(No Model.) 2 Sheets—Sheet 1.

E. W. JUNGNER.

ELECTRICAL FIRE ALARM APPARATUS.

No. 525,020. Patented Aug. 28, 1894.

Fig. 1.

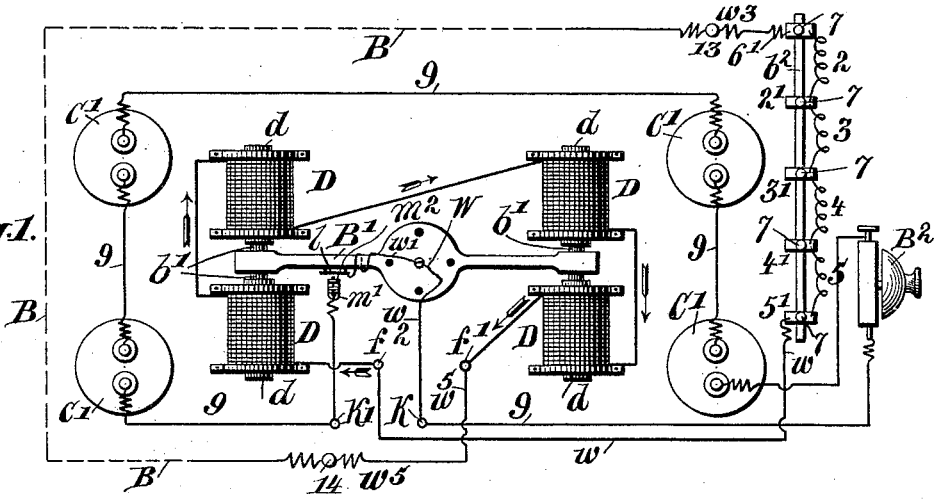


Fig. 4.

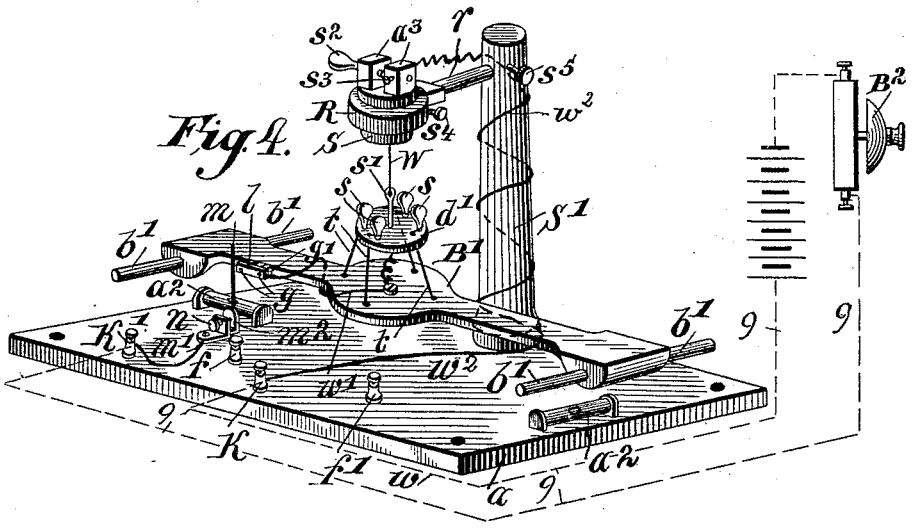
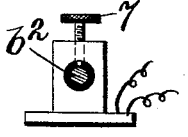


Fig. 5.



Witnesses:
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Henry Orth

Inventor:
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by Church & Church
Attys

(No Model.) 2 Sheets—Sheet 2.

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ELECTRICAL FIRE ALARM APPARATUS.

