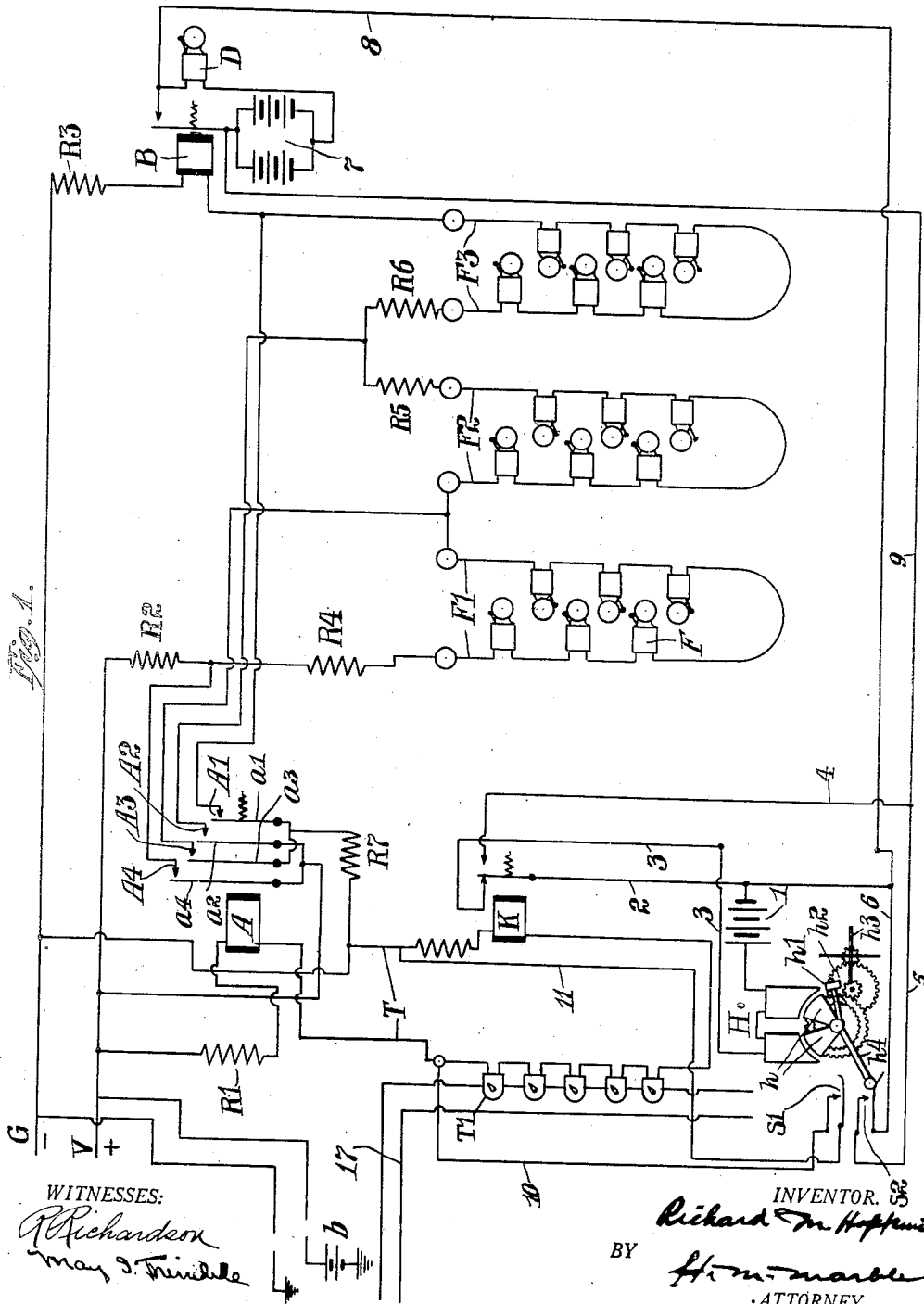


1,349,961.

Patented Aug. 17, 1920.

