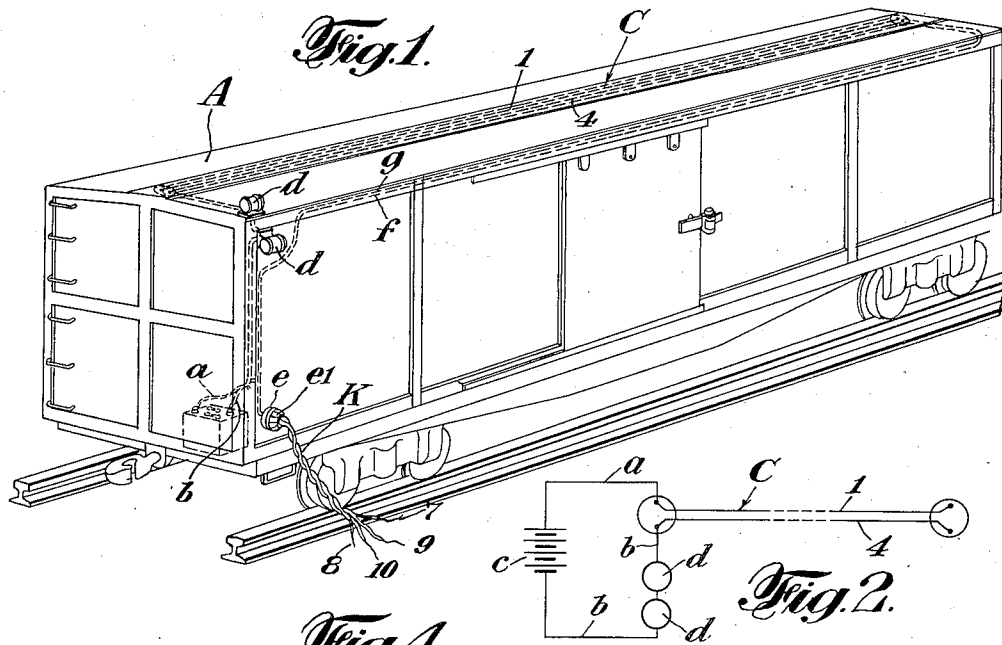


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FIRE INDICATING SYSTEM

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FIRE INDICATING SYSTEM

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My invention relates to a system for detecting or indicating the occurrence or presence of fire or other high temperature condition.

My invention has reference to a system utilizable for indicating a fire condition on a freight, baggage, express car, or the like.

My invention has particular reference to a fire indicating system for any suitable movable vehicle or the like, the arrangement being such that the temperature responsive device of said vehicle may be connected into circuit with a stationary fire indicating or control system when said vehicle has been brought to rest in a storage space, depot or the like.

Further objects, advantages and characteristics of my invention will become apparent from the following description taken in connection with the accompanying drawing.

My invention resides in the systems, arrangement, combination and features of construction of the character hereinafter described and claimed.

For an understanding of my invention and for an illustration of some of the embodiments thereof, reference is to be had to the accompanying drawing, in which:

Figure 1 is a perspective view of a freight car having associated therewith a fire indicating system in accordance with my invention;

Fig. 2 is a diagram of circuit connections for the fire indicating system of Fig. 1;

Fig. 3 is a transverse vertical sectional view of a fire detecting cable; and

Fig. 4 is a diagram of circuit connections illustrating the system of Fig. 2 in combination with a supervised fire detecting system.

Referring to Fig. 1, A represents any suitable vehicle, conveyance or the like which for purposes of explanation of my invention, has been illustrated as an ordinary freight car although, by no means at all, is my invention to be thus limited.

It is well known that freight cars are often used for transporting valuable goods of inflammable character or goods of such character that spontaneous combustion is apt to develop therein. Where a car carrying valuable goods as noted above is one of a long train of cars, a fire condition is apt to develop and long persist before knowledge thereof comes to an employee of the railroad either on the train or at a wayside station. By that time, the contents of the car may be more or less of a total loss and the fire condition may even have developed sufficiently to en-

danger other cars of the train or property along the roadside. In accordance with one phase of my invention, a suitable arrangement is provided for promptly indicating the presence of a fire condition on a car equipped as proposed by me so that steps may be immediately taken to overcome the dangerous condition.

