

1,008,313.

2 SHEETS—SHEET 1.



Witnesses

Witnesses
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FIRE ALARM SYSTEM FOR TELEPHONE EXCHANGES.
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2 SHEETS—SHEET 2.

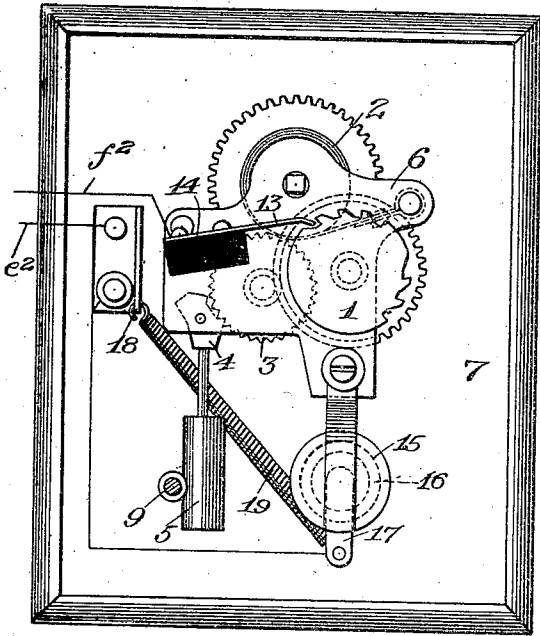


Fig. 2

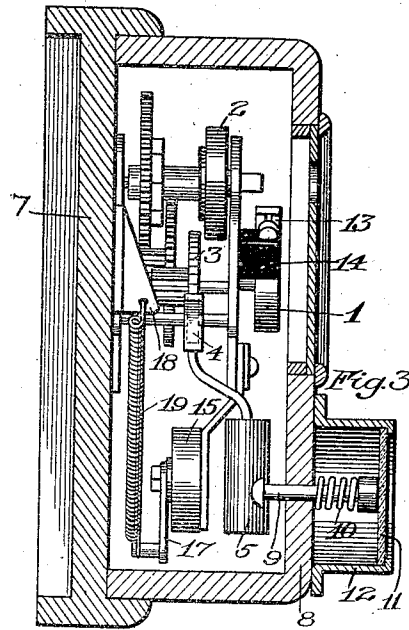


Fig. 3

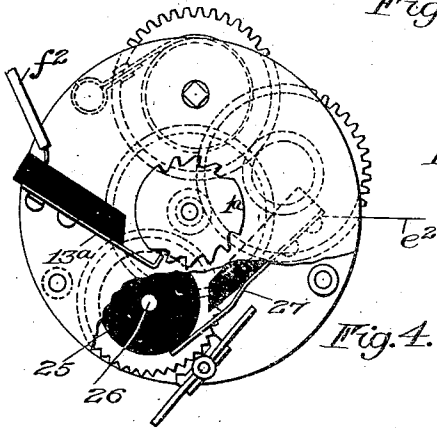


Fig. 4

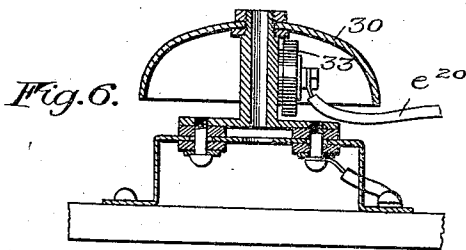


Fig. 5

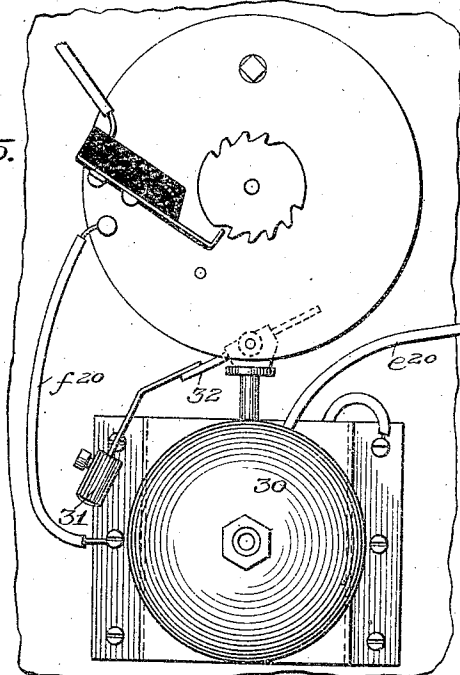


Fig. 6

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FIRE-ALARM SYSTEM FOR TELEPHONE-EXCHANGES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, WILLIAM L. DENIO, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Fire-Alarm Systems for Telephone-Exchanges; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference-numerals marked thereon.