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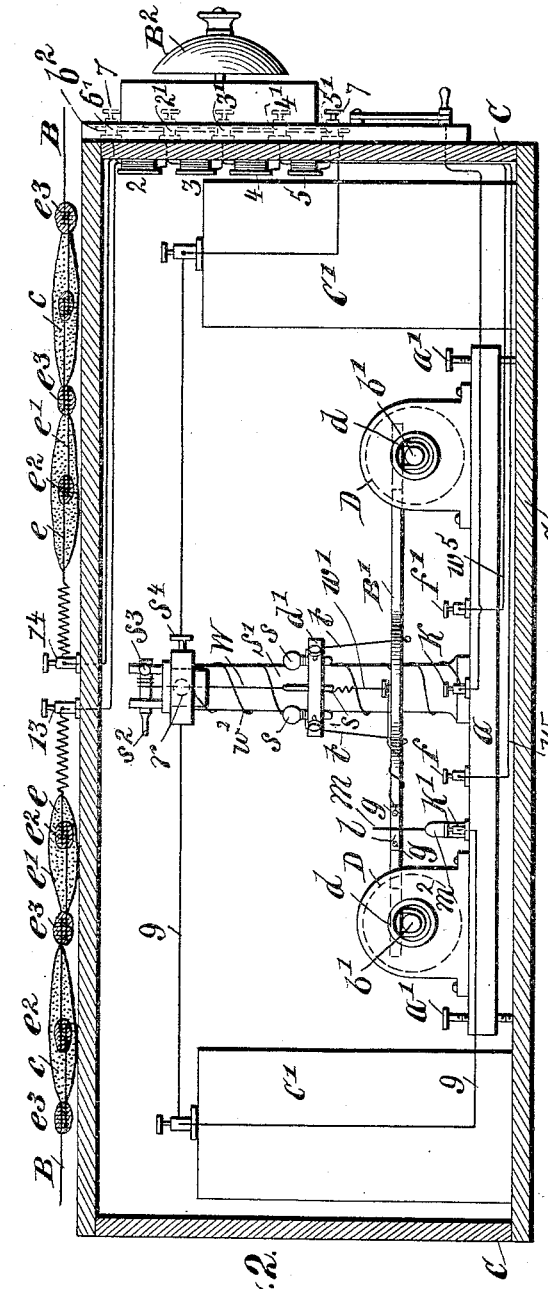

Fig. 2.

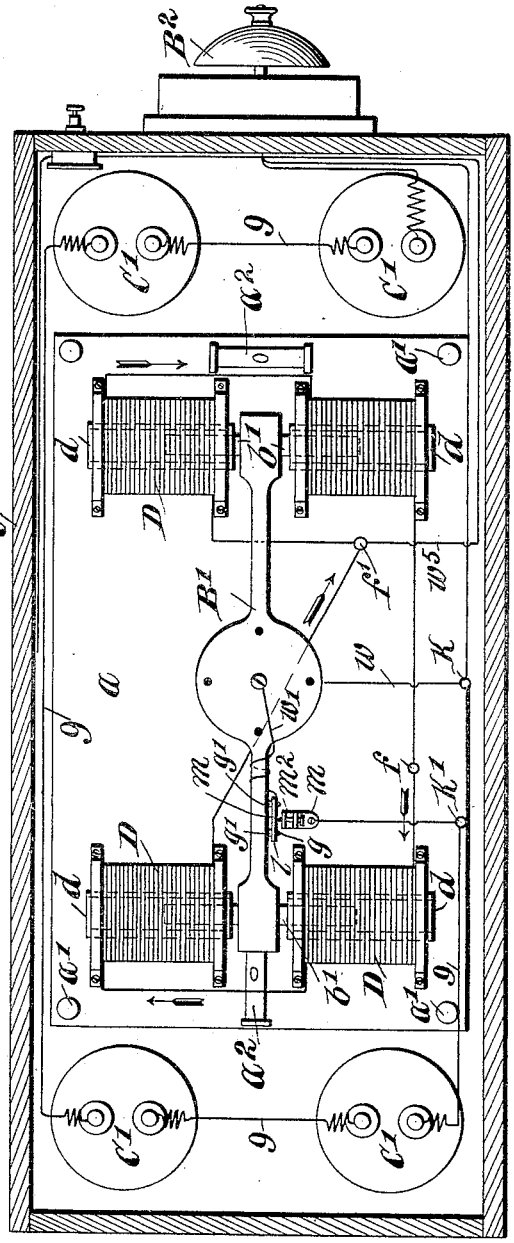

Fig. 3.

