No. 820,823. PATENTED MAY 15, 1906.

J. P. ROBERTSON.

ELECTRICAL FIRE ALARM APPARATUS.

APPLICATION FILED JULY 17, 1903.

6 SHEETS—SHEET 1.

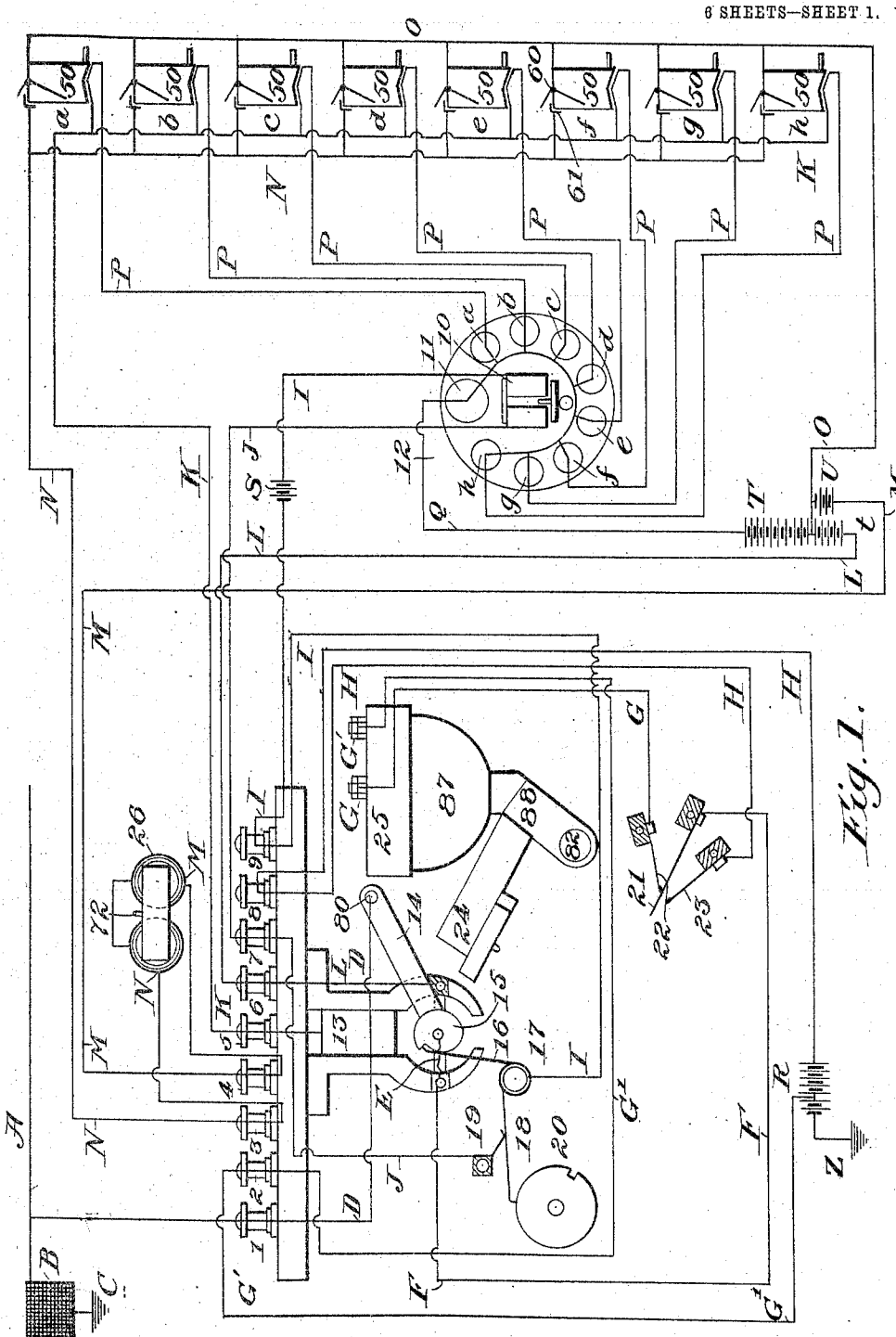

Fig. 1.

Witnesses:
L. L. Andrews Jr.
Russell B Russell.

Inventor:
James Percival Robertson
By H. M. Marble
Attorney

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6 SHEETS—SHEET 2.

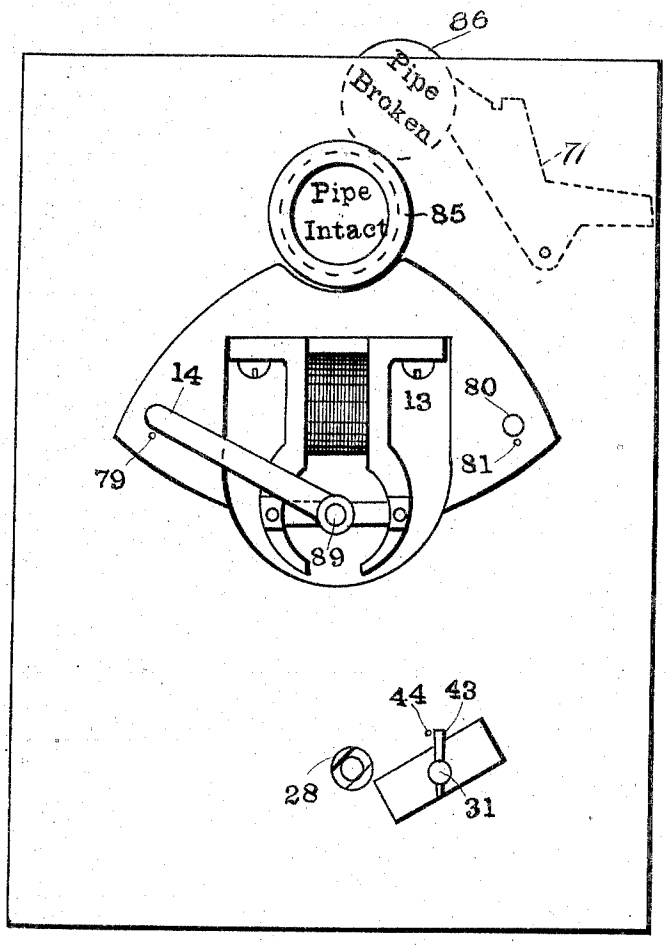

FIG. 2

Witnesses
Minnie Pope
C. F. Cunningham

Inventor
James Percival Robertson
By H. M. Marble
Attorney

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6 SHEETS—SHEET 3.