With this end in view, a suitable temperature responsive device is disposed interiorly of the car A and, by preference, this temperature responsive device is a desired length of fire detecting cable C such, for example, as disclosed in my pending application Serial No. 352,624, filed April 5, 1929. As clearly disclosed in said application and as disclosed herein in Fig. 3, said cable C may comprise a core 1 disposed within a tube or sleeve 2 longitudinally slotted as indicated at 2a. Disposed upon the sleeve 2 is a layer of insulating material 3 formed, preferably by winding a plurality of fabric strands upon the aforesaid sleeve 2. Encircling the insulating layer 3 is a suitable sheath 4 which carries a waterproof cover 5 having a fabric layer 6 disposed thereupon.

The aforesaid core 1 is formed from any suitable metallic material adapted to become molten when elevated in temperature to a predetermined extent as may be effected when said core 1 is exposed to radiated heat coming from a high temperature area such, for example, as may be occasioned by a fire condition occurring in the neighborhood of the cable C. The core 1, then, is a good conductor of electricity and the same is true of the sheath 4, said core 1 and sheath 4 forming sides of an electrical circuit separated by the insulation 3. Upon occurrence of an ambient temperature increase of predetermined magnitude, the core 1 becomes molten and expands laterally through the insulation 3 so as to come into contact with the sheath 4 whereby the cable conductors are short-circuited.

In accordance with my invention, a suitable length of the aforesaid cable C is so disposed as to extend into any suitable region of the car A. As herein shown although not necessarily, such length of the cable C is disposed interiorly of the car roof, the cable being held in fixed position in any suitable manner.

With the cable thus held in fixed position and shown more particularly in Fig. 2, conductors a and b are connected, respectively, to the aforesaid core 1 and sheath 4, the conductor a leading to one terminal of a storage battery c or other suitable source of electrical energy, the conductor b leading to the other terminal of said battery c.

Included in the circuit formed by the conductors *a* and *b* are one or more signal devices *d* which preferably and as herein illustrated are incandescent electric lamps designed to be fully illuminated by the battery *c*.

In accordance with my invention, although not necessarily, a pair of the lamps *d* are utilized. Whether or not the arrangement is of this character, it is highly desirable that one lamp *d* be so disposed that it extends well above the upper surface of the car roof, it also being desirable that a lamp *d* be disposed laterally with respect to the side of the car. Preferably, the lamps *d* are exposed both at the front and rear whereby they are visible both from the front and rear of the train. Furthermore, said lamp *d* should have each light path spanned by transparent sheet material of amber or other color significantly different from the red and green signals customarily used in railroad work.

With a car A equipped as described above, the circuit including the lamps *d* and extending from the terminals of the battery *c* is normally open. Accordingly, the lamps *d* normally are non-luminous. However, should a fire condition develop in the material contained in the car A, heat is transmitted to the core *1* of the cable C and the latter becomes molten when elevated sufficiently in temperature. When this happens, the core *1* and sheath *4* are short-circuited, whereby the circuit from the terminals of the battery *c* which includes the lamps *d* is closed or completed. As a result, the lamps *d* are energized.

In freight train operation, it is customary for an attendant of the train to sit in the upper part of the caboose so that he observe the cars in front of him. Thus, the lamp *d* extending above the roof of any car A equipped in accordance with my invention is in the direct field of vision of the aforesaid attendant. As a result, it follows that the occurrence of a fire condition on any car A is quite apt to be promptly observed. Furthermore, the disposition of a lamp *d* laterally of a car side is of importance because placing such a lamp in the field of vision of a train attendant looking forwardly of the train along the side thereof or of the engineman or fireman when the latter look rearwardly.

Furthermore, a lamp or lamps *d* disposed in accordance with my invention are in such position that they are readily observable by a tower attendant. Therefore, should a fire condition have developed and escaped attention of someone on the train, it is more than likely that the same will be observed by some tower or signal attendant who of course will immediately issue a warning concerning the fire condition.