2 SHEETS—SHEET 1.

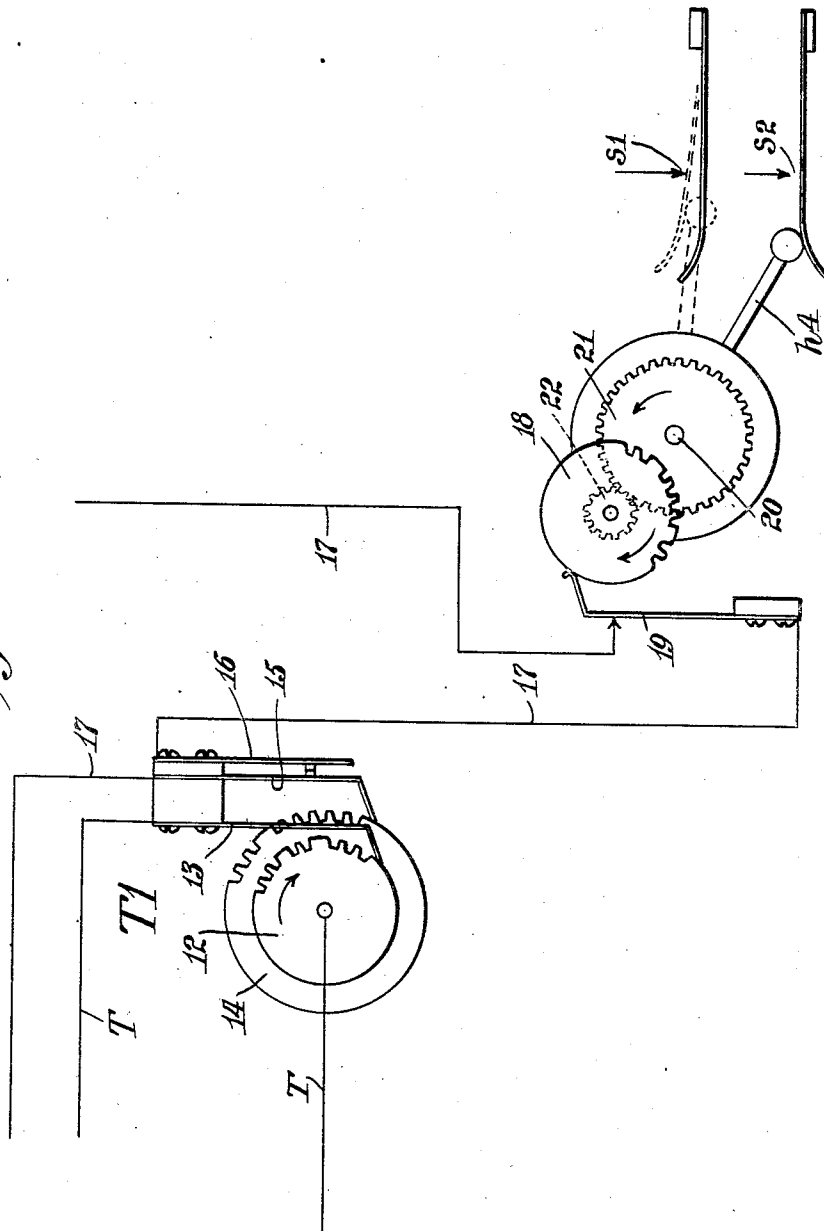


1,349,961.

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2 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

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RICHARD M. HOPKINS, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN DISTRICT TELEGRAPH COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

SIGNALING SYSTEM.

1,349,961.

Specification of Letters Patent.

Patented Aug. 17, 1920.

Application filed October 20, 1916. Serial No. 126,649.

To all whom it may concern:

Be it known that I, RICHARD M. HOPKINS, a citizen of the United States of America, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Signaling Systems, of which the following is a specification.

My invention relates generally to signaling systems, and particularly to systems wherein one or more call boxes, thermostats, burglar alarms, or other transmitting devices are to cause the operation of signal giving devices; and in its particular application herein principally described, my invention comprises an improvement upon, and addition to, a system set forth in the companion application of Joseph F. D. Hoge, Serial No. 124,459, now Patent No. 1,236,434, dated August 14, 1917.

The said Hoge system, the circuits of which are illustrated herein, is particularly intended for a fire alarm system to be used in large stores, warehouses, etc., where, in the event of a fire, alarms are to be sounded at a large number of different points. The said Hoge system provides a plurality of circuits containing alarm giving devices, which circuits are normally in series relation, in order that they may be under test normally, means being provided, however, for switching such circuits, automatically, into multiple relation with the source of current supply, so that derangement of one such circuit shall not prevent operation of the other circuits, and so that there shall be ample current in each circuit for the operation of the alarm giving devices thereof. According to the said Hoge system there is also provided a transmitter circuit, wherein is located one or more transmitters, automatic or otherwise, and when one of these transmitters operates the signal giving devices referred to are caused to operate. As will appear hereafter, this transmitter circuit is also normally under test.