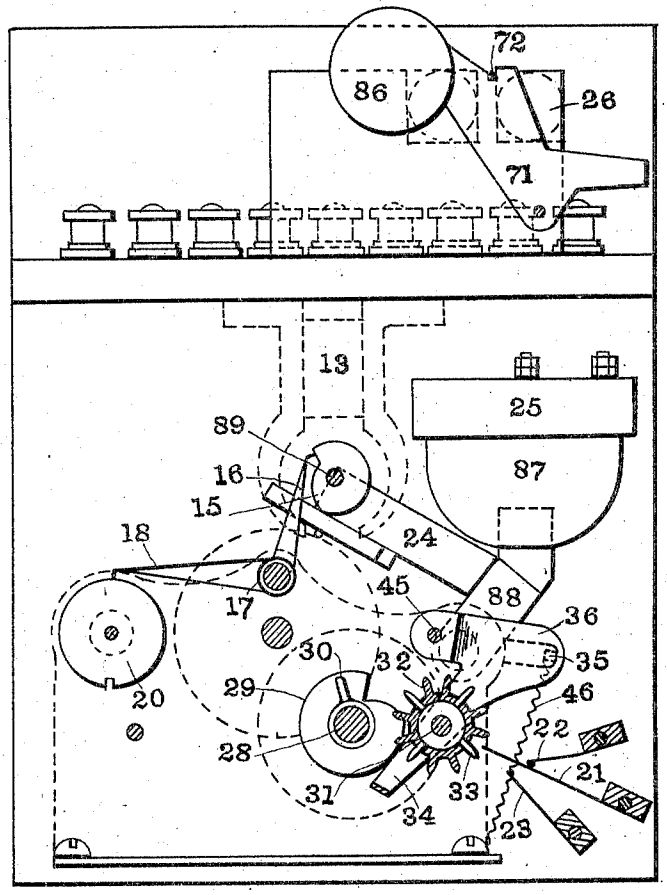

FIG. 3

Witnesses
Minerva Pope
C. F. Carrington

Inventor
James Percival Robertson
By H. W. Marble
Attorney

No. 820,823. PATENTED MAY 15, 1906.

J. P. ROBERTSON.

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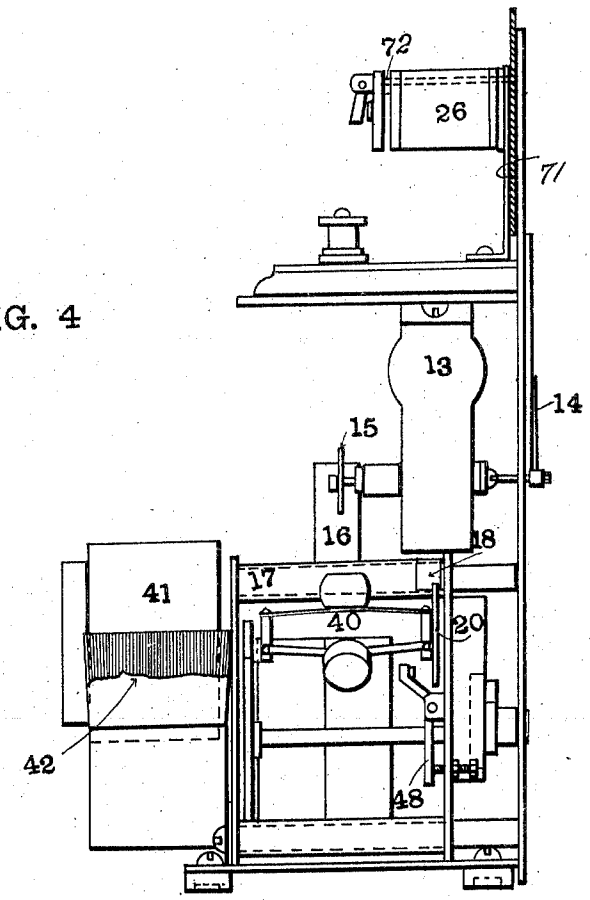
6 SHEETS—SHEET 4.

FIG. 4



Witnesses
Minnie Lape
C. F. Cunningham

Inventor:
James Percival Robertson
By H. M. Marble
Attorney

No. 820,823. PATENTED MAY 15, 1906.

J. P. ROBERTSON.

ELECTRICAL FIRE ALARM APPARATUS.

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6 SHEETS—SHEET 5.

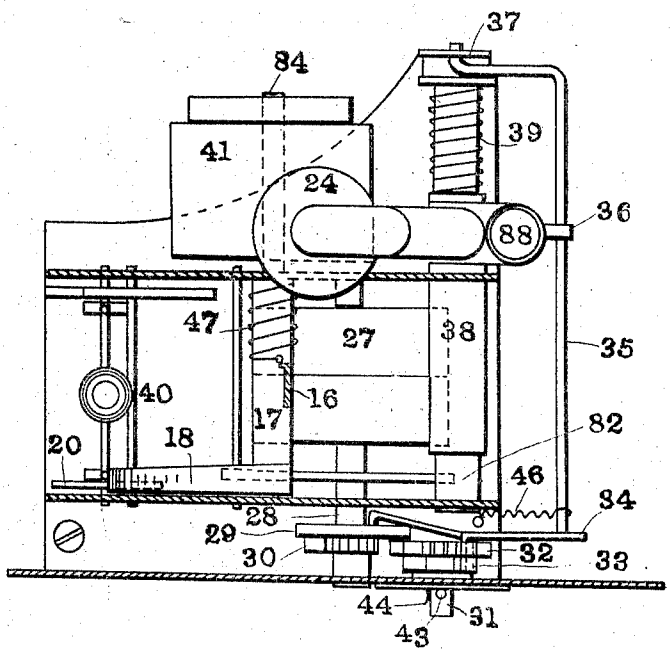

FIG. 5

Witnesses
Minerva Pope
C. F. Cunningham

Inventor
James Percival Robertson
By H. M. Marble
Attorney

No. 820,823. PATENTED MAY 15, 1906.

J. P. ROBERTSON.

ELECTRICAL FIRE ALARM APPARATUS.

APPLICATION FILED JULY 17, 1903.

