(No Model.)

F. E. KINSMAN.

APPARATUS FOR PROTECTING TELEPHONIC AND TELEGRAPHIC INSTRUMENTS.

No. 283,492. Patented Aug. 21, 1883.

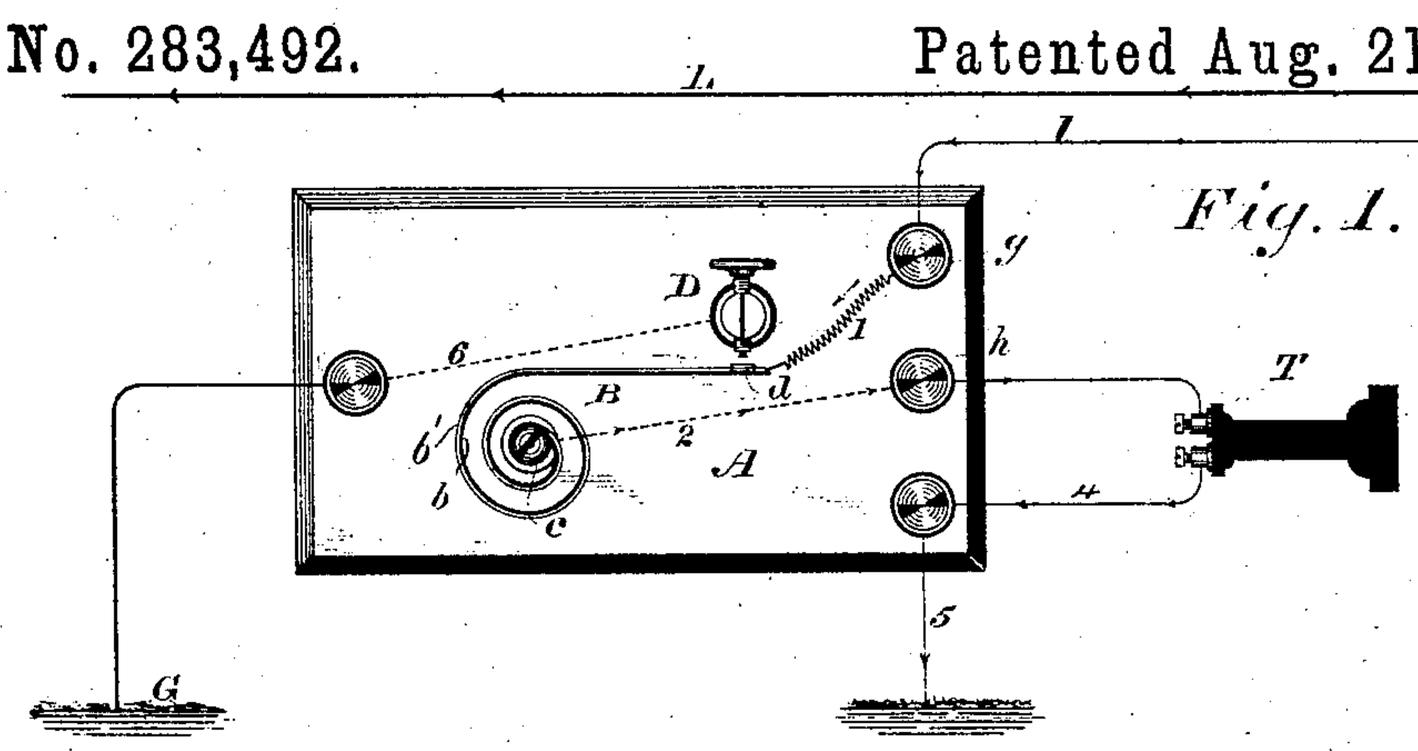

Fig. 1.