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UNITED STATES PATENT OFFICE.

ERNST WALDEMAR JUNGNER, OF STOCKHOLM, SWEDEN.

ELECTRICAL FIRE-ALARM APPARATUS.

SPECIFICATION forming part of Letters Patent No. 525,020, dated August 28, 1894.

Application filed November 8, 1893. Serial No. 490,369. (No model.)

To all whom it may concern:

Be it known that I, ERNST WALDEMAR JUNGNER, a subject of the King of Sweden and Norway, residing at Stockholm, Sweden, have invented certain new and useful Improvements in Electrical Fire-Alarm Apparatus, of which the following is a specification.

My invention has relation to electric fire alarms and more especially to that class in which the alarm is given or the location of the fire otherwise indicated by the influence of a thermo electric current. But that my invention may be fully understood I will describe the same in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the thermo-electric circuit, and the solenoids performing the function of a relay and alarm circuits. Fig. 2 is a vertical sectional elevation of the apparatus used in connection with a thermo-electric circuit. Fig. 3 is a plan view illustrating the solenoids of the relay connected in derivation by pairs. Fig. 4 is a perspective view of the circuit closing devices, and Fig. 5 is a detail view.

Similar symbols of reference indicate like parts wherever such may occur in the figures of drawings just described.

Any suitably constructed thermo electric battery may be employed in connection with my apparatus, I prefer, however, to use the battery described in my Letters Patent of the United States dated June 12, 1894, No. 521,128, and I will give here a mere general description of the construction of said battery, sufficient however to understand the same.

The thermo electric battery B Fig. 2 consists of a series of elements each composed of two pieces or strips of different metals preferably copper and iron wires $e\,e'$, alternating with each other and connected in series by overlapping the contiguous ends and binding them together by means of fine iron wire as shown at e^2, and by brazing or soldering, as shown at e^3.

For the purpose of avoiding the production of thermo electric currents by too low a temperature of the ambient air I insulate every other joint by wrapping the same with cotton thread or yarn, as shown at *c*, and with a view to obtaining the best results the extent of the insulation should be suitably proportioned, because if the insulations are too thick the battery will be energized by a comparatively slight increase, above a given degree, in the temperature of the ambient air. If, on the other hand, said insulations are too thin the thermo current is correspondingly weakened and may become too weak and of too short a duration for the purposes in view. These difficulties I avoid by winding the joints in the form of double cones or spindles, the insulation being thickest at the joint and is gradually reduced in thickness in opposite directions, every other joint being left bare, as shown. The thermo electric battery or chain constructed as described is secured as near as possible to the ceiling of a room, and is not influenced by radiated heat, the greater portion of which will be reflected from the metallic surfaces, but only by heat absorbed or taken up, and of a sufficiently high degree, as for instance that of a hot air current resulting from the breaking out of a fire. The current generated is however at no time sufficiently powerful to operate an alarm or to otherwise indicate the location of the fire, and in order to utilize this weak current as a means for giving an alarm or otherwise indicating the location of a fire, I use solenoids which perform the function of a relay and are hereinafter referred to as the relay, the induced current induced therein by the thermo-electric current being powerful enough to actuate a circuit closer in a local or signaling circuit.

A relay and local circuit closer are located in each building, or in each room of a building, while the local battery or generator may be located at any desired distance from said relay and circuit closer, an alarm or indicator or both may be arranged at some given point in the building, or in each room of a building and included in the local or signaling circuit, or the alarm or indicator or both may be located at a distance from such building, as for instance at a fire engine station or at a police station. In the accompanying drawings I have illustrated the relay, the circuit closer, and the local or signaling circuit as combined in one apparatus, with a view to facilitating such illustration and the description thereof, but I would have it understood that I do not limit my invention to the arrangement shown.