My present invention relates to fire alarm systems which are adapted for use in localities, such as cities, provided with telephone exchange systems and it has for its primary object the combining with a subscriber's telephone circuit, of a fire alarm signaling or calling instrument which when set into operation either automatically or manually will transmit to the exchange operator, in addition to the impulses indicating the number or code signal of the instrument, other impulses which vibrate the diaphragm of the central office operator's telephone receiver for the purpose of indicating audibly the operation of the signaling mechanism.

My invention comprehends the arrangement of parts whereby the operation of the signaling apparatus may be immediately recognized by the telephone operator as distinguishing the code signal of the fire alarm apparatus from line disturbances such as an intermittent ground applied to the line or other trouble thereon, thus obviating the delay which ensues if the operator is required to wait until the signaling apparatus has been in operation for a sufficient length of time to send in a full signal which is otherwise necessary to distinguish such signal from some other effect which may be produced on the telephone line, to the end that the central operator may make a direct connection of the telephone line, on which a signal is being transmitted, with the fire department headquarters.

To these and other ends the invention consists in certain improvements and combinations of parts all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is a diagrammatic view illustrating a telephone exchange system comprising a subscriber's instrument circuit, a fire alarm signal box arranged in conjunction therewith, and a fire alarm ap-

paratus actuated thereby all arranged in accordance with my present invention. Figs. 2 and 3 are detail views of the signaling apparatus illustrating the preferred form of apparatus for carrying out my invention, and Fig. 4 is a detail view showing a modified arrangement of said device, and Figs. 5 and 6 are illustrations showing another arrangement of parts by means of which a distinctive signal received from an alarm bell may be transmitted.

Similar reference numerals in the several figures indicate the same parts.

My present invention is applicable to any form or type of calling device or mechanism adapted to transmit current impulses, or a series of groups of such impulses, and which may be associated with a telephone subscriber's instrument circuit for the purpose of indicating an alarm for some particular purpose despatched from the subscriber's station. Apparatus embodying my invention is adapted particularly for use in connection with fire alarm signal boxes or mechanism.

The essential object of my invention is to provide, in conjunction with mechanism of this character, a microphone or some other form of transmitter which is so arranged in the alarm circuit that a distinctive signal is transmitted thereover simultaneously with the transmission of the impulses of the alarm code. In connection with a fire alarm signal box said distinctive signal indicates to the central office operator the operation of the signaling mechanism in addition to the flickering of the visual or pilot light on the central office switch-board which flashes in response to the impulses of current transmitted over the telephone circuit by the signaling or calling mechanism. These flashes occurring at regular predetermined intervals will indicate the number of the fire alarm box in operation, but as a pilot light may be similarly operated from other disturbances on a telephone line, such for instance as the opening and closing of the receiver hook contacts of the telephone set; an intermittent ground applied to the line; or an occasional short circuit thereon, it is impossible for the central office operator to distinguish between such causes of trouble and the regular operation of the fire alarm box, unless the operator closely observes the flashing of the light, records the same and verifies the number from some record at hand. This all entails delay in transmitting the fire

alarm signal to the fire head-quarters because the operator must wait until at least one full "round" of the signal box has been transmitted and during this time the operator is also prevented from responding to other calls for connections received over other telephone lines. These difficulties are all eliminated by apparatus constructed in accordance with my present invention.

10 In illustrating the operation of devices embodying my invention I have shown in Fig. 1 a simple form of telephone exchange system, the central office apparatus being that of the usual central energized type comprising a main battery B to which are connected the usual answering and calling cord circuits A and C, respectively, with the former of which is associated the central office operator's telephone set D comprising the usual transmitter *d* and receiver *d'*. The subscriber's telephone instrument circuit comprises the line wires *e* and *f* which extend from the tip and sleeve contact springs *e'* and *f'* of the switchboard jack to the subscriber's telephone set comprising the transmitter T and receiver R. The jack springs normally rest in the position shown in dotted lines in Fig. 1 in engagement with the contacts *g* and *h* of the pilot lamp circuit, comprising the wires *g'* and *h'* which receive current from battery B' for the purpose of energizing the magnet H which attracts the armature *h²* into engagement with the contact *h³* to close the local circuit of the pilot lamp *h⁴*, said circuit comprising the wire *h⁵* attached to the armature *h²* and the wire *h⁶* leading to the wire *g'*. From the foregoing it will be seen that whenever the telephone instrument circuit is closed current will traverse the following circuit: line wire *e*, spring *e'*, contact *g*, wire *g'*, battery B', magnet H, wire *h'*, contact *h*, spring *f'* to line wire *f*. The energizing of the magnet H attracts *h²* permitting current to flow over the following circuit: battery B', contact *h³*, armature *h²*, wire *h⁵*, lamp *h⁴*, wires *h⁶* and *g'* to battery B'.