6 SHEETS—SHEET 6.

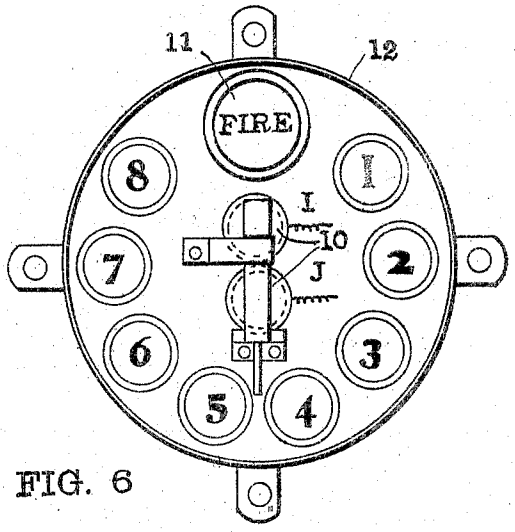

FIG. 6

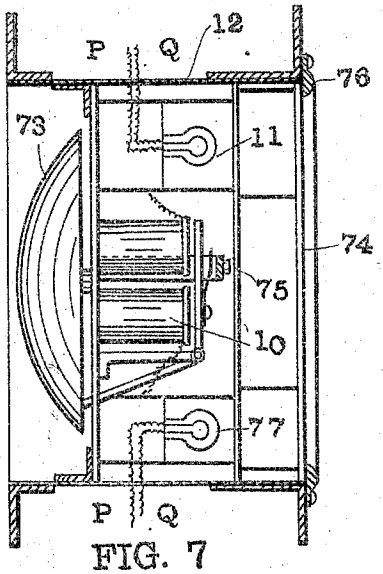

FIG. 7

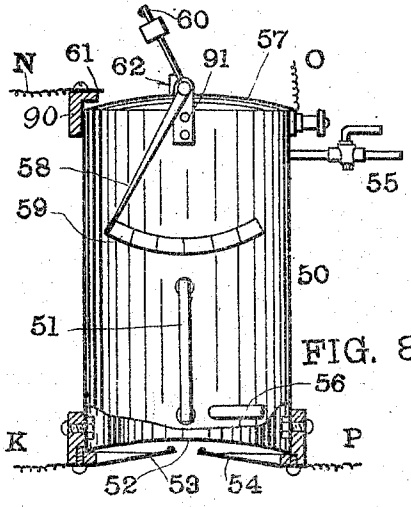

FIG. 8

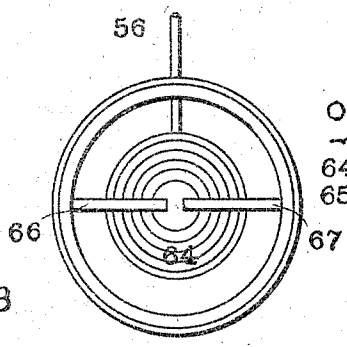

FIG. 10

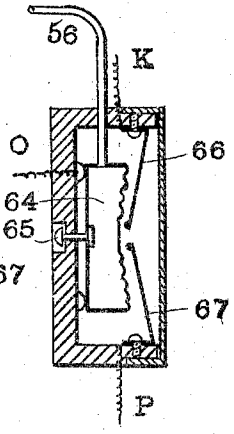

FIG. 11

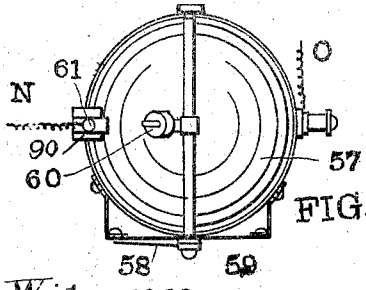

FIG. 9

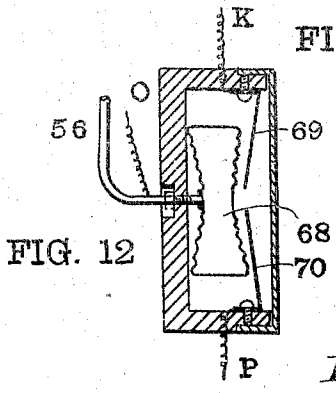

FIG. 12

Witnesses

Mildred Pope

C. F. Cunningham

Inventor:

James Percival Robertson

By H. M. Marble

Attorney

UNITED STATES PATENT OFFICE.

JAMES PERCIVAL ROBERTSON, OF NORTH SYDNEY, NEAR SYDNEY, NEW SOUTH WALES, AUSTRALIA.

ELECTRICAL FIRE-ALARM APPARATUS.

No. 820,823. Specification of Letters Patent. Patented May 15, 1906.

Application filed July 17, 1903. Serial No. 166,045.

To all whom it may concern:

Be it known that I, JAMES PERCIVAL ROBERTSON, electrician, a subject of the King of Great Britain and Ireland, residing in the city of North Sydney, near Sydney, in the State of New South Wales, Australia, have invented new and useful Improvements in Electrical Fire-Alarm Apparatus, of which the following is a specification.

My invention relates generally to automatic alarm systems and apparatus, and more particularly to automatic fire-alarm systems and apparatus, and my invention has particular reference to alarm apparatus adapted to be worked in connection with a distant central alarm system or a central-exchange telephone system and embodies certain improvements over the alarm system illustrated and described in my Patent No. 787,344, dated April 11, 1905.

In the following specification I particularly describe my invention as embodied in an automatic fire-alarm system employed in connection with a central-exchange telephone system, the apparatus of the system being set in operation primarily by suitable thermostats; but it will be understood that any other primary actuating device, such as are or may be commonly used in alarm systems, may be employed in place of the thermostat herein described. In the system herein described I locate at suitable points signal-transmitting means connected to the wires of a central alarm system or central-exchange telephone system. Such signal-transmitting means comprises means for sending through the wires of such system a telephone-message or other characteristic signal, which may serve to differentiate the alarm from the signals ordinarily sent over these circuits. The signal-transmitting means also comprises means for operating at the central station a suitable signaling device, such as a drop-shutter or signaling-lamp, which will attract the attention of the operator located there, this being what is commonly known in telephone and like systems as "ringing," which word, wherever used herein does not necessarily imply the operation of a call-bell or the like, but merely the operation of any signaling device such as may serve to attract attention of the central operator. The alarm-transmitting mechanism preferably employed is a telephonographic device, comprising what is in substance the well-known graphophone arranged in connection with what is in substance a telephone-transmitter, the connection being such that sounds reproduced by the graphophone actuate the transmitter to transmit telephonically suitable words to indicate the character of the alarm and the place from which it is sent—such, for example, as "Fire at 100 King street." The graphophone referred to is provided with automatic controlling mechanism arranged to be released by electrical mechanism which may be actuated by any one of a number of thermostats or other primary actuating devices. The telephonographic signal-transmitting device is normally isolated from the telephone or other distant-alarm line; but the electric controlling mechanism is arranged when released to cause a calling-signal to be sent over the line and then to connect such signal-transmitting device to the line. Provision is made for cutting the telephonographic signaling device out of the line-circuit after the alarm has been transmitted, so as to reinstate the telephone or other line circuit in its normal condition.