Ordinarily, the cable C is supported interiorly of the car solely by clamps or the like. The conductors *a* and *b* forming the battery and lamp circuit may extend through suitable conduits if desired.

A fire detecting system of the character described above affords satisfactory protection for a car A while in transit. When the latter is to be stored or disposed in a yard, depot, or the like for any length of time, it is highly desirable that a supplementary protective arrangement be provided and this is true, more particularly, when a number of cars A are to be disposed in the same yard or depot, and it is desired that they be brought effectively under the observation of a watchman or the like located more or less distantly from said yard or depot.

In accordance with this broad and important

phase of my invention, the fire detecting cable C on the car A is adapted to be connected into a suitable stationary signalling or control circuit which is of the supervised type. To this end, the car A may carry a contact-making device or receptacle *e* mounted in some conveniently accessible place on said car A. Somewhat diagrammatically, the receptacle *e* is shown in Fig. 4 as comprising two pairs of contact elements, one pair of said contact elements being connected by conductors *f* and *g* to the core *1* and sheath *4*, respectively, at one end of the cable C, the aforesaid conductor *a* being connected to the contact element of the other pair of contact elements, and a conductor *h* leading from the sheath *4* at the other end of the cable C to the other contact element of said other pair of contact elements. Associated with that contact element to which the conductor *a* is connected is a contact member *a1* connected by a conductor *a2* to the same terminal of the battery *c* as the conductor *a* is connected to in Fig. 2.

Normally, the contact member *a1* engages its contact element so that the circuit is complete between the conductors *a* and *a2*. However, the circuit between these two conductors *a* and *a2* is adapted to be broken when a suitable plug is associated with the receptacle *e* as hereinafter described.

Adapted for association with the receptacle *e* is a plug *e1* which preferably comprises blade contact members adapted to be slidably related to the respective contact elements of said receptacle *e*. Connected to the plug *e1* is a cable K, the conductors *8*, *10*, *9* and *7* of which are connected to the respective blade contact members of said plug *e1*. The conductors *8*, *10*, *9* and *7* lead to any suitable control and signal circuit which as herein illustrated, but not necessarily, is of the character disclosed in my pending application Serial No. 388,148, filed August 24, 1929. The relays, signal devices, etc. of said control and signal circuit may be mounted on a panel, not shown, disposed in an office, watchman's booth or other space either within, without or far removed from the aforesaid yard or depot in which the car A is stored.

In accordance with my invention, a car A, as soon as it is brought to the aforesaid yard or depot, has a plug *e1* associated with the receptacle *e* carried thereby. The plug *e1* is so designed that the blade contact member which is to be associated with the contact element to which lead the conductors *a* and *a2* is operative, when the plug *e1* is inserted in the receptacle *e*, to automatically open the prior existing circuit between contact member *a1* and its associated contact element, this prior existing circuit being automatically reestablished by closure of the contact member *a1* upon its associated contact element when the plug *e1* is withdrawn from the receptacle *e*.

It results, therefore, that the act of inserting the plug *e1* into the receptacle *e* automatically opens the circuit of the battery *c* and lamps *d*, this being the hereinbefore described signaling circuit adapted for use during transit of the car A. As a further result of the insertion of the plug *e1* into the receptacle *e*, the cable section C on the car A is inserted in the circuit including the conductors *8*, *10*, *9* and *7*. That is, the core *1* and sheath *4*, at one end of said cable section C, are connected by the respective conductors *a* and *h* to the conductors *8* and *10*, while the core *1* and sheath *4*, at the other end of said cable section

C, are connected by the respective conductors *f* and *g* to the conductors 7 and 8. The fire detecting cable on the car A is thereby connected in the supervised circuit now to be described whereby an alarm will be given in the event that a fire condition should develop on the car A while it is in the storage yard or depot.