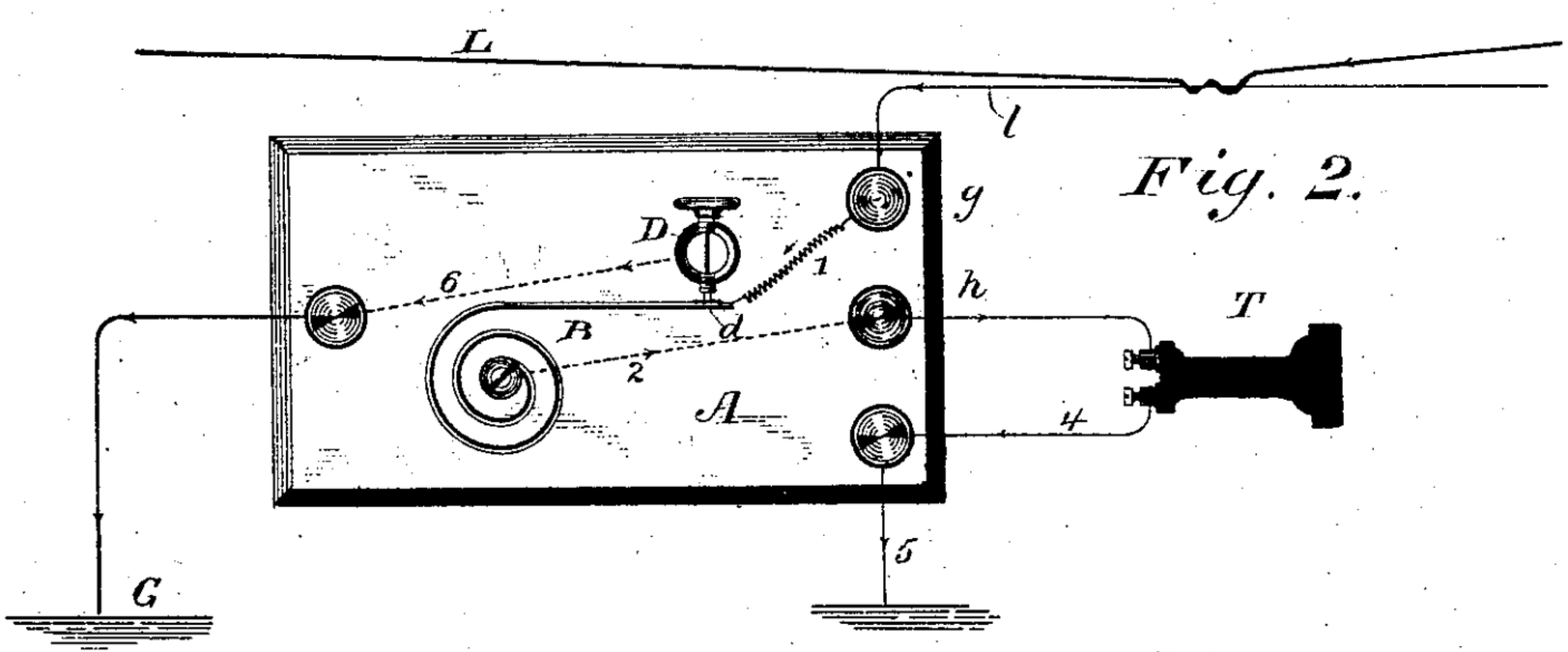

Fig. 2.