The signal-transmitting apparatus herein described differs from that of my said Patent No. 787,344 in that in the apparatus herein described provision is made for the automatic repetition of the telephonic message a suitable number of times by the return of the graphophone-reproducer to its starting-point one or more times, such repetitions of the message being preceded by the transmission of a calling-signal. The apparatus herein described further differs from the apparatus of my said former application in many improvements in construction, arrangement, and operation of the apparatus, as will hereinafter be more fully set forth, and pointed out in the claims. These improvements refer to the arrangement of the circuits; to the starting and controlling mechanism to the graphophone; to the automatic cut-out and circuit-changing devices; also to the provision of apparatus for indicating automatically any failure in the thermostat pipe system or thermostat-heads.

The annexed drawings are for the most part in a diagrammatic form, in some cases, however, an elementary construction of parts being indicated for better explanation.

Figure 1 is explanatory generally of the ar-

rangement of the circuits and the relation of the same to the main telephone or fire-alarm line. Fig. 2 is explanatory of the electromotor device for closing the local-alarm-bell circuit and connecting the call apparatus to the main line and releasing the graphophone-brake. It also indicates the stop mechanism. Fig. 3 is explanatory of certain portions of the leak-detector apparatus and also of the connection between the electric motor-starting mechanism and the circuit-changing devices and the reproducer-resetting devices. Figs. 4 and 5 are explanatory of the graphophone and controlling and governing mechanism thereon. Figs. 6 and 7 are respectively part elevation and sectional view of the local-alarm device; Figs. 8 and 9, side elevation, partly in section, and top plan, respectively, of thermostat-head, including leak-detector and indicating mechanism; Figs. 10, 11, and 12, elevation and sections, respectively, showing an alternative form of thermostat-head.

In the drawings I show what is in substance a graphophone arranged to be driven by a suitable spring-motor and having its reproducer 24 connected to a suitable telephone-transmitter 25 in such manner that sounds produced by the reproducer are transmitted to said telephone-transmitter and thence are transmitted electrically to the line.

In the diagram Fig. 1 I do not show the record-cylinder and the operating mechanism of the graphophone, but only the reproducer 24, the transmitter 25, with the parts associated therewith, and certain other parts of the graphophone mechanism hereinafter referred to. This graphophone is arranged to be set in operation by an electric controlling device comprising an electric motor 13, having field-magnets and a rotary armature, which armature when actuated rotates through a portion of a revolution only and by such rotation moves a switch-arm 14 into contact with a contact-button 80, whereby the circuit of the telephonographic signaling device is connected to the main line A. The said armature in its rotation also rotates a cam 15, whereby a detent 18 is lifted out of engagement with a stop-disk 20 on the governor-shaft of the graphophone, thus permitting the graphophone to commence its operation. This actuating-motor 13 is controlled electrically by the thermostats or other primary actuating devices, as will be described hereinafter.

Referring now more particularly to Fig. 1, A is the main fire-alarm or telephone line; B, the exchange; C, the exchange earth; D, line connecting main line A to contact-button 80; E, wire connection from the armature-spindle of the motor 13 to a conductor F, leading from E to a contact-spring 21, which spring is operated by suitable means hereinafter described and is arranged to make contact alternately with contact-springs 22 and 23 and thereby to connect a ringing-battery and the telephonographic transmitter 25 alternately to conductor F, and so to the main line A.

As shown in Fig. 1, which is the "set" position, the spring 21 is closed against the contact 22, completing the connection to the conductor G. This conductor G is connected to the terminal of the microphone 25, whose other terminal is connected by the conductor G', through the binding-post 2, to two cells of the battery R, and thence to the alarm earth Z. When the contact-arm 14 is in the closed position on the button 80, as indicated in Fig. 1, the circuit is completed through C, B, A, D, 80, 14, E, F, 21, 22, G, G', battery R, and earth Z. When the contact 21 is depressed to open the circuit between F and G, it is closed against the contact 23, whereby the circuit is closed from F to H, thence through the binding-post 8, through the full length of the battery R, and thence to the alarm earth Z. When the full battery R is thus placed in circuit, it operates a suitable signaling device at the central station B.

In connection with the telephonographic signal-transmitting device I employ a local alarm and indicator comprising an alarm-bell 10 and lamps 11 and *a b c* to *h*. The circuit I J of the bell 10 is closed by a brush 19 making contact with detent 18 simultaneously with the throwing over of the switch-arm 14 to the position shown in Fig. 1, and the circuit of lamp 11 and of one of the lamps *a* to *h* is closed by the operation of the thermostat, which causes the operation of the motor 13.

Cam 15 operates detent 18 through a follower-arm 16, connected to a hub 17, capable of some slight motion about its support, to which hub detent 18 is also connected. A spring 47, Fig. 5, is provided on the hub 17, which spring tends to press the follower 16 against the cam 15. When by the operation of the motor 13 switch-arm 14 is thrown over to the position shown in Fig. 1, the follower 16 drops into the notch of cam 15, and thereby causes the detent 18 to release the disk 20, so permitting the graphophone to commence to operate and at the same time bringing together contact-detent 18 and contact-spring 19, thereby closing the circuit I J of the local-alarm bell 10. This circuit I J may be traced as follows: from the hub 17 through conductor I and binding-post 9, through battery S, the magnet of bell 10, conductor J, binding-post 7, spring 18, and arm 18.

The graphophone indicated in the drawings is one of common form adapted for the special purposes required of this apparatus and fitted with accessory parts. The reproducer 24 and its mounting and the record 41 contain no feature of novelty. The usual finger-lever-lifting piece 36 is provided to raise the reproducer from and lower it onto the record, as may be necessary.

