

March 28, 1939.

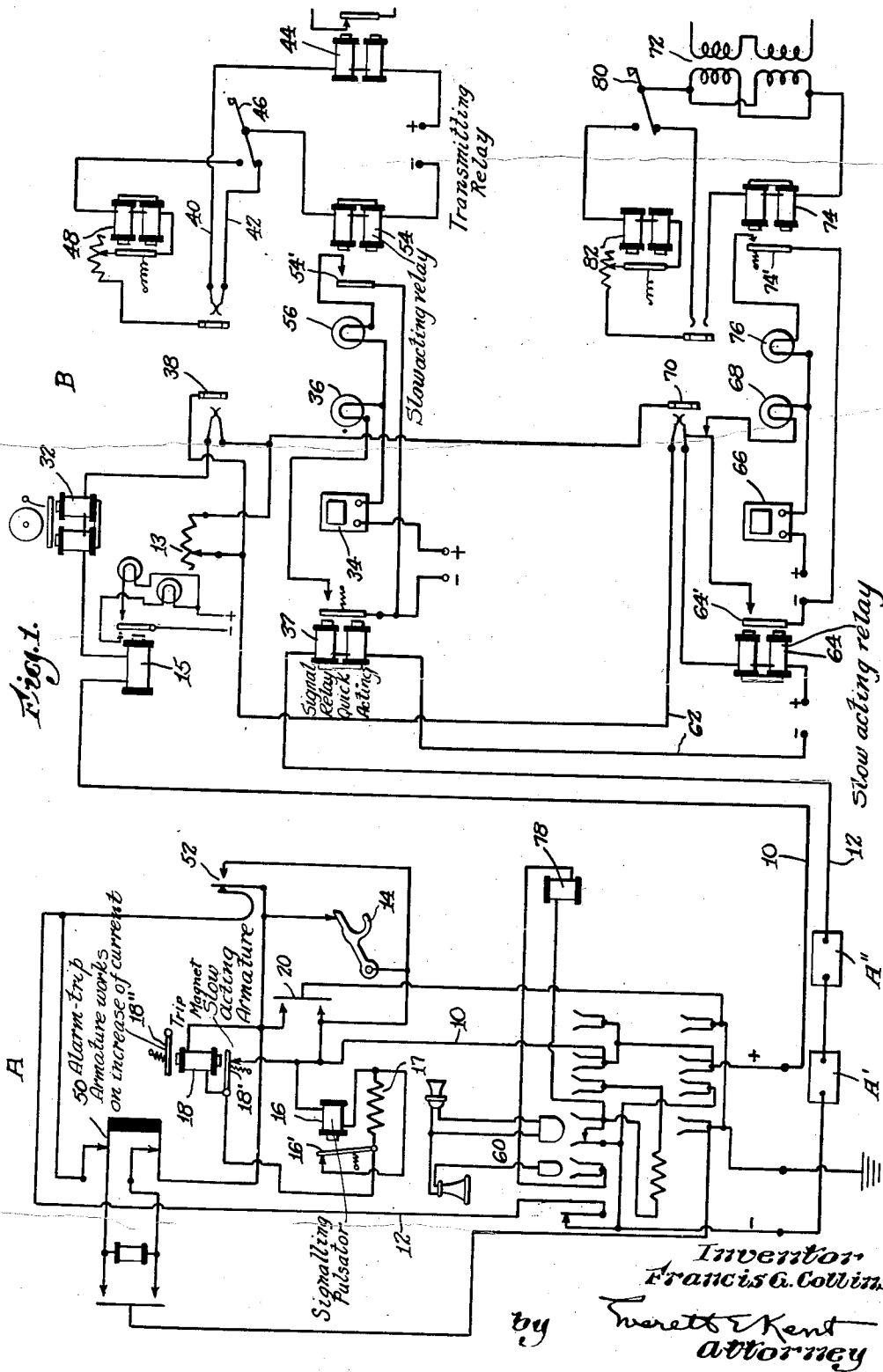
F. G. COLLINS

2,152,535

ALARM SYSTEM

Filed July 15, 1935

3 Sheets-Sheet 1



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Fig. 3.

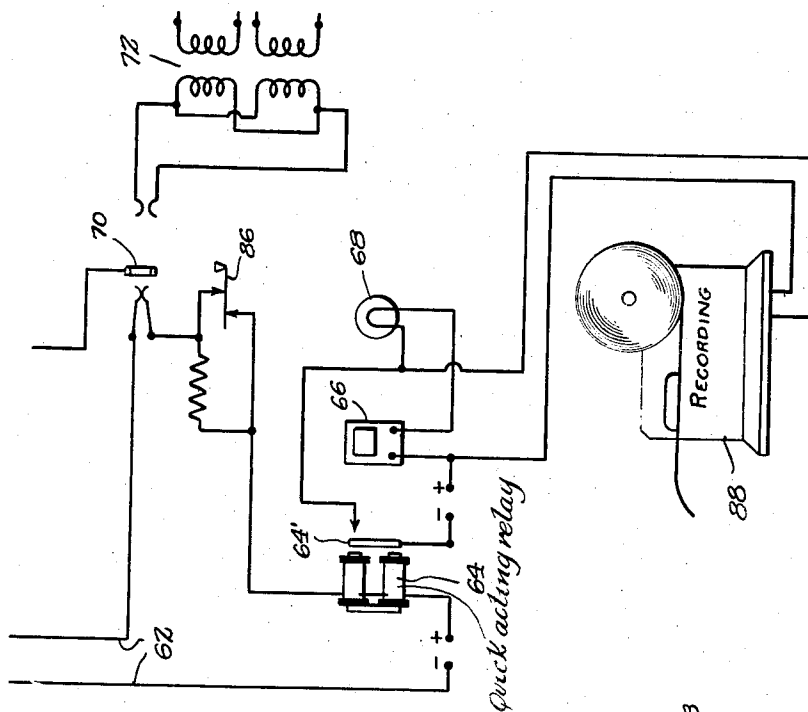