As stated above, the herein described supervised circuit is of the character disclosed in my pending application Serial No. 388,148, filed August 24, 1929, and that circuit comprises relays R, R¹, R² and R³. The conductors 7 and 8 terminate in and include the winding of relay R. The conductor 9 includes the armature 11 of relay R¹ and is connected to one terminal of a suitable source of electrical energy E. The conductor 10 includes the winding of relay R² and is connected to the other terminal of said source of electrical energy E. The winding of relay R¹ is connected across the aforesaid conductors 9 and 10 and hence across said source of electrical energy E.

A second source of electrical energy E¹ has the respective conductors 12 and 13 connected to the terminals thereof. Conductor 12 is connected to the aforesaid conductor 10 while the conductor 13 terminates in a contact coactable with the armature 11 of relay R¹.

Connected to the terminals of a suitable signal device S are the respective conductors 14 and 15. Conductor 14 terminates in a contact coactable with an armature 16 of the relay R¹ while the conductor 15 is connected to the aforesaid conductor 13.

The relay R² comprises armatures 17 and 18. Conductors 19 and 20 terminate in contacts coactable, respectively, with said armatures 17 and 18, said conductors 19 and 20 including the winding of relay R³.

A conductor 21 terminates in a contact coactable with the aforesaid armature 18, said conductor 21 leading to one terminal of a suitable signal device S¹, the other terminal of which is connected by a conductor 22 to one terminal of another signal device S². The other terminal of the latter is connected to a conductor 23 leading to and connected to the aforesaid conductor 9. An extension of the conductor 23 leads to and is connected to an armature 24 of the aforesaid relay R³.

The relay R comprises an armature 25 to which is connected a conductor 26 leading to the armature 17 of relay R² and also to the conductor 9.

A conductor 27 comprises contacts coactable, respectively, with the armature 25 of relay R and with the armature 24 of relay R³. Connected to the conductor 27 is a conductor 28 leading to one terminal of a suitable signal device S³, the other terminal of which is connected, by a conductor 29, to the aforesaid conductor 10 which also has connected thereto a conductor 30 leading to the aforesaid armature 18 of relay R².

Conductors 31 and 32 connected, respectively, to the conductors 19 and 21 lead to an auxiliary suitable signal device or devices, not shown, but which, ordinarily, is or are disposed in a region remote from the signal devices S¹ and S².

The condition of the various relays, including their armatures, is as illustrated in Fig. 4 if it is assumed that the cable and associated circuit conditions are normal, such as exist when the aforesaid core 1 is in its non-molten state; when there are no broken wires or loose connections in the cable C or any of the associated equipment, including the various signals, connected

therewith; and when the voltage of the source of electrical energy E is at a proper value and that the circuit thereof is not open.

The herein described source of electrical energy E may be, and ordinarily is, an ordinary six volt storage battery. This battery E constitutes the main source of supply of electrical energy, the other source of electrical energy E¹ being supplementary and utilizable, if desired, in the event that the voltage of the main battery E decreases to an abnormal extent; ordinarily, the supplementary battery E¹ may comprise a plurality of dry cells suitably connected whereby the voltage thereacross is substantially six volts.

A circuit arrangement of the character hereinbefore described involves a plurality of semi-independent circuits so arranged that there may be electrical supervision of (1) the fire detecting cable C and equipment associated directly therewith; (2) the various signals; and (3) the source of electrical energy E. Further and primarily, the circuit arrangement is such that an indication or other control function is obtained in the event that the core 1 becomes molten.

Cable supervision

As hereinbefore described, the conductor 9 extends from one terminal of the battery E and is connected to the core 1 of cable C, the conductor 7 also connected to said core 1 leading to one terminal of the winding of relay R, the other terminal of which is connected to the sleeve 4 of cable C by the conductor 8, said sleeve 4 being connected to the conductor 10 which leads back to the other terminal of the battery E. In this circuit, the armature 11 of relay R¹ is included, as are the windings of relays R and R². The winding-characteristics of relays R and R², however, are different and so arranged that the current flow is sufficient to cause the relay R to be operated, but insufficient to cause the relay R² to be operated. Hence, under normal conditions, the armatures of relays R and R² remain in the position illustrated.