In case of trouble developing in the transmitter circuit, for example, in the event of a break or ground in that circuit, or in event that the current supplied to that circuit falls below some predetermined value, the various alarm giving devices, as well as a certain trouble indicating device, will all operate; but under such circumstances there is no necessity for continued operation of the

alarm giving devices. My present invention, therefore, comprises means whereby, in the event of trouble developing in the transmitter circuit, after a predetermined interval of time the operation of the alarm giving devices is stopped, without, however, stopping the operation of the trouble signal device, and whereby circuit conditions in the circuits other than the transmitter circuit in which the trouble developed, and in the trouble signal circuit, are then restored to normal.

The objects of my invention are to avoid continued operation of the alarm giving devices, due to trouble developed in the transmitter circuit, without discontinuing the operation of the trouble signal; to automatically restore to normal condition, after a predetermined interval of time, the circuits of the system, other than the transmitter circuit in which the trouble developed, and the trouble signal circuit; and to accomplish the above objects in a simple manner and by reliable and relatively inexpensive means.

I will now proceed to describe my invention with reference to the accompanying drawings, and will then point out the novel features in claims. In said drawings:

Figure 1 shows, diagrammatically, an arrangement of circuits and apparatus embodying the said Hoge invention, with circuits and apparatus embodying my invention added thereto; the break wheel and contact pen of the relay H being omitted to avoid confusion of illustration.

Fig. 2 is a fragmentary diagram, on a larger scale, showing means for transmitting a signal to a central station in the event of trouble occurring in the transmitter circuit.

Referring first to Fig. 1: V and G designate, respectively, incoming and outgoing current leads, of which G may be understood to be grounded and V may be understood to contain a grounded battery *b*; and A a multiple-contact relay which effects the switching from series to multiple, as before mentioned. T designates a transmitter circuit and F¹, F² and F³ designate respectively three circuits for alarm giving devices, which devices are designated by character F. B designates a trouble-circuit relay.

The transmitter circuit T starts from

current supply conductor V, and includes a resistance R^1 and a suitable number of transmitters T^1 . These transmitters may be of any suitable type. Conveniently, they may be ordinarily hand-operated call boxes, connected in series in the circuit T, and arranged when operated to successively open and close circuit T so as to send a definite signal, but they may also be automatically released or automatically operated transmitters of well known type, for example, transmitters which are thermostatically controlled or thermostatically operated. The particular type of transmitter employed is unimportant, so far as my present invention is concerned.

The alarm giving devices F may be of any suitable type; conveniently, they may be electric bells, as indicated diagrammatically; but they may also be electric whistles, or buzzers, or any other devices suitable for giving signals, either visual or audible.

The transmitter circuit T, besides including the transmitters T^1 , as above stated, includes the magnet of the switching relay A, preferably located on the incoming side of the circuit T. The normal or test circuit for the alarm giving circuits F^1 , F^2 and F^3 , is as follows:

From current supply conductor V through resistances R^2 , and R^4 , to one side of circuit F^1 , and through that circuit F^1 and circuit F^2 in series, to resistance R^5 , thence through resistance R^6 , through circuit F^3 and thence through the magnet of relay B and resistance R^3 to the other current supply conductor G. Between resistances R^2 and R^4 there is a current tap leading to back contact A^4 of relay A. Between circuits F^1 and F^2 there is a current tap leading to back contact A^3 of relay A. Between resistances R^5 and R^6 (and therefore between circuits F^2 and F^3) there is a current tap leading to relay back contact A^2 ; and from the return side of the circuit F^3 there is a current tap leading to relay back contact A^1 . The armature contacts a^4 and a^2 are connected to current supply conductor V, and the armature contacts a^3 and a^1 are connected, preferably through a suitable resistance R^7 , to return conductor G.

Trouble signal relay B controls, through a back contact, a trouble circuit containing a signal giving device (such for example as a bell) D, and a source of current supply therefor. It will be clear that when the armature of relay B is released, the signal device D will operate or sound.