The relay and circuit closer are mounted on a suitable base a provided with any suitable leveling devices, as for instance leveling screws a', and a spirit level or levels a^2, said devices being inclosed in a casing C to protect the same from dust, and in said casing is also contained the battery which is shown as composed of four cells or elements C′ symmetrically disposed about the base board a and connected in series, as shown in Fig. 1. The relay consists of four solenoids D having hollow cores d of glass, said solenoids being mounted on base a and connected either in series as shown in Fig. 1, or in derivation by pairs as shown in Fig. 3, the terminals being connected to binding posts f and f' respectively to which the terminals of the main or thermo electric circuit are also connected, a suitable resistance being preferably interposed in the latter circuit.

As shown in Fig. 1 one terminal of the thermo battery B is connected to a binding post 14 that is electrically connected by wire w^5 with binding post f', the other terminal of said thermo-battery is connected to a binding post 13 electrically connected by wire w^3 with one terminal of a plurality of resistance coils 2, 3, 4, and 5, connected in series, the other terminal of said coils being electrically connected to binding post f^2 by wire w for purposes hereinafter explained.

The terminals of the local circuit are respectively connected to binding posts k and k', said binding post k' being electrically connected with the support m' for a contact m Figs. 1 and 4, said contact m consisting preferably of a thin strip of platinum brazed to a thin brass plate m^2 secured to a bracket or support m' that has a screw threaded bearing for an adjusting screw n which impinges upon the aforesaid brass plate, whereby the contact m may be adjusted relatively to a corresponding contact on the circuit closer.

The circuit closer consists of a bar of wood B′ that has at each end a cylindrical magnet b' whose opposite ends project into the tubular glass cores d of a pair of oppositely arranged solenoids D. The bar B′ has an enlargement at its longitudinal center to which are secured four silk threads t, that pass through holes in a disk d' of non-conducting material, thence around screws s to which the other end of the threads are fastened, said screws working in threaded bearings in said disk d' whereby the bar B′ can be accurately leveled and balanced and adjusted vertically relatively to the tubular cores d of the solenoids D.

The bar B′ is provided near one end with a platinum contact l, adapted to co-operate with the contact m hereinbefore referred to whenever the said bar is displaced from its normal position by currents induced in the solenoids D. The contact l is secured to the bar by means of screws and interposed spacing sleeves g g', Fig. 4, and is electrically connected by wire w' with one end of a metallic screw s' that passes centrally through disk d', and to the opposite end of said screw is secured one end of a silver wire W that is wound around a wooden screw s^2 working in bearings in arms a^3 projecting from the upper face of a thimble S that is T-shaped in vertical section, a set screw s^3 working in one of the arms a^3 being provided to lock screw s^2 against displacement. The thimble S is loosely fitted in and seated on a ring R, and can be rotated in the latter, a set screw s^4 working through said ring being provided, to lock the thimble against displacement. The ring has secured thereto an arm r that fits in a hole or bearing in a standard S′ in which said bar can be turned and moved endwise, a set screw s^5 being provided to lock the arms r against displacement, the ring R, sleeve S and standard S′ being constructed of a non-conductive material.

The free end of the suspension wire W is electrically connected by a wire w^2 with the binding post k Figs. 1 and 4.

By means of the described arrangement and construction of devices the magnet bar B′ may be readily as well as nicely adjusted relatively to the tubular cores d of the solenoids, a vertical adjustment through the medium of the screw s^2 being provided independently of the like adjustment through the medium of the screws s and suspension threads t. Through the medium of the arm r on ring R and the set screw s^5 the magnet bar can be adjusted centrally between the two pairs of solenoids, and any torsional action in the suspension wires compensated by the rotation of the thimble S.

The magnets b' present unlike poles to their respective solenoids and the latter are wound in such manner that two coils on one side of the bar will attract one end thereof and repel the other, while the coils on the opposite side respectively repel and attract said ends of the bar, thereby causing the bar B′ to vibrate about its axis of suspension W whenever the solenoids are energized by a thermo electric current, whereby the local circuit is closed by the contact of l with m.