If the just described circuit should be broken for any reason, the relay R is deenergized and, therefore, its armature 25 moves into engagement with the contact at the adjacent end of conductor 27. As a result, a circuit is closed through the signal device S³, this circuit including the conductor 9 leading from the positive terminal of battery B, the conductor 26, armature 25, conductor 27, conductor 28, the signal device S³, conductor 29, and thence back to the negative terminal of the battery E by way of conductor 10. The signal device S³ is actuated by the resultant current flow to indicate the presence or existence of an open circuit or loose connection such, for example, as might occur if, for any reason, the continuity of the core 1 should be disturbed.

Signal supervision

As hereinbefore described, the conductor 9 extends from one terminal of the battery E to the conductor 23, to and through the energizing winding of signal device S², the conductor 22, to and through the energizing winding of signal device S¹, conductor 21, conductor 32, to and through the energizing winding of the remotely positioned signal device, conductor 31, conductor 19, winding of relay R³, conductor 20, armature 18 of relay R², conductor 30, and thence by way of conductor 10 back to the negative terminal of the battery E.

In the circuit just described, the resistance characteristics of the various signal devices, on the one hand, and the winding characteristics of relay R3, on the other hand, are different to an extent permitting operation of said relay R3 without causing operation of any of the signal devices. Accordingly, relay R3 maintains its armature 24 in the position illustrated.

Should the just described circuit be broken for any reason, the circuit through the winding of relay R3 is opened and this relay becomes deenergized to permit its armature 24 to engage the contact at the adjacent end of conductor 27. In response to such deenergization of relay R3, a circuit is completed through the signal device S3, this circuit extending by way of conductor 9 from the positive terminal of battery E, conductor 23, armature 24 of relay R3, conductor 27, conductor 28, signal device S3, conductor 29, and thence back to the negative terminal of battery E by way of the conductor 10. The signal device S3 is actuated by the resultant current flow to indicate the presence of any trouble, such as a broken wire or loose connection, in the signal devices S1, S2 or the remotely positioned signal device connected to the conductors 31 and 32.

Battery supervision

As hereinbefore described, the conductor 9 extends from one terminal of battery E and has one terminal of the winding of relay R1 connected thereto, the other terminal of said winding being connected to the conductor 13 which leads back to the other terminal of the battery E. Due to the current flow in the circuit just described, the relay R1 is maintained in energized condition and, accordingly, its armature 11 is maintained in the position illustrated in Fig. 4.

Should the last described circuit be broken or should the current flow therein decrease to an abnormal extent, the relay R1 is deenergized, its one armature 11 moving into engagement with the contact at the end of conductor 13 and its other armature 16 moving into engagement with the contact at the end of conductor 14.

As a first result of the just described deenergization of relay R1, a circuit is established from the positive terminal of battery E1, conductor 13, conductor 15, the signal device S, conductor 14, armature 16 of relay R1, conductor 10 and thence back to the negative terminal of battery E1 by way of the conductor 12. Accordingly, the signal device S is actuated to thereby indicate an abnormal condition of the battery E.

As a second result of the above described deenergization of relay R1, the positive terminal of battery E1 is connected by conductor 13 to the armature 11 of said relay R1. The negative terminal of battery E1 is permanently connected by the conductor 12 to the conductor 10 and, accordingly, as will be obvious from Fig. 4, the armature 11 of relay R1, by moving to its deenergized position, substitutes the battery E1 for the battery E.

In the manner described above, an indication is obtained of an abnormal condition of the main battery E by current flowing from the auxiliary battery E1. At the same time, and during the persistence of said indication, the auxiliary battery E1 is substituted for the battery E to thereby maintain the entire system in its operative condition.

When the battery E is restored to its normal condition, relay R1 is energized and, accordingly, the main battery E is restored to service, the battery E1 being automatically eliminated.

Fire detection

As hereinbefore described in connection with the supervision of cable C and under normal conditions, the winding characteristics of relays R and R2 are different to an extent permitting operation of the relay R but insufficient to cause operation of the relay R2. Accordingly, under normal operating conditions, the armatures of relays R and R2 are in the position illustrated in Fig. 4.

Should the cable C, in any section or region thereof, be exposed to fire or other abnormal high temperature conditions, a section of the core 1 becomes molten and moves or comes into engagement with the sheath 4 to thereby cause a short circuit.