From the foregoing it will be clear that, normally, circuits F^1 , F^2 and F^3 are in series relation with respect to conductors V and G, and therefore that in case of an interruption or ground in any one of these circuits, or in case the current supply falls below some predetermined value, the magnet

of relay B will be deenergized, or at least, its magnetization will fall to so low a value, as to permit the release of the armature of that relay, with consequent closing of the circuit of the trouble signal device D, and the consequent giving of a trouble signal. Owing to the relatively large resistance in this series circuit, due both to the length of the several circuits F^1 , F^2 and F^3 comprising that circuit, and the resistance of the magnets of the bells or other signal giving devices included in that circuit, as well as to the various resistances R^2 , R^4 , R^5 , and R^6 and R^3 , included in that series circuit, the current employed for testing will be very small.

In case an alarm be given by one of the transmitters T^1 , the magnet of relay A will be deenergized and the various armature contacts a^1 — a^4 , will drop back and make contact with their various back contact stops A^1 — A^4 , so connecting the several alarm giving circuits, F^1 , F^2 and F^3 separately to the conductors V and G, as follows:

F^1 is connected with conductor V through contacts a^4 and A^4 and resistance R^4 , and is connected with conductor G through contacts A^3 and a^3 . F^2 is connected with conductor V through contacts a^2 and A^2 and resistance R^5 , and is connected with conductor G through contacts A^3 and a^3 . F^3 is connected with conductor V through contacts a^2 and A^2 and is connected with conductor G through contacts A^1 and a^1 . It will thus be seen that upon the operation of any one of the transmitters T^1 each of the circuits F^1 , F^2 and F^3 is connected, independently of each of the other of said circuits, to conductors V and G, and each such circuit F^1 , F^2 and F^3 receives current of a strength determined by the resistance in that circuit. The various resistances indicated are regulating resistances, of values determined at the time of installation, and are such that current of a strength required for the operation of the various signal giving devices F in each such circuit, will be supplied. It will be understood that the initial or test current, passing through such circuits when they are in series relation, is not sufficient to cause the operation of the various alarm giving devices F, but when the several circuits F^1 , F^2 and F^3 are in multiple relation, the current received by such circuits will be ample to cause the operation of all of the devices F.

It will be obvious that in case circuit T should be broken or grounded between conductor V and the point of connection of relay A to such circuit T, relay A will operate, so that this portion of circuit T is normally under test. It will be explained hereafter that, by means of the relay H, to be referred to hereafter, the trouble sig-

nal device B—D is operated in the case of a ground in circuit T at a place between the point of connection of relay A to that circuit T, and the point of connection of relay K to that circuit. The trouble signal device B—D therefore operates either in the event of a break or ground in one of the circuits F^1 , F^2 and F^3 or in the circuit T, so that this trouble signal operates either in the case of trouble or in case of an alarm.

As so far described, the circuits and apparatus (except relays K and H) are those of the Hoge system above referred to. It will be clear that if the signal giving devices F are devices which operate or give a signal or alarm, so long as a current of operating value is passing through them, then in the event of trouble in the circuit T, such as a break or ground or undue decrease of the current supply to the circuit, the signal giving devices F will continue in operation indefinitely, and undesirably. To prevent this, I provide a delay action relay H, in connection with another relay K, and circuits as will be described presently. The relay H is represented diagrammatically as a relay in which, in event of deenergization of its magnet, clockwise rotation of its armature h will be caused by a weight h^1 ; such clockwise rotation being retarded by a suitable retarding device such as a ratchet-driven gear train h^2 operating a fan h^3 ; and this armature also carries an arm h^4 , which, in the early part of its clockwise movement, will permit closure of a contact s^2 , while later in its movement will cause the closing of a contact s^1 . The magnet of relay K is included in the transmitter circuit T, and a battery or other source of current supply, 1, is normally included in a circuit 2—3 passing through the armature and front contact of relay K and through the magnets of relay H.