27, Fig. 5, is the motor-spring casing, and 40, Figs. 4 and 5, the governor-gear. The sleeve 17, Figs. 1, 4, and 5, carrying the arms 16 and 18, and the spring 47, before referred to, are mounted on one of the pillars of the frame, so that the sleeve will be capable of slight movement around the same to allow of the lifting of the hooked point of the lever 18 from the notch in the disk 20 and the closing of the connection between 18 and 19, as before described. The saddle 38, running on the hollow slotted bar 82, supports the reproducer. On the rear part of the bar 82 a returning-spring 39 is mounted. The finger-lever 36 for lifting and lowering down the reproducer is controlled by a rocking bar 35, which is operated by a lever end 34, fulcrumed at 45 and controlled by a notch in the cam-disk 29, which is set on the driving-spindle of the motor mechanism of the graphophone. Once in each revolution of this cam 29 the tail of the lever 34 trips by dropping into the notch. It is caused to trip by the downward pull of the spring 46, and in this downward movement it depresses the finger-lever 36, thereby raising the reproducer 24 quickly off the record, freeing the saddle 38 from the traversing screw and allowing the spring 39 to return the reproducer back to the starting position, where it is shown in Fig. 5. Having effected this movement, the cam continuing to rotate presses out the end of the lever 34 again, thereby gently lowering the reproducer onto the record and bringing the nut on the under part of the saddle 38 into engagement with the feed-screw, which then again traverses the reproducer along the record, effecting repetition of the message. The employment of reproducer-returning mechanism reduces the size of the record-phonogram, allowing the call apparatus to be of small and compact size, while still adapted for long-call service.

On the side of the cam 29 is a tappet 30, which operates against the spurs 32 (twelve in number) of the controlling-wheel, turning this wheel ahead one tooth for each complete revolution of the cam 29. The spur-wheel 32 is provided with side spurs 33, adapted to depress the end of the spring contact-plate 22 when moving past it.

As the wheel 32, with its spurs 33, is at rest except during the moment when it is being turned by the action of the tappet 30, it is easy to regulate the proportion and relation of the spurs 33 to the spring contact-plate 21, so that the said plate 21 will be depressed into contact with 23 by these spurs 33 for just sufficient time to send a ringing-current through the line. Normally during the passing of a call the spring-plate 21 is in contact with the contact-plate 22, completing the speaking-circuit therethrough. During the time that the tappets 33 are acting on the spring-plate 21 the contact with 22 is broken and a contact made momentarily at 23, the speaking-circuit being thereby interrupted while the ringing-battery is thrown into the line to ring up the exchange or fire-station, the ringing up being immediately succeeded by the snapping back of the spring 21 into contact with the spring 22, thereby reclosing the speaking-circuit and cutting out the ringing-battery.

A pin 43 is set in the arbor 31 of the wheel 32, and a stop 44 is set in the casing to intercept the pin 43 and to prevent the wheel 32 making more than one complete revolution. The parts are so adjusted that when the machine is set ready to give an alarm one of the tappets 33 is acting on the spring-plate 21, closing the connection with the spring-plate 23, and thereby putting the ringing-battery in circuit with the line. Immediately upon the rotation of the parts commencing the ringing up of the telephone exchange or fire-station is followed by the cutting in of the speaking-circuits through the contact 22. When the next spur 33 comes into contact with the spring-plate 21, the same is again depressed so as to cut out the speaking-battery and cut in the ringing-battery just for sufficient time to rering the exchange or station. Then the speaking-circuit is completed again, and the graphophone-reproducer again traverses the record. In this way the apparatus automatically rings up the exchange or alarm-station three times, repeating its message between each ringing call, and finally coming to rest with one of the spurs 33 in such a position as to hold the spring-plate 21 midway between the contacts 22 and 23, thus opening both ringing and speaking distant-call circuits until the mechanism is reset and leaving the line A free for use by any other alarm apparatus or for ordinary telephonic purposes. Thus one main line A to a fire-brigade station may be made to serve an unlimited number of my alarms. The tripping device 34 is provided so that a short length of record-cylinder may be used, the reproducer being returned and retraversed over it each time the cam 29 makes one complete revolution. The shape of the gap in the cam 29 is such that the lever 34 will be tripped suddenly, so as to leave the reproducer quickly; but the other side of the gap is formed so that 34 will be lifted out again gradually, so as to lower the reproducer gently onto the record.

The rocking bar 35 is supported by the lever end 34 and in the frame of the graphophone, as shown at 37. I do not attach any essential importance to the structure of parts shown for returning the reproducer each time it has traversed the record, so as to reset it to go over the record again. Other mechanism may be readily devised for the purpose of lifting the reproducer after it has reached the end of the record and bringing it back again to the point of commencement in order that

the record may be repeated twice or oftener. 40 is the governor-gear of the graphophone, which may be of the ordinary spring-and-ball type. The brake-shoe 48 is regulated so as to permit the rotation of the record 41 at the necessary speed to obtain perfect articulation.

The neck 88 of the reproducer 24 supports the microphone 25, to which the lines G and G' are connected, as previously described with reference to Fig. 1. In order to obtain the necessary flexibility, the connection is obtained through an india-rubber-ball carrier 87. The ordinary carbon-powder microphone may be used when it is mounted as shown in Fig. 3, because on account of the movement to which it is there subjected there is no danger of the carbon packing. When, however, the microphone is set up immovable in the case and connected to the neck 88 by a rubber tube, it is highly desirable that it be loaded with carbon shot and not with powder in order to obtain uniformly good articulation from the gr. phophone-record. When the line A is of considerable length or of high resistance, the one induction-coil is combined with the microphone, as in telephone practice.

The cam 15, mounted on the spindle 89 of the motor 13, is of the form indicated. Normally when set in the position shown in Fig. 2 the deep part of the cam presses the arm 16 outwardly, thereby depressing the arm 18, nipping its hooked end in the notch of the disk 20, forming part of the governor mechanism 40 of the graphophone. In resetting the apparatus after it has given an alarm the arm 14 needs to be replaced to the position shown in Fig. 2 and the hooked end of the arm 18 set in the notch in the governor-disk 20. In the position of the motor shown in Fig. 2 the alarm-bell circuit and the circuits by the lines F, G, and H are open. When the motor-circuit is closed by the buckling of the thermostat-head, as hereinafter described, the armature makes a portion of a rotation, carrying the arm 14 from its position of rest against the stop 79 across onto the contact-button 80, further movement being prevented by the stop 81. When it takes up this position, it closes through the contact-button 80 the circuit to the telephone or distant-call line A by connecting the lines D and F and at the same time rotating the cam 15 until the top end of the arm 16 drops into the gap, allows that arm to spring forward under pressure of the spring 47, thereby lifting the arm 18 out of the notch in the disk 20, thus freeing said disk to revolve under the action of the spring-motor 27 and at the same time closing the local-alarm-bell circuit by making contact with the plate 19, which is mounted in the casing of the apparatus.