It will be understood that during the operation of the fire alarm box or signaling device associated with the subscriber's instrument that the last described circuit will be energized each time the circuit is closed to despatch an impulse of the code signal, but as before stated this is precisely the effect which may be produced by the operation of the subscriber's receiver hook or from any source of trouble arising on the line.

60 The central office switch-board is provided with a cord circuit comprising the wires *k* and *l* terminating in the tip and sleeve contacts *k'* and *l'* of a special cord plug from which said wires lead to the fire department head-quarters or other

place where the alarm recording apparatus may be located. In the present illustration I have shown the fire department circuit comprising the wires *k* and *l* as being provided with magnets M which are actuated by circuit impulses received from the battery B². These magnets control the armature *m* of a local circuit supplied with current by the battery B³ and comprising the magnets N of a registering mechanism adapted to perforate a paper tape or ribbon *n*, upon each impulse of current transmitted over the local circuit controlling said registering mechanism, such circuit comprising the wires *m'*, leading from the armature *m*, and *m²*, terminating in the contact *m³* with which said armature coöperates when attracted by the magnets M against the tension of the spring *m⁴*.

In order to illustrate my invention and give an accurate understanding of its operation I have shown it applied to a calling device comprising a transmitting mechanism embodying a numeral wheel 1 which is adapted to be rotated in one direction by a suitable gear train comprising a spring 2 and the escapement 3 with which coöperates the verge 4, the movement of which may be controlled to determine the speed of rotation of the member 1 as by means of a weighted pendulum 5, (Fig. 2). The arbors of the various parts of the gear train are journaled in suitable frame pieces, indicated by 6, and the whole is mounted in a suitable casing; comprising a support 7 and a removable cover 8. Carried on the latter is a retaining member or pin 9 which is normally projected in the path of the pendulum 5 against the tension of a spring 10 in which position it is held by the friable and preferably transparent disk 11 which is held exposed within a flanged collar 12, secured on the exterior or cover of the casing. This disk is preferably made of glass and may be easily broken to release the retaining pin 9 to permit the latter to be projected by the spring to release the pendulum and permit the operation of the fire alarm box or signaling mechanism.

The member or number wheel 1 is provided with any desired number of teeth, corresponding to the code number given the signal box, and coöperating therewith is a spring 13 which is mounted on the insulated support 14 secured to the frame piece 6. Also attached to the latter is a small metallic casing 15 containing carbon granules or other current modifying medium, said casing being closed by diaphragm 16 to the center of which is secured the laterally extending arm 17. Extending from the diaphragm arm 17 to the stationary plate or post 18, secured to the base 7, is a coiled spring 19 which may be adjusted to any desired tension. The object of this spring

s to provide a tension member which will be vibrated by the jar imparted thereto by the vibration of the alarm mechanism which occurs when the latter is in operation, as will be understood.

A signaling device of this character is bridged across the subscriber's instrument circuit, as shown in Fig. 1, the bridge circuit being formed by the wires e^2 and f^2 , the former leading from the wire e to the diaphragm arm 17, and the latter leading from the wire f to the contact spring 13. When the calling device is in its normal position the end of the contact spring 13 lies in one of the notches of the number wheel or member 1 so that the bridge or alarm circuit is open at this point. When the calling device is operated and the member 1 permitted to rotate, the teeth thereon successively engage the spring 13 and close the bridge and transmit current impulses over the following circuit: battery B' , wire g' , contact g , spring e' , wires e and e^2 , diaphragm arm 17, thence through the carbon granules or current modifying medium 15^a, electrode 15, frame 6, wheel 1, contact spring 13, wires f^2 and f , spring f' , contact h , wires h' , magnet H to battery B' . The energizing of the magnet H closes the pilot light circuit, as before described, to flash the lamp h^4 and attract the central office operator's attention. The latter then inserts the plug of the answering cord A in the subscriber's line jack when the tip and sleeve contacts a and a' , engage the jack springs, disconnecting the lamp circuit and connecting in the operator's telephone set D . The fire alarm box or signal transmitting mechanism being then in operation causes an undulatory current to be transmitted over the line during the periods of time the teeth of the number wheel or member 1 are in contact with the spring 13, with the result that the corresponding vibration of the diaphragm of the operator's receiver d' is agitated to give the operator a distinctive signal by which the operation of the fire alarm box may be determined, whereupon the answering cord plug is removed and the plug of the circuit leading to the fire alarm head-quarters is inserted. The last mentioned plug, comprising the tip and sleeve contacts k' and l' , then engage the springs e' and f' . The circuit thus established may be traced as follows: battery B^2 , wire k , contact k' , spring e' , wires e and e^2 , arm 17, carbon 15^a, electrode 15, frame 6, wheel 1, spring 13, wires f^2 and f , spring f' , contact l' , wire l , magnets M to battery B^2 . Each impulse of the current transmitted over the foregoing circuit, as the teeth of the wheel 1 successively contact with the spring 13, energizes the magnets M and these in turn attract the armature m of the local circuit of the registering mechanism causing the magnets N of the

latter to actuate the device employed for marking or perforating the record tape or ribbon n in unison with the current impulses transmitted by the number wheel 1 of the impulse transmitter.