When relays A and K are operated through the normal operation of one of the transmitters T^1 , the circuit of relay H is broken and again completed at such short intervals that, although contact s^2 is completed and broken, in correspondence with the signal of the transmitter T^1 operating, yet owing to the action of the retarding train h^2 and fan h^3 , contact s^1 is not completed. But in the event that a break occurs in circuit T, the magnets of relay H are deenergized for a sufficient time to permit the closing of contact s^1 of that relay, and a circuit is completed through conductor 10, contact s^1 and conductor 11, which bridges or shunts the transmitters T^1 , thus cutting out the effect of a break in the transmitter circuit, without energizing the magnet of relay K. Also, the magnet of relay A being again energized, as a result of the closing of contact s^1 , the armatures of that relay A are again attracted, and the various

circuits F^1 , F^2 and F^3 are restored automatically to their normal series relation, and the operation of the alarm devices F ceases. This automatic restoration is a feature of some importance, because, in certain alarm systems now in use the operation of the alarm giving devices, such as devices F, in the event of development of trouble in the transmitter circuit, results in the blowing of certain fuses, or other derangement of apparatus which requires a visit of an attendant and manual repair. According to my present invention, however, this is not necessary, because, as just explained, the instant the circuit T is completed by the relay H through contact s^1 , the relay A is returned to normal condition automatically.

During the time that contact s^2 is closed, a circuit is completed from battery 7 through signal device D, conductor 8, contact s^2 , and conductors 5 and 9 back to battery. The armature of relay K when against its back stop, completes the same circuit through signal device D, through circuit branches 2, 6, and 4; the armature and rear contact of relay K being connected in multiple with contact s^2 .

It is desirable in many cases to transmit a signal to a central station when trouble has developed. To this end a suitable break wheel and pen may be provided on the relay H. One type of alarm transmitter T^1 commonly used in the circuits of this system, comprises means for sending a signal to a central station, as well as means for operating the circuit T to cause the operation of the signal devices F. Without limiting myself to details of construction, in Fig. 2 I have indicated, diagrammatically, an arrangement of break wheels and contact pens which may be employed in such a transmitter; 12 designating the break wheel, and 13 the corresponding contact pen, for circuit T, and 14 designating the break wheel and 15 and 16 contact pens, for the central station circuit 17. I have not shown the clock train for driving these break wheels, but it may be assumed that the clock train of an ordinary call box is used for the purpose. Likewise, in Fig. 2 the break wheels are shown as of different diameters, for convenience in illustration only. It will be clear that when the transmitter to which these break wheels belong is operated, not only will the break wheel 12 and pen 13 break and close the circuit T in accordance with the signal to be transmitted, but also that break wheel 14 and pens 15 and 16 will alternately break and close central station circuit 17 in accordance with the signal to be transmitted through that circuit.

Now, in order that relay H, when operated by something other than an ordinary signal, may transmit a signal through the circuit 17, that relay H is provided with a

break wheel 18 and pen 19, connected in the circuit 17; this break wheel being, in the construction shown, gear-connected to the armature shaft of the relay by gears 21 and 22; and when the relay is in normal condition, the end of the pen 19 is at such distance from the beginning of the signal-toothed portion of break wheel 18, that small motions of the armature of the relay, such as are due to normal operation of the transmitters T¹, do not bring the toothed portion of the break wheel opposite the pen 19; while, on the other hand, a more prolonged motion of the armature of the relay, such as is due to a break, short or ground in the circuit T, causes the teeth of this break wheel to pass the pen 19, so sending the signal of that break wheel through the circuit 17.

In the event of a ground in circuit T, beyond the point of connection of relay A to that circuit T, the magnet of relay K is deenergized, with resulting deenergization of the magnet of relay H, and resulting closing of contact s², which causes the operation of the trouble signal D and also the sending of a signal, by relay H, through circuit 17.

It will thus be seen that not only is a trouble signal given in the event of a break or ground in any of the circuits F¹, F² and F³, but also that a trouble signal is given in the event of a break or ground in circuit T.

It will further be understood that upon the repair of a break or ground in circuit T the magnet of relay K is again energized automatically with resulting automatic restoration of relay H. Therefore there is nothing in this system requiring manual restoration by an attendant after repair of a break or ground. The apparatus is in all respects self restoring.

What I claim is:—

1. In a signaling system, the combination with a source of current supply and a transmitter circuit containing one or more transmitters, of a signal giving circuit including one or more signal-giving devices, means controlled by said transmitter circuit and arranged to cause the signal-giving device or devices to operate in the event of operation of one of the said transmitters, means for passing a low test current through said signal-giving circuit normally, a trouble signal device arranged to operate in the event of substantial or complete failure of said test current, and means controlled by said transmitter circuit and also controlling said trouble signal device and arranged to stop the operation of said signal-giving device or devices and to cause the operation of said trouble signal device, in the event of development of trouble in the transmitter circuit.