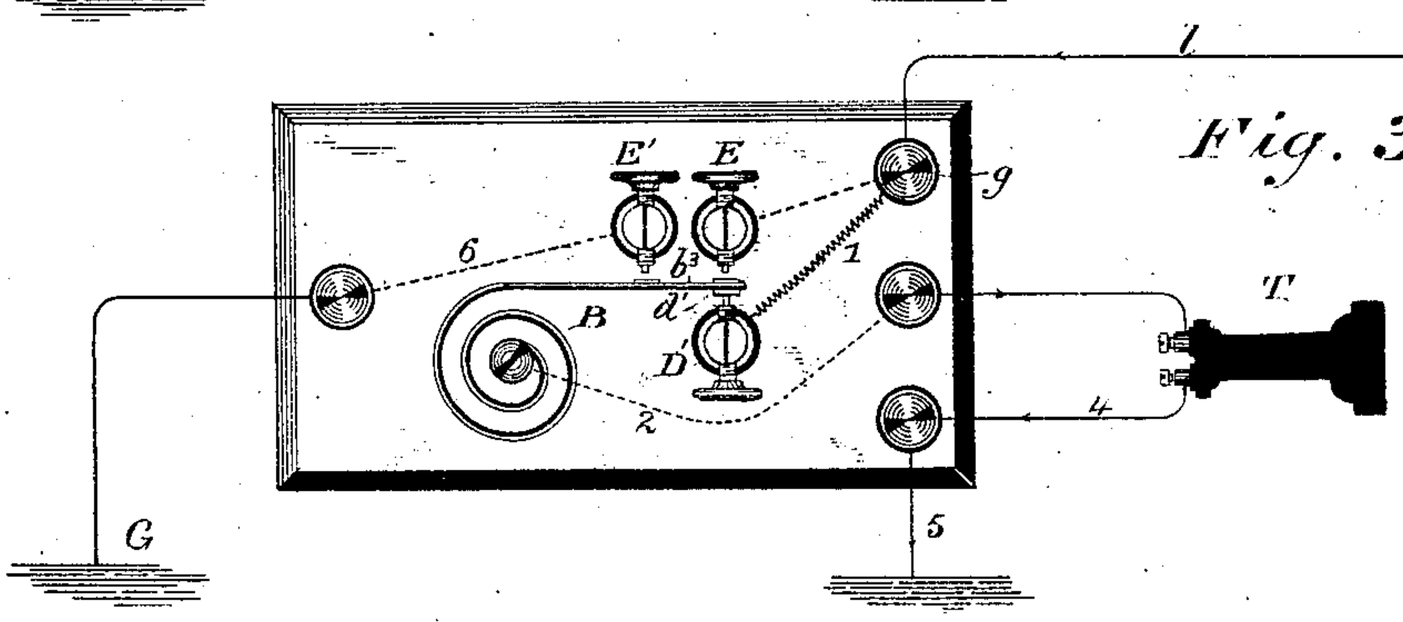

Fig. 3.

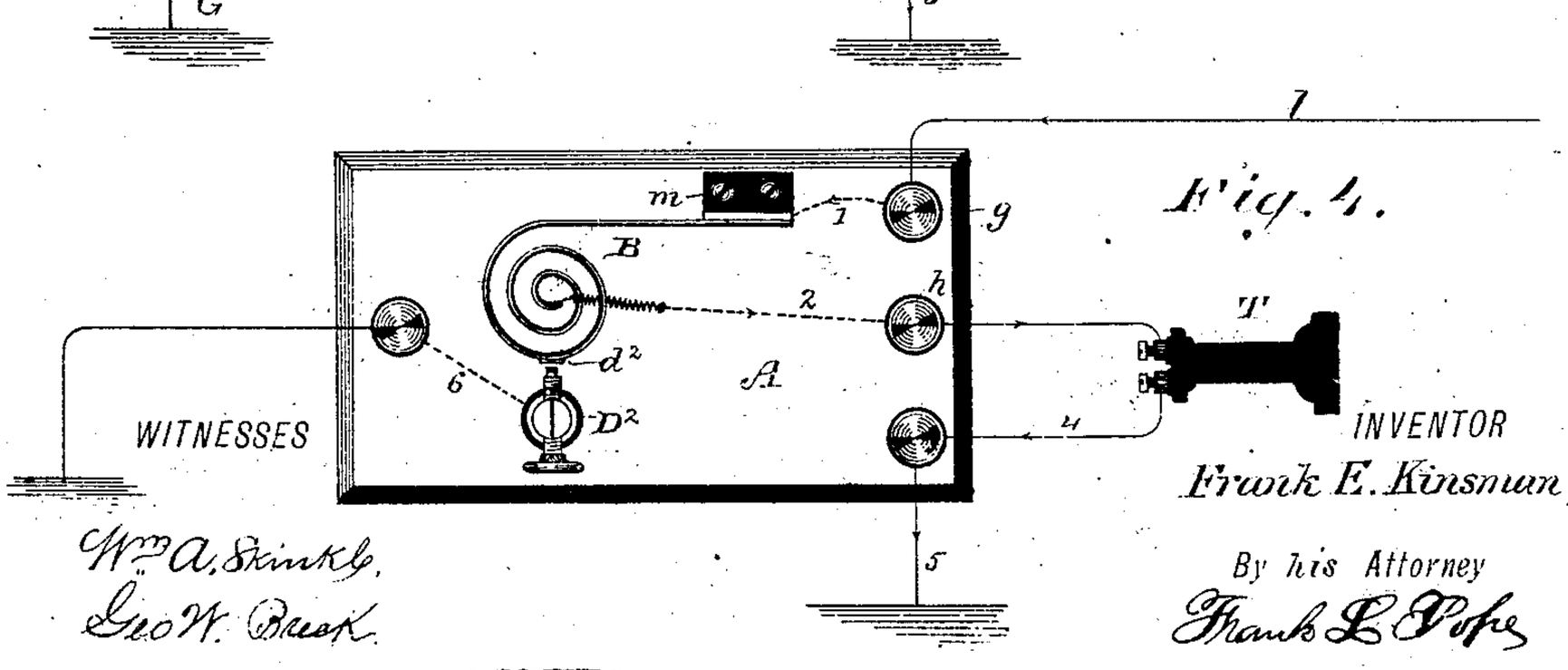

Fig. 4.