As the only office of the rotary motor 13 is to throw over the contact-arm 14 when its circuit K L is closed, there may be substituted for it any electromagnetic mechanism adapted to move said arm 14 to the necessary extent when energized by the closing of said circuit K L.

28 is the arbor on which the motor-spring 27 is mounted. Its end is formed, as shown in Fig. 2, to receive a winding-key. When the graphophone has run down after delivering a call, it is reset by rewinding the motor-spring 27, thus resetting the arbor 31 (which is turned back by the action of the tappet 30 on the spurs 32) until the stop-pin 43 rests against the left side of the fixed stop-pin 44 in the casing.

Referring now to Figs. 6 and 7, showing the local alarm and indicator, it will be seen that this part of the apparatus consists of a casing 12, in the back part of which the gong 73 of local-alarm bell 10 is mounted. In the middle portion of the casing internally the electromagnetic striking-gear of bell 10 is set up, while around it is mounted a series of dark tubes, in each of which an ordinary incandescent lamp or lamp with metallic filament is set up. The gong 73 may be struck by a flying hammer worked by a rotary motor or by a trembler-hammer, in either case the circuits being arranged as described.

The several lamps in the local indicator are numbered *a* to *h*, respectively, to correspond with the thermostats similarly marked, of which there are eight. The master-lamp 11 is in series with each one of the other lamps 77 in the indicator, respectively, as shown in the wiring arrangement in Fig. 1, so that upon the lamp-circuit being closed two lamps are lighted up, one the master-lamp 11 and the other one of the lamps *a* to *h*, corresponding with the thermostat from which the alarm comes. In the case is a sheet of ruby-glass 75 and on the face of the case a plain glass plate 74, secured by a ring 76. Between the two glasses is set a tube in front of each of the lamps. This construction of lamp-indicator provides an effective lighting for daylight, as well as night inspection. This alarm and indicator may be conveniently placed outside a building. Similarly the thermostats and the distant-call apparatus may be set outside the building or close by windows in the same. The wiring in that case will be either wholly external to the building or almost so, thereby limiting risk of failure by crossing or breaking of circuits.

Referring now to Figs. 8 and 9, showing the thermostat, 50 is a metallic vessel provided with a gage-glass 51, adapted to show the level of liquid contained in the vessel 50. 52 is the bottom of the vessel 50. It is formed of a buckled plate, which is normally buckled inward, as shown, and adapted when sprung outward by internal pressure in the vessel 50 to make contact with the two spring-plates 53 and 54, connected, respec-

tively, to the lines K and P. These spring-plates may be mounted on the vessel 50 or on the casing, but must be insulated from the vessel 50. The line O is connected, as shown, directly to the metal work of the vessel 50. A valve connection 55 is provided for the purpose of attaching a pump or reservoir to fill in the expansive fluid used and bring up the pressure within the vessel to the necessary point or to relieve it, if in excess. The line N is connected to a contact-piece 61, mounted on the vessel 50, through an insulating-piece 90. 58 is an indicator-hand mounted on an arbor which is carried by bearing-pieces 91, pinned or brazed to the sides of the vessel 50. This arbor carries also a contact-bar 60, which is acted upon by a lug 62, secured to the flexible head 57 of the vessel 50. When the head 57 is depressed, due to reduction of pressure in the vessel 50, the lug 62 is retired and the contact-lever bar 60 thereby allowed to drop until it makes contact with the plate 61, thus closing the circuit between the lines N and O. The plate 57 is formed of thin metal corrugated in rings like the head of an aneroid barometer, so as to be very sensitive to variation of pressure in the vessel 50. It is normally distended by the internal pressure, as shown in Fig. 8, so as to hold up the contact-lever bar 60 and keep open the circuit between N and O. When, however, the pressure in the vessel 50 falls below the predetermined point at which the apparatus will work effectively, contact is made between 60 and 61, the circuit thereby closed between N and O, thereby operating a leak-indicating device, hereinafter referred to and which may be conveniently located in a manager's office or other central point. Any failure in the pipe system connected to a thermostat-pipe necessarily shows itself in a reduction of pressure in the corresponding thermostat-head 50, and when this reduction becomes abnormal the alarm is operated as described and information conveyed to the manager's office or other central point, so that the fact will become known without delay.

The gage-glass 51 provides another visual means of inspection, for if liquid be run into the vessel 50 up to a marked point, said vessel being placed above the level of the pipes connected to it, any leakage from the pipes will show by a lowering of the liquid-level in the gage-glass. When, therefore, the leak-alarm is given in the manager's office, the exact pipe-circuit in which the leak has occurred can be detected by an inspection of the gage-glasses of the thermostats. There is a further check on the gage-glass by means of the indicator-hand 58 moving over the marked quadrant 59. This indicator-hand 58 moves in sympathy with the contact-making bar 60, by which the circuit between N and O is closed, and affords a means of reading off the pressure under which the liquid is contained in the pipe system connected to the thermostat upon which it is fitted. 56 is the end of the thermostat-pipe system, connected to the lower end of the vessel 50. This thermostat-pipe system will be described separately.

Figs. 10, 11, and 12 represent an alternative form of thermostat-head without means for indicating pressure and also without a leak-alarm. These thermostat-heads, like the one shown in Figs. 8 and 9, should be placed above the level of the pipes to which they are respectively connected. The thermostat-heads shown in Figs. 11 and 12, respectively, differ from one another only in the fact that in the latter case the drum is made with a back and front end expanding plate to obtain maximum sensitiveness, whereas in the former case there is only a front end expanding plate, the back plate being a fixture. The pipe 56 is preferably led into the center of the back head, as shown in Fig. 12; but where the construction is as shown in Fig. 11 it may be carried into the side of the drum. The drum-head, whether it is made in the form shown in Fig. 11 or in that shown in Fig. 12, is made like the expanding plate of an aneroid barometer—that is, with circular corrugations—and it is normally buckled inward, so that until an excessive pressure corresponding with the predetermined degree of heat to start the alarm occurs within the drum and pipe system connected thereto there will be no contact between the drum itself and the circuits K and P. When such an undue pressure arises, the front end plate buckling outward closes the connection with K and P, thereby opening all the necessary circuits to throw the local alarms and distant call into action.