As a result, the prior existing circuit through the relay R is shunted out by the short circuiting core material and, due to the low resistance of said material as compared with the resistance of the winding of relay R2, sufficient current traverses the winding of relay R2 to cause energization of the same. Relay R2, accordingly, attracts its armatures 17 and 18. The latter, due to its movement from the contact at the end of conductor 20, opens the heretofore described circuit of the winding of relay R3, this circuit including the signal devices S1, S2 and the remotely positioned signal device. As a result, relay R3 is deenergized and its armature 24 moves into engagement with the contact at the adjacent end of conductor 27.

Energization of relay R2, as described above, causes actuation of the signal devices S2 and S1, the energizing circuit for the latter extending from the positive terminal of battery E, conductor 9, conductor 23, signal device S2, conductor 22, signal device S1, conductor 21, armature 18 of relay R2, conductor 30, and thence by way of the conductor 10 back to the negative terminal of battery E.

Energization of relay R2 also causes actuation of the remotely positioned signal device, the energizing circuit therefor extending from the positive terminal of the main battery E, conductor 9, conductor 26, armature 17 of relay R2, conductor 19, conductor 31, the remotely positioned signal device, conductor 32, conductor 21, armature 18 of relay R2, conductor 30, and thence by way of conductor 10 back to the negative terminal of battery E.

Deenergization of the relays R and R3 causes actuation of the signal device S3, the energizing circuit for the latter extending from the positive terminal of the main battery E, conductor 9, conductor 23, armature 24 of relay R3, conductor 27, conductor 28, the signal device S3, conductor 29, and thence back to the negative terminal of battery E by way of conductor 10; a parallel circuit for energizing the signal device S3 extends from conductor 9, and includes the conductor 26, armature 25 of relay R, conductor 27, conductor 28, the signal device S3, and thence by way of the conductor 29 back to the other battery conductor 10.

The hereinbefore described signal devices may be of such character as is suitable or desirable. They may be audible, visual, or a combination thereof; if desired, some or all of the signal devices may be replaced by other control mechanism utilizable for any desired purpose. However, in accordance with preferred present practice, it is desirable that the signal devices S and S3 be ordinary bells; that the signal device S1

be a fire gong of the vibrating type; that the signal device S2 be a fire gong of the single stroke type; and that the remotely positioned signal device be a gong having suitable characteristics.

5 As above stated, the signal device S3 operates in response to the presence of an open circuit in the main electrical circuit, namely, the circuit including the core and sleeve of the fire detecting cable C; furthermore, said signal device S3
10 operates in the event of trouble, as a broken wire or loose connection, in the signal devices S1, S2 or the remotely positioned signal device.

The signal device S indicates that the main battery E has become exhausted or that it is
15 not properly supplying current to the fire detecting cable. As hereinbefore specifically pointed out, the auxiliary battery E1 is automatically substituted for the main battery E should the latter fail to function properly. The initiation
20 of operation of the signal device S is effected as soon as such substitution has taken place and the operation thereof continues until the main battery E has been restored to service.

The signal devices S, S2 and the remotely
25 positioned signal device are actuated upon the occurrence of a fire condition or a temperature simulation thereof in the immediate vicinity of cable C. Obviously, the signal devices S1 and S2 are of extreme importance in the operation
30 of my system and, as pointed out above, they are under direct supervision so that corrective measures may be taken should they not be in operative condition. As an added measure of safety and as hereinbefore pointed out, the signal device S3 is also operative in conjunction with the
35 signal devices S1, S2 and the remotely positioned signal device upon the occurrence of a fire condition, as aforesaid.

The remotely positioned signal device may or
40 may not be utilized as desired. In the event that this device is to be omitted, the armature 17 of relay R2 is blocked open and insulated in any suitable manner; at the same time, an electricity-conducting strap or "jumper" is connected
45 across the conductors 31 and 32.

Ordinarily, it is desirable that both the signal devices S1 and S2 be utilized in the manner described; however, under some circumstances it may be desirable to utilize but one of them. As
50 pointed out above, the signal devices S and S3 are ordinary bells; obviously, however, the frequency of the sound produced by each should differ in an identifying manner.