WITNESSES

Wm A. Skinkle,
Geo W. Breck.

INVENTOR

Frank E. Kinsman,

By his Attorney

Frank L. Pope

UNITED STATES PATENT OFFICE.

FRANK E. KINSMAN, OF NEW YORK, N. Y.

APPARATUS FOR PROTECTING TELEPHONIC AND TELEGRAPHIC INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 283,492, dated August 21, 1883.

Application filed June 20, 1882. (No model.)

To all whom it may concern:

Be it known that I, FRANK E. KINSMAN, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Protecting Telephonic and Telegraphic Instruments, of which the following is a specification.

My invention relates to certain improvements in the construction of apparatus and arrangement of circuits for preventing injury to telephonic and telegraphic apparatus from the overheating of the conductors by electric currents of abnormal strength.

Heretofore great inconvenience has been experienced and loss of property occasioned by accidental and, in many cases, unavoidable contacts between conductors conveying powerful electric currents, such as are employed in electric lighting systems and lines having less conductivity—such, for example, as telephone-wires. When such contact occurs the insulation of the conductors is often insufficient to prevent the escape of a portion of the current from the highly-charged conductor to the earth through the smaller wires. The resistance offered by the latter to a current of considerable quantity causes the line-wires to become overheated, and the thin wires, constituting the helices of the instruments, to be burned. The wood-work of the buildings through which such conductors pass is, moreover, exposed to ignition by contact with the heated wires.

The object of my invention is to so organize the respective circuits that a current traversing the main line of a telephonic or other like circuit of sufficient quantity to cause injury to the instruments or to overheat the line-wires shall be automatically shunted through a conductor offering but little resistance to the passage of the current to the earth.

My invention consists in including, in a telephonic or other like circuit, between the instruments and the main line a thermostat arranged to automatically close a normally-open circuit through an independent conductor connected directly with the earth, said thermostat being automatically operated by the heat generated by the passage of any excess of electric current, and thereby divert the injurious excess of current from the telephonic or other instrument and also wholly or partially from the thermostat itself. The particular form of thermostat which I prefer to employ consists of a flat coil of metallic ribbon, through which the telephone-circuit is normally closed, but the convolutions of which will, in consequence of the heat generated by the passage of a strong current of electricity, expand or separate, thereby throwing a contact-point carried upon the metallic ribbon against a contact-stop connected directly with the earth. The same movement of the thermostat may be employed to open the normally-closed telephone-circuit, thus cutting off the instrument from the main line, or it may act merely to close the shunt-circuit of less resistance, and thereby divert the excess of abnormal current from the instrument. Upon the cessation of the excess of current the thermostat will become cool and resume its former position, and thus the normal connections of the telephone-circuit will be automatically restored. The flat coil of metallic ribbon constituting the thermostat may with advantage be formed of two dissimilar metals soldered or otherwise permanently united with each other, the inner metal having a greater coefficient of expansion than the outer one, thereby securing a more rapid movement than would be occasioned by constructing the inner side of the ribbon of a metal expanding with only the same rapidity as the outer. The entire coil may be made to offer a comparatively high resistance to a powerful current, and it may be so constructed that the inner convolutions shall normally rest in electrical connection with each other, but by the separation of the convolutions upon being heated a greater length of ribbon shall be brought into circuit, thus offering increased resistance. This form of construction is preferable when the thermostat acts only to close the shunt-circuit, and does not break the telephone connections, as the resistance thus automatically thrown into circuit will be sufficient to prevent the greater portion of the current from traversing that circuit. In some instances it is found desirable to confine the resistance to a small portion of the thermostat, so that the heat generated therein may be communicated through the convolutions by the conductivity of the metal.

In the accompanying drawings I have illustrated the construction which I prefer to employ in applying my invention to a telephone-circuit.

Figure 1 represents the arrangement and normal position of the conductors and apparatus; Fig. 2, the operation of the shunting device. Figs. 3 and 4 represent certain modifications in the construction of the same.

Referring to Fig. 1, L represents a large electric conductor—such, for example, as that employed in an electric lighting system—and *l* a telephone main line passing in proximity to the larger wire.