The thermostats shown in Figs. 10, 11, and 12 are covered in an application for Letters Patent, filed October 7, 1903, Serial No. 176,052. The leak-indicating apparatus above referred to and employed for indicating leaks in the thermostats is as follows: In a manager's office or at some other convenient point I preferably provide an indicator-window 85, Fig. 2. Behind this window there is a card carrying the words "Pipe intact" or other suitable words or signal to indicate that the line is tight, and between the window and the said card there is a shutter 86, mounted upon an arm 71, which is pivotally mounted and is controlled by a magnet 26, Figs. 1 and 3, through the agency of a detent-pin 72, carried by the armature of said magnet and normally engaging a notch in lever 71. As shown in Fig. 1, the wire N, to which the contact-piece 61, Fig. 6, of each thermostat is connected, leads to binding-post 3 and thence to magnet 26, and the other side of said magnet is connected by wire M, passing through binding-post 4 to

battery U and thence to the common return-line O, to which all of the thermostats are connected. It will be seen that if a leak develops in any thermostat, so that contact is closed between the contacts 60 and 61 thereof, a circuit is completed from battery U through wires M and N and magnet 26, thus causing the shutter 86 to drop by gravity and by its presence at the window 85 to indicate the leak. The portion of the shutter which is visible through the window when the shutter drops may carry the words "Pipe broken" or other words or symbol suitable to indicate that the thermostat is not in working order.

The apparatus is effective not only for calling up the fire-station and sending a definite spoken message particularizing the address at which a fire has broken out even before the fact is known to persons in the immediate locality, but it is also effective for informing the brigade on arrival of the location of the seat of the outbreak in the building.

In order to insure clear articulation in the microphone, it is necessary that it shall be placed beyond the immediate influence of the local alarm.

Where it is deemed advisable to dispense with an articulated message from a graphophone-record, a metallic or other cylinder or disk may be used in place thereof adapted to vibrate a contact maker and breaker intermittently, so as to convey, as it were, a telegraph message which will be distinguishable through the telephone at the receiving-exchange. A certain simplification in the apparatus would thus be obtained, but at the expense of delay in the reading off of the signal at the fire-station, as it would be necessary for the exchange attendant to inform the fire-station per telephone of the telephone-number from which the call was received, so as to enable the fire-station attendant to discover the location of fire by referring to a telephone-index. When the graphophone apparatus is used through an exchange, the exchange attendant merely connects the ringing-line through the exchange to the fire-station just as for an ordinary subscriber's call and the apparatus does the rest, reringing the station and repeating its spoken message until it is checked by a stop. This message contains such particulars as are necessary to refer the fire-brigade to the building or place from which the alarm has been sent out. For instance, it would contain such a formula as "Fire at No. 100 King street."

It is necessary to provide a specially-made record for each premises in which the apparatus is fitted. There is no particular feature in these records to distinguish them from ordinary graphophone-records, the mode of production of which is well known to qualified persons.

When the telephone service is being used, the record has a double message cut or graven in it—thus "211 fire-station, fire 100 King street"—the first being the fire-call and the second the information required at fire-station. The first part of the message indicates to the exchange attendant that the fire-station is wanted, and he would make the line connection at once, ringing up first in the usual way. Then the fire-station attendant answering would receive the information he requires from the second portion of the message directly.

It will be evident that the signaling apparatus may be made to continue speaking its message over any predetermined period within reasonable limits or to ring up and repeat the message as many as twelve times, or even more.

I have found in practice that working conditions are complied with sufficiently by making the total period of the call about four minutes and arranging the mechanism to ring up three times during the period of the call.

The thermostat-tube is of small diameter and made of any flexible composition of metal not acted on by the expansive fluid used. It is closed at one end and terminates at its open end in a drum-like vessel, hereinbefore more fully described. The tube may contain only air under slight pressure, (in which case it should preferably be made of copper,) or it may contain a volatile liquid, such as ammonia or alcohol. When a liquid is used, the tube should be so disposed that the liquid will remain in the pipe and have an air-cushion behind it in the drum-terminal. A neat adjustment of pressure can be obtained by pinching the closed end of the tube, so as to diminish the tube's capacity; but for all practical purposes a sufficiently neat adjustment is effected by pumping up or relieving the pressure through the by-pass 55 in the drum-terminal. When alcohol, ammonia, or similar volatile liquid is the expansive medium used, adjustment is obtained by adding water and varying the proportion of the mixture of water and volatile liquid, so that a required rise of pressure shall correspond with the temperature at which the thermostat-head will blow and close the contacts.

The action of the apparatus is precisely the same irrespectively of which of the thermostats associated with it is affected, except that of course the local indicator shows by the corresponding lamp which floor or section of the building sends the call. Fig. 1 shows an arrangement for eight floors or sections, there being nine signal-lamps in all, including the head-lamp.

For the purpose of illustration if it be as-

sumed that the pressure in thermostat *a* increases by reason of rise of temperature in the locality of its pipe system 56 sufficient to buckle out its head 52, so as to complete the circuit with contacts 53 and 54, circuits will be closed between the common return and the lines P and K. The circuit P O through the battery T lights up the lamps 11 and *a* in the local alarm. The battery *t*, acting through the circuits K O L, excites the motor 13, rotating its armature so as to carry round the contact-arm 14 from the position of rest (shown in Fig. 2) until it makes contact with the stud or button 80, whereby the main line A is connected up through D, the controller 20 of the graphophone-motor set free, and the graphophone itself and the tappets operating on the spring-plate 21 thereby brought into action.

The first action of the tappets 33 is to bring over the spring-contact 21 into contact with the plate 23, thereby connecting up the ringing-battery R through the lines H, F, and E to the main line A, thus ringing up the call in the exchange. A sufficient time for ringing up having elapsed, the tappet 33 allows the spring-plate 21 to snap past it, thereupon making contact with the spring-plate 22 and closing the speaking-circuit of the microphone through the lines D E F G G′ and two cells of the battery R through the main line A. When the reproducer reaches the end of the record, the lever 34 drops into the notch of the cam 29, raising the reproducer 24 and permitting the same to be returned to starting position by its spring. The cam 29 then lowers the reproducer upon the record, and the reproducer then again travels over the record, again repeating the message. As the cam 29 revolves its tooth 30 engages one of the teeth 32; but there being fewer teeth 33 than teeth 32 the ringing-circuit is not completed every time the reproducer is returned to starting-point, but only during every third return in the particular construction shown. However, the mechanism runs a sufficient length of time so that the ringing-signal is transmitted several times.