2. In a signaling system, the combination with a source of current supply and a transmitter circuit containing one or more transmitters, of a signal-giving circuit including one or more signal-giving devices, means controlled by said transmitter circuit and arranged to cause the signal-giving device or devices to operate in the event of operation of one of said transmitters, and means controlled by said transmitter circuit for closing a shunt around said transmitters in the event of development of trouble in the portion of the transmitter circuit included between the ends of such shunt connection.

3. In a signaling system, the combination with a source of current supply and a transmitter circuit containing one or more transmitters, of a signal-giving circuit including one or more signal-giving devices, means controlled by said transmitter circuit and arranged to cause the signal-giving device or devices to operate in the event of operation of one of said transmitters, a trouble signal device and means controlled by said transmitter circuit and comprising a delay action relay arranged to close a shunt around said transmitter or transmitters, and also to cause the operation of such trouble signal device, in the event of development of trouble in the transmitter circuit.

4. In a signaling system, the combination with a source of current supply and a transmitter circuit containing one or more transmitters, of a signal-giving circuit including one or more signal-giving devices, means controlled by said transmitter circuit and arranged to cause the signal-giving device or devices to operate in the event of operation of one of said transmitters, a trouble signal device, a relay included in said transmitter circuit and arranged to be operated by the operation of a transmitter in such circuit or by development of trouble in such circuit, and a delay action relay controlled by said first mentioned relay and arranged to close a shunt around such transmitter or transmitters in the event of prolonged interruption or grounding of such transmitter circuit and also in such event to cause the operation of said trouble signal device.

5. In a signaling system, the combination with a source of current supply and a transmitter circuit including one or more transmitters, of a signal-giving circuit including one or more signal-giving devices, a trouble signal relay included in that circuit, means actuated by the transmitter circuit for causing the operation of said signal giving devices and said trouble relay in the event of trouble in the transmitter circuit or in the event of operation of one of the transmitters therein, a trouble signal device and a circuit

therefor arranged to be operated by said trouble signal relay in the event of trouble in the transmitter circuit, a normally open circuit spanning the transmitter circuit, a delay action relay controlled by the transmitter circuit and arranged to close such spanning circuit in the event of continued existence of trouble in such transmitter circuit, and a circuit leading through the trouble signal device and through contacts of said delay action relay, and arranged to be closed by said delay action relay upon operation thereof.

6. In a signaling system, the combination with a source of current supply and a transmitter circuit containing one or more transmitters, of a signal-giving circuit including one or more signal-giving devices, means controlled by said transmitter circuit and controlling said signal-giving circuit and arranged to cause the signal-giving device or devices to operate in the event of operation of one of said transmitters, a trouble signal device, and means controlled by said transmitter circuit and comprising a delay action relay arranged to close a shunt around said transmitter or transmitters, and also to cause the operation of such trouble signal device, in the event of development of trouble in the transmitter circuit, said relay comprising transmitting means arranged to transmit a signal in the event of development of trouble in the transmitter circuit.

7. In a signaling system, the combination with a source of current supply, a transmitter circuit containing one or more transmitters, and a further signal circuit, likewise containing such transmitters, said transmitters arranged to transmit signals through both such circuits when operated, of a signal-

giving circuit including one or more signal-giving devices, means controlled by said transmitter circuit, and controlling such signal-giving circuit, and arranged to cause the signal-giving device or devices to operate in the event of operation of one of said transmitters, and means controlled by said transmitter circuit and arranged to stop the operation of said signal-giving device or devices, and also to transmit a signal through such further signal circuit, in the development of trouble in the transmitter circuit.

8. In a signaling system, the combination with a plurality of transmitters, each adapted for transmitting signals simultaneously through two separate circuits, a transmitter circuit and a further signal circuit, through which such transmitters may send signals, and a source of current supply for said transmitter circuit, of a signal-giving circuit including one or more signal-giving devices, means controlled by said transmitter circuit and arranged to cause the signal-giving device or devices to operate in the event of operation of one of said transmitters, and a delay action relay controlled by said transmitter circuit, and arranged to stop the operation of said signal-giving device or devices, after a predetermined interval of time, and also to send a signal through such further signal circuit in the event of development of trouble in the transmitter circuit.

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

RICHARD M. HOPKINS.

Witnesses:

GRACE HILDEBRANT,
CATHERINE J. FLEMING.