuits by which said two windings are included separately in the two limbs of the line respectively, and means by which undue heating of either of said windings will cause the actuation of said heat coil and the consequent grounding of both of said limbs of the line and the consequent interruption of both of said limbs of the line, substantially as described.

6. In a protector unit, a heat coil; two windings in said heat coil; terminals for said windings and mounted upon said heat coil; supporting conductor springs contacting electrically with said terminals and holding said heat coil and adapted to form portions of the limbs of a telephone line; and circuits whereby the two windings of the heat coil are included in the two limbs of the telephone line, substantially as described.

7. In a thermo-electric device, a heat-responsive unit, an electrical conductor in said heat-responsive unit, a path for electric current including as a part thereof said electrical conductor in said heat-responsive unit, and means adapted to be made operative by said heat-responsive unit and adapted first to establish an auxiliary path and then to interrupt the path first mentioned, substantially as described.

8. In a thermo-electric device, a heat-responsive unit, a plurality of electrical conductors in said heat-responsive unit, a plurality of main paths for electric current each including as a part thereof one of said electrical conductors in said heat-responsive unit, and means adapted to be made operative by said heat-responsive unit and adapted first to establish an auxiliary path for each of said main paths and then to interrupt all of said main paths, substantially as described.

Signed by me at Chicago, county of Cook and State of Illinois in the presence of two witnesses.

WILLIAM KAISLING.

Witnesses:

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SAMUEL G. MCMEEN.