T represents a telephone included in the circuit of the main line *l* between the earth and the thermostatic circuit-closer. The thermostat consists of a coil, B, of metallic ribbon, preferably constructed of parallel strips of two different metals—such as platinum and steel—united together, the inner metal, *b'*, having a greater coefficient of expansion by an increase of temperature than the outer metal, *b*. The entire coil constituting the thermostat offers considerable resistance to the passage of a strong current of electricity. The inner end of the thermostatic coil is secured to a supporting-base, A, by means of a screw, *c*, and is also in electrical connection, through a wire, 2, with the binding-post *h*. The outer end, B, of the coil is free to be moved upward by the expansion or separation of the convolutions, thus bringing a contact-point, *d*, mounted thereupon, into electrical connection with a stop, D, which is in turn connected, through a wire, 6, with the earth at G. The free end B of the coil is connected by the wire 1 with the main line *l* through the binding-post G. The relative positions of the thermostatic coil and the adjustable contact-point D are so arranged that the circuit will normally remain closed through the convolutions of the thermostat, the telephone T, and wires 4 and 5 to the earth.

The normal course of the current upon the large conductor is indicated by the arrow-heads marked thereon. If, now, the line L should accidentally come in contact with the telephone-wire *l*, as shown in Fig. 2, the current from the line L, or a portion thereof, will escape to the earth G through the telephone-line, as indicated by the arrow-heads. The passage of this powerful current through the resistance offered by the thermostatic coil will generate heat therein, causing the thermostatic device to assume the position shown in Fig. 2, the convolutions being expanded and the contact-point *d* pressed against the adjustable stop D. An earth-circuit of much less resistance than that offered by the circuit containing the telephone will therefore be immediately formed through the wire 6, and the greater portion of the abnormal or foreign current will reach the earth by this route, while the current passing through the telephone will be too small to cause injury to the instrument, but will be sufficient to keep the thermostat heated and expanded and the circuit of the wire 6 closed so long as it continues to flow.

It may be desirable in some instances to so arrange the thermostat that the earth-connection through the telephone shall be entirely interrupted upon the closing of the secondary or shunt circuit. This may be accomplished by the device shown in Fig. 3, wherein the normal connection with the free end of the thermostat is made by means of a contact-stop, D', connected with the telephone main line, and against which a contact-point, *d'*, mounted upon the movable portion of the thermostatic coil, normally presses. This connection will be interrupted by the operation of the thermostat. The circuit through the shunt-wire may be closed, as shown in the figure, by means of two contact-points, E and E', respectively, connected with the binding-post *g* and with the earth through the wire 6, and arranged to be brought into electrical connection with each other upon the operation of the thermostat through the portion b^3 of the thermostatic coil. This portion of the coil should be constructed to offer so much resistance to the current that the heat generated therein shall be sufficient to keep the convolutions in a state of expansion so long as a current of sufficient strength to cause injury to the telephonic apparatus is passing over the telephone main line.

A further modification in the arrangement of the thermostat is shown in Fig. 4, wherein the outer end of the coil is secured to a block, *m*, of some suitable insulating material—such as hard rubber—and the inner end of the coil is free to move under the influence of heat. The circuit-connections in this modification are similar to those described with reference to Figs. 1 and 2. The shunt-circuit is completed upon the operation of the thermostat through the adjustable contact-screw D^2, against which a contact-point, d^2, bears when the coil is expanded.

I do not wish to confine myself to the particular forms of construction herein described; and it is evident that any other suitable form of thermostat which will be operated by the heat generated by the passage of a strong current of electricity therethrough may be employed in place of the one herein shown and described.

I am aware that it is not new to make use of an independent normally-open earth-circuit, in combination with an electro-magnet acting to connect the main line with said earth-circuit when the coils of the electro-magnet are traversed by an electrical impulse of abnormal strength; nor is it new to employ thermostatic and electro-magnetic devices interchangeably for the purpose of actuating a circuit-closer in order to divert electric currents of abnormal strength from an electrical instrument designed to be actuated by a normal current only; and hence I do not broadly claim such a device or apparatus.

What I claim, and desire to secure by Letters Patent, is—

The combination, substantially as hereinbefore set forth, of a main line, an earth-line, a receiving-instrument connected between said main and earth lines and uniting them to form a continuous circuit, a thermostatic coil placed in the main line, or in circuit between the main line and said instrument, and an additional normally-open earth-line adapted to be automatically connected to the main line by the expansion of said coil when traversed by an abnormal current, whereby such current is diverted from said receiving-instrument and wholly or partially from the thermostat or actuating device itself.

FRANK E. KINSMAN.

Witnesses:

CHARLES A. TERRY,

MILLER C. EARL.