In connecting the spring 19, I have preferably arranged the stationary post 18 at one side of and in rear of the arm 17 so that by adjusting the latter on the diaphragm 16 the tension of the spring may be increased or diminished so that varying tones may be produced when said spring is set in vibration.

In Fig. 4, the form of the calling device illustrated, is the same in the principle of operation as the one hereinbefore described, in that it comprises the clock train, the number wheel 1^a and the contact spring 13^a, but in lieu of the transmitter attached to the frame of the calling mechanism I employ a disk of carbon 25, preferably mounted loosely upon the shaft 26 of the escapement wheel, which will be agitated by the interrupted rotary movement of the latter. Bearing lightly against the disk 25 is a leaf spring 27, which forms one of the terminals of the bridge circuit in which the box is arranged. When a box of this construction is employed the vibration of the apparatus, causes an agitation of the carbon disk 25 on the metallic part of the frame, on which it is supported, causing the central office operator to receive an audible and distinctive signal which may be at once recognized, although not so pleasant and agreeable as the sounds produced by the vibration of the coil spring 19, shown in Fig. 2, which may be adjusted to produce various tones.

As a further example of one of the uses and adaptations of my present invention the arrangement of parts illustrated in Figs. 5 and 6 are shown in which instead of applying the microphone to the signaling mechanism I have illustrated it as being separated therefrom and adapted to transmit over the telephone circuit the undulatory current produced by the bell 30 which may be sounded in any desired manner during the operation of the alarm mechanism, in the present instance by means of a tapper 31 carried on one of the leaves of the fan 32. In this instance the microphone or transmitter is attached to the post 33 within the bell and is included in the instrument circuit comprising the wires e^{20} and f^{20} . This form of the device is particularly adapted for use in connection with fire alarm boxes placed on party telephone lines or those lines to which a plurality of subscribers' telephone instruments are connected, as an audible signal of this character can be used to indicate to all of the subscribers, as well as the central operator, the fact that a fire alarm box is in operation so that if said party line is being used by any of the

subscribers, for conversational purposes, such use may be temporarily discontinued until the fire alarm signal has been transmitted, all of which may, of course, be governed by proper rules established by the telephone company to whose lines the apparatus is applied.

I claim as my invention:

1. The combination with a subscriber's telephone instrument circuit and a central office equipment comprising an operator's receiver, of mechanism associated with said instrument circuit for transmitting impulses of current thereover by opening and closing said circuit and means for varying the resistance of the circuit during the transmission of the impulses to produce an audible signal in the operator's receiver.

2. The combination with a central telephone office equipment comprising an operator's receiver, of a normally open circuit leading from said central office, mechanism arranged in said circuit for alternately opening and closing it to despatch current impulses comprising means for varying the resistance in said circuit during the transmission of said impulses.

3. The combination with a central telephone office equipment comprising a receiver, of a normally open fire alarm circuit leading from said office, a fire alarm signal box associated with said circuit comprising movable devices for closing and opening said circuit to transmit current impulses thereover and embodying a current modifying medium placed in the circuit and arranged to be influenced mechanically by the movement of said devices during their operation.

4. The combination with a subscriber's telephone instrument circuit and a central office equipment comprising an operator's receiver, of a normally open fire alarm circuit bridged across the subscriber's instru-

ment circuit, a fire alarm signal mechanism for alternately closing and opening said bridge and a current modifying medium also arranged in said bridge and so disposed that it is influenced by the signal mechanism to vary the resistance of the fire alarm circuit during the transmission of current impulses thereover.

5. The combination with a central telephone office equipment comprising an operator's receiver and a normally open fire alarm circuit leading therefrom, of an alarm signal mechanism comprising a gear train, a movable contact member driven thereby and a stationary contact cooperating therewith, a current modifying medium associated with said mechanism and adapted to be agitated by the movement of the gear train, said medium and stationary and movable contacts being disposed in series in the fire alarm circuit for transmitting current impulses thereover during the operation of the signal mechanism and varying the resistance of said circuit during the transmission of such impulses to produce a distinctive audible signal in the central office operator's receiver.

6. In a fire alarm signal mechanism the combination with a frame, a movable contact member, a contact spring cooperating therewith and a spring operated gear train for driving said member embodying escapement devices, of an electrode member supported on the frame, a cooperating member arranged in juxtaposition thereto, a current modifying medium located between them and a sound producing device connected to one of the electrodes and adapted to be vibrated by movement imparted to it during the operation of the signal mechanism.

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