In order to prolong the contact between l and m and therethrough the signal, I provide a flexible or resilient contact m, so that when bar B′ is vibrated and l brought into contact with m the latter will yield to pressure, and as the bar returns to its normal position said contact m will move with l to the extent of the deflection from a vertical or normal position, and thereby prolong the duration of contact. Inasmuch as there is mutual attraction of l and m which tends to retard the interruption of the contact between them I prefer to secure to the casing containing the apparatus an alarm bell B^2 included in the local circuit the vibrations of which are transmitted to the delicately suspended magnet bar B′ whereby the said contact is quickly interrupted and the magnet bar allowed to swing back to a position of rest.

By a proper adjustment of the contact piece m relatively to the contact l in bar B′ when the latter is at rest, the vibration of the bar due to currents resulting from a slight rise above the normal in the temperature of the air about the thermo electric battery will prevent the closure of the local circuit. Under some circumstances this adjustment may however prove insufficient, and to prevent the closure of the local circuit except at such temperatures as will result in case of fire, I interpose in the thermo electric circuit a plurality of resistance coils 2, 3, 4 and 5, hereinbefore referred to, said coils connected in series through the medium of a corresponding plurality of binding posts 2′, 3′ and 4′, one terminal of the thermo electric battery B being electrically connected by wire w^3 through binding post 13 to a binding post 6′ to which is also connected one terminal of the resistance coil 2, one terminal of the last of the series of resistance coils being connected to a binding post 5′, and the latter, by wire w through binding post f to one terminal of the series of induction coils D, as shown in Fig. 1.

In order that the resistance to the passage of the thermo electric current may be regulated, I provide a bar b^2 that slides freely in openings formed in the binding posts 2′ to 6′ so that by sliding the bar out of one or more of the binding posts a corresponding number of the resistance coils can be included in the thermo electric circuit. Instead of this arrangement the openings in the binding posts can be lined with a sleeve constructed of a suitable insulating material and provided with an opening for the passage of a contact screw 7 that will impinge upon bar b^2 and thus connect the same electrically with the respective binding posts. Thus, for instance, if the contact screws of all the posts are tightened up, the current in the thermo chain will follow the line of least resistance, namely, through bar b^2 to binding post 5′. If, on the other hand, the contact screw of binding post 6′ is moved out of contact with bar b^2 the thermo electric current will flow through resistance 2 and bar b^2 to binding post 5′. In this manner one or more or all of the resistances 2, 3, 4 and 5, may be included in the thermo electric circuit as may be found necessary. The same results are accomplished with a sliding bar by sliding the same out of one or more or all of the binding posts 6′, 2′, 3′, 4′, and 5′, as intimated above.

Current generated in the thermo electric battery B will flow from binding post 13 by wire w^3 to binding post 6′, thence through bar b^2 or through one or more of the resistance coils to binding post 5′ and by wire w to binding post f thence through the four solenoids as indicated by arrows Fig. 1 to binding post f' and by wire w^5 to binding post 14. Current will be induced in the solenoids that will cause the magnet bar to vibrate, whereby the main or alarm circuit is closed by the contacts l and m, and as the alarm B^2 is included in the local circuit 9 an audible signal will be given. Of course it will be readily understood that the local electric circuit may include other signaling devices as hereinbefore stated, as, for instance, an annunciator, and these may be located in each room or at some particular point within or outside of a building, the necessary circuit connections being well understood by electricians and need not be described or illustrated. The thermo electric battery B′ may however become energized by undue overheating of the room or space in which it is arranged, or by the action of the heat of illuminating devices placed near the ceiling or directly under the battery. This can be avoided by arranging below the thermo electric battery a heat deflector, as a board, and by securing to the under side of this board a second or auxiliary thermo electric battery in the form of a coil and electrically connecting the two in such manner as to obtain currents of different direction in the two batteries and by so regulating the number of elements in each that the currents generated will be of the same strength whereby the current in one will counteract or annul the effect of the current in the other.