The mechanism finally comes to rest when the stop-pin 43 comes into contact with the stop 44, thereby preventing further rotation of the graphophone apparatus and parts connected therewith and opens all the circuits except the local alarm-bell and indicator-lamps by holding the spring-plate 21 midway between the contacts 22 and 23.

Where it is necessary only to send an intermittent current and not a spoken message, the traversing and returning mechanism for the reproducer are not required. In this case the record is cut according to a dot-and-dash system on the edge of a disk set in place of of the record 41, (shown in the drawings;) but the automatic cut-out 21 22 23 is still used, so that the ringing-current will not be sent through the microphone. The microphone itself may in this case be dispensed with, and in place of it a simple current-interrupter worked by the movement of a bar running on the serrated edge of the rotating record-disk may be used to send a current into the telephone-line directly and not through the medium of a microphone, which is needed only for the reproduction of articulate speech.

To reset the apparatus after an alarm has been transmitted, it is necessary to rewind the graphophone-motor, to put back the contact-switch 14 and replace the check-arm 18 in the notch in the governor-disk 20, at same time opening its contact with 19, and to replace the blown contact-head of the thermostat and make good damage by fire (if any) to the pipe system or wiring.

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

1. In automatic alarm apparatus, the combination with alarm-signal-transmitting means for transmitting an alarm through a line-circuit, comprising automatic driving means, of a detent normally preventing operation of said transmitting means, an automatically-operated switch normally disconnecting said signal-transmitting means from the line, means for releasing said detent and operating said switch, ringing-circuit and signaling-circuit contact-pieces and a movable contact-piece coacting therewith and electrically connected to said switch, and means operated by said signal-transmitting means for moving said movable contact-piece alternately into contact with said ringing-circuit and signaling-circuit contact-pieces during the operation of the signal-transmitting mechanism.

2. In automatic alarm apparatus, the combination with alarm-signal-transmitting means for transmitting an alarm through a line-circuit, comprising a spring-motor for driving the same, of a detent normally preventing operation of said transmitting means, an automatically-operated switch normally disconnecting said signal-transmitting means from the line, means for releasing said detent and operating said switch, ringing-circuit and signaling-circuit contact-pieces and a movable contact-piece coacting therewith and electrically connected with said switch, a gear-wheel having teeth which engage the movable contact-piece to cause it to make contact with said other contact-pieces alternately, and a tappet operated by a shaft of said motor and arranged to engage said gear-wheel and advance the same intermittently.

3. In automatic alarm apparatus, the combination with telephonographic signal-transmitting mechanism for transmitting an alarm through a line-circuit, comprising automatic driving means, a record, a telephonographic transmitter, and means for feeding the repro-

ducer thereof along said record, of a detent normally preventing operation of said transmitting means, an automatically-operated switch normally disconnecting said transmitter from the line, means for releasing said detent and operating said switch, talking-circuit and ringing-circuit contacts and a movable contact-piece coacting therewith and interposed between said switch and said transmitter, means for returning the reproducer to its starting-point, and means automatically operated for releasing the reproducer from its feeding means at predetermined points and permitting the return thereof, and for moving said movable contact-piece alternately into circuit with said talking-circuit and ringing-circuit contact-pieces.

4. In automatic alarm apparatus, the combination with telephonographic signal-transmitting mechanism for transmitting an alarm through a line-circuit, comprising automatic driving means, a record, a telephonographic transmitter, and means for feeding the reproducer thereof along said record, of a detent normally preventing the operating of said transmitting means, an automatically-operated switch normally disconnecting said transmitter from the line, means for releasing said detent and operating said switch, talking-circuit and ringing-circuit contact-pieces and a movable contact-piece coacting therewith and interposed between said switch and said transmitter, means for returning the reproducer to its starting-point, a gear-wheel having teeth which engage the movable contact-piece to cause it to make contact with said other contact-pieces alternately, and means operated by a shaft of said driving means for engaging said gear-wheel and advancing the same intermittently, and for releasing the reproducer from its feeding means at predetermined points and permitting the return thereof.

5. In automatic alarm apparatus, the combination with alarm-signal-transmitting means for transmitting an alarm through a line-circuit, comprising automatic driving means, of a detent normally preventing operation of said transmitting means, a switch normally disconnecting said signal-transmitting means from the line, a rotary armature, a magnet therefor having pole-pieces embracing said armature, said magnet adapted to be controlled by an automatically-controlled local circuit, and means operated by said armature for closing said switch and releasing said detent.

6. In automatic alarm apparatus, the combination with alarm-signal-transmitting means for transmitting an alarm through a line-circuit, comprising automatic driving means, of a detent normally preventing operation of said transmitting means, a rotary armature, a magnet therefor having pole-pieces embracing said armature, said magnet adapted to be controlled by an automatically-controlled local circuit, and a cam for operating said detent and a switch normally disconnecting said signal-transmitting means from the line, both operated by said armature.

7. In automatic alarm apparatus, the combination with a plurality of thermostats each comprising a chamber adapted to contain fluid under pressure, and alarm-signal-transmitting mechanism comprising a controlling-magnet in a circuit controlled independently by the several thermostats and means operated by said magnet for causing said mechanism to transmit a signal through a line-circuit, of a leak-indicator, a circuit therefor, and contact devices for each thermostat, controlling said indicator through the circuit thereof, and means for operating each of said contact devices upon decrease in pressure in the corresponding thermostat.

8. In automatic alarm apparatus, the combination with alarm-signal-transmitting means comprising automatic driving means, and ringing and signaling circuits, of a ringing-contact, a signaling-contact, a common movable contact member adapted to coact with both said contacts, means operated by said signaling mechanism for causing said contact member to contact with said contacts alternately during the operation of the apparatus, and means for bringing the mechanism to rest with said contact member out of contact with both said contacts.

9. In automatic alarm apparatus, the combination with alarm-signal-transmitting means comprising automatic driving means, and ringing and signaling circuits, of a ringing-contact, a signaling-contact, a movable contact member adapted to play between said contacts, a toothed wheel rotated by said mechanism in its operation and arranged to engage said contact member and cause the same to make contact with the ringing-contact and signaling-contact alternately, and a stop engaging a movable member of the apparatus at the conclusion of the operation thereof and arranged to bring said apparatus to rest with said movable contact out of contact with both said contacts.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JAMES PERCIVAL ROBERTSON.

Witnesses:
W. J. SPENSER,
W. J. DAVIS.