Thus, in accordance with my invention, the
55 simple act of inserting the plug e1 in the receptacle e connects the fire detecting cable C on the car A in the supervised signaling circuit, the operation of which has just been described. In practice, the yard or depot should have a plurality of
60 the cables K each terminating in a plug e1, the various cables K being connected in parallel relation as generally indicated in Fig. 4 wherein the conductors 8a, 10a, 9a and 7a of a second cable K are shown as connected to the respective
65 conductors 8, 10, 9 and 7. From the foregoing it follows that, with the depot or yard properly wired with the cables K, a large number of cars A may be disposed therein and with a cable plug e1 associated with a receptacle e on each car A, it
70 results that all of the cars are connected in the central supervised signaling circuit. When the plug e1 is removed from the receptacle e, the circuit of Fig. 4 is the same as the circuit of Fig. 2 and, under this condition, the signal system is
75 operative with respect to the battery c and the

lamps d as hereinbefore described. This necessarily follows because with the plug e1 removed from the receptacle e, the conductors f, g and h are open at their respective contact elements while the conductors a and a2 are connected at
5 their contact element.

Although my invention, as regards the signaling lamps d, or equivalent, has been particularly described in connection with freight cars, it shall be understood that the invention is not to be thus
10 limited since signaling arrangements as used on the car A are equally applicable to mail cars, baggage cars, express cars, or the like.

As regards that phase of my invention wherein a plurality of cars are to be located in a yard or
15 depot with the temperature responsive devices thereon connected to a central signaling system, it shall be distinctly understood that the invention is of general application and that it is not to be limited to a car A such as disclosed. This is
20 true because this broad idea is applicable to a fire detecting system for practically any vehicle, conveyance, carrier or the like. Thus, boats, yachts, aircraft, automobiles, trucks, or the like may be
25 equipped with a fire indicating system such, for example, as illustrated in Figs. 1 and 2, and the anchorage, hangar, garage or the like may be
30 equipped with a supervised signal system such as shown in Fig. 4 with a number of cables K to be connected individually to the fire indicating
35 systems on the boat, aircraft, truck or the like.

Although the fire detecting system herein illustrated for use on the car A (a similar or equivalent system may be utilized on a boat, aircraft,
40 truck or the like) is of the non-supervised type, the arrangement is such that the association of a plug e1 with a receptacle e places the temperature-responsive device, i. e. the cable C in a supervised circuit. Therefore, each time that a plug
45 e1 and receptacle e are thus associated, it follows that any open circuit or loose connection in the conductors of the cable C or in the immediately associated circuits causes the actuation of a single
50 indicative of some non-operative arrangement in the fire detecting circuit.

The herein described cable C is adapted to exercise its control function when the core 1 becomes molten. Obviously, the constituents of said
55 core 1 may be so chosen that this condition arises upon attainment of any predetermined temperature ambient to said cable C. In ordinary building installations, it has been found desirable for the core 1 to become molten at a temperature of about 160° F. although, as will be understood, this may be varied within such latitude as may be
60 desired.

In Fig. 4, I have illustrated and described a supervisory signaling circuit of a particular character. It shall be understood that all features of this circuit need not be utilized for any given
65 installation and, moreover, it shall be understood that other supervisory circuits may be substituted for the one herein disclosed. Thus, for example, the circuit illustrated in Fig. 2 of my aforesaid application Serial No. 388,148, filed August
70 24, 1929 may be utilized in lieu of the supervisory circuit herein illustrated in Fig. 4.

Obviously, if desired, the arrangement of Figs. 1 and 2 may be employed without providing for connection of the cable of that arrangement to an
75 external circuit by provision of the receptacle e, or equivalent.

As shown, an arrangement is provided at the contact member a1 and its associated contact element for automatically opening the circuit of 75

battery *c* when a plug *e1* is associated with a receptacle *a1*. If desired, a manual switch may be employed in lieu of this automatic switch although the latter appears more desirable.