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

1. An electric fire alarm system comprising a normally closed thermo electric circuit, an adjustable resistance and a relay included in said circuit, in combination with a normally interrupted signaling circuit and a circuit closer controlled by current in the relay to close the signaling circuit, for the purpose set forth.

2. An electric fire alarm system comprising a normally closed thermo electric circuit, a relay, and an adjustable resistance, included therein, comprising a plurality of resistance coils, metallic contacts connecting said coils in series and to one terminal of the thermo electric circuit and of the relay respectively, and a contact adapted to be connected to one or more or all of the coil contacts, in combination with a normally interrupted signaling circuit and a circuit closer adapted to close said signaling circuit, for the purpose set forth.

3. In a thermo electric fire alarm the combination with a normally closed thermo electric circuit, a relay therein composed of four solenoids arranged in pairs and provided with tubular glass cores, and a normally interrupted signaling circuit, of circuit closing devices comprising a fixed contact connected with one of the terminals of the signal circuit, a pair of magnets projecting into the cores of oppositely arranged solenoids, a support for said magnets suspended freely between the solenoids, and a contact on said support connected with the other terminal of the signaling circuit and adapted to cooperate with the aforesaid fixed contact to close

said circuit when the magnet support is vibrated by current passing through the solenoids, for the purpose set forth.

4. The combination with the four solenoids D each provided with a tubular glass core and a normally interrupted signaling circuit, of circuit closing devices comprising a fixed contact connected with one terminal of said signaling circuit, a pair of magnets extending into the cores of oppositely arranged solenoids, a support for said magnets, means connected with said support to hold the magnets in suspension in the cores, adjusting devices for adjusting the support and magnets relatively to said cores, and a contact connected with said support and with the other terminal of the signaling circuit and adapted to cooperate with the aforesaid fixed contact to close said circuit, for the purpose set forth.

5. The combination with the four solenoids D each provided with a glass core, and a normally interrupted signaling circuit, of circuit closing devices comprising a pair of magnets extending into the cores of oppositely arranged solenoids, a support for said magnets, a suspension device connected with the support to hold said magnets in suspension in the cores, adjusting devices for adjusting the support and magnets relative to said cores, means for compensating torsional action in the suspension device, and a contact connected with the magnet support and with the other terminal of the signaling circuit and adapted to cooperate with the aforesaid fixed contact to close said circuit, for the purpose set forth.

6. The combination with the bar B′ and standard S′ of the disk *d′* from which said bar is suspended, the ring R provided with an arm adjustable endwise in the standard, a thimble revoluble in the said ring and a screw from which the aforesaid disk is suspended, said screw working in bearings on said thimble, for the purpose set forth.

7. The combination with the bar B′ and standard S′ of the disk *d′* from which said bar is suspended, the ring R provided with an arm adjustable endwise in the standard, a thimble revoluble in the said ring, a screw from which the aforesaid disk is suspended, said screw working in bearings on said thimble, and means for locking the said arm, screw and thimble against accidental displacement, for the purpose set forth.

8. The combination of an adjustable resistance comprising a plurality of resistance coils, a corresponding plurality of binding posts connecting the coils in series, said posts provided with a passage lined with an insulating material, binding screws working in said posts through the said lining, a conductor bar extending through said lined passages, a thermo electric circuit and a relay therein, the terminals of said circuit respectively connected with one terminal post of the series and with one terminal of the relay, the other terminal of the latter connected with the other terminal post of the series, with a normally interrupted signaling circuit and a circuit closer therefor, substantially as and for the purpose set forth.

9. The combination of the bar B′ provided with an enlargement at its middle point, the disk *d′* to which said bar is suspended by threads *t*, and means for adjusting said threads as to length, the thimble S, the screw s^2 from which disk *d′* is suspended, said screw working in bearings on the thimble ring R provided with an arm *r*, and the standard S′ provided with a bearing in which said arm is adjustably seated, with the solenoid D arranged in pairs as described for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ERNST WALDEMAR JUNGNER.

Witnesses:
TH. WAURINSKY,
L. ROWELL.