5 In the appended claims, the term "vehicle" shall be understood as generically comprehending either land, water or air vehicles and more particularly, railroad cars, boats, yachts, aircraft, airplanes, automobiles, trucks or the like. Further-
10 more, the term "fire condition" shall be understood as meaning a fire condition literally or a temperature simulation thereof. Still further, expressions such as "producing a signal" shall be understood as of sufficient breadth to cover the
15 operation of a suitable control device.

While the invention has been described with respect to certain particular preferred examples which give satisfactory results, it will be understood by those skilled in the art after understanding the invention, that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended therefore in the appended claims to cover all such changes and modifications.

25 What is claimed as new and desired to be secured by Letters Patent is:

1. An electrical system for indicating the existence of undesirable thermal conditions in a vehicle comprising a vehicle circuit operative while
30 the vehicle is in transit and including an electrically actuated signal mounted on the vehicle, a source of electrical energy carried by the vehicle and a thermo-responsive device comprising juxtaposed normally insulated conductors mounted
35 on the vehicle for connecting the source of energy to operate the signal device upon the existence of abnormal thermal conditions, and an electrical circuit at a stopping place for the vehicle comprising a source of electrical energy,
40 an electrically actuated device and means for disconnecting the thermo-responsive device from the vehicle circuit and connecting it in circuit with the electrically actuated device at the stopping place with the elements thereof forming a part
45 of a closed circuit with the electrically actuated device and said second mentioned source of energy, the circuit being such that the current flowing therethrough normally operates the electrically actuated device.

50 2. An electrical system for indicating the existence of undesirable thermal conditions in a vehicle comprising a vehicle circuit operative while the vehicle is in transit and including an electrically actuated signal mounted on the vehicle,
55 a source of electrical energy carried by the vehicle and a thermo-responsive device comprising two juxtaposed normally insulated conductors mounted on the vehicle for connecting the source of energy to operate the signal device on the existence of abnormal thermal conditions,
60 and an electrical circuit at a stopping place for

the vehicle comprising a source of electrical energy, two electrically actuated devices, one being operable on a lesser current than the other, and means for disconnecting the thermo-responsive device from the vehicle circuit and connecting
5 it in circuit with the circuit at the stopping place with the elements thereof forming a part of a closed circuit with said second mentioned source of energy and the two electrically actuated devices.

3. An electrical system for indicating the existence of undesirable thermal conditions in a vehicle comprising a vehicle circuit operative while the vehicle is in transit and including an electrically actuated signal mounted on the vehicle,
15 a source of electrical energy carried by the vehicle and a thermo-responsive device mounted on the vehicle for connecting the source of energy to operate the signal device upon the existence of abnormal thermal conditions including
20 a pair of juxtaposed normally insulated electrical conductors one of which is fusible under abnormal thermal conditions, and an electrical circuit at a stopping place for the vehicle comprising a source of electrical energy, two electrically actuated
25 devices, one being operable on a lesser current than the other, and means for disconnecting the thermo-responsive device from the vehicle circuit and connecting it in circuit with the circuit at the stopping place with the elements
30 thereof forming a closed circuit with said second mentioned source of energy and the two electrically actuated devices.

4. An electrical system for indicating the existence of undesirable thermal conditions in a
35 vehicle comprising a vehicle circuit operative while the vehicle is in transit and including an electrically actuated signal mounted on the vehicle, a source of electrical energy carried by the vehicle and a thermo-responsive device mounted on the vehicle, the thermo-responsive
40 device including two normally separated conductors adapted to be electrically connected on the existence of abnormal thermal conditions and connect the source of energy to operate the signal,
45 an electrical circuit at a stopping place for the vehicle comprising a source of electrical energy, two electrically actuated devices, one being operable on a lesser current than the other, and means including a pair of complementary plug
50 connectors one connected into the vehicle circuit and the other connected into the circuit at the stopping place for disconnecting the thermo-responsive device from the vehicle circuit and interconnecting it with the circuit at the stopping
55 place with the conductors of the thermo-responsive device forming a part of the closed circuit including said second mentioned source of energy and the two electrically actuated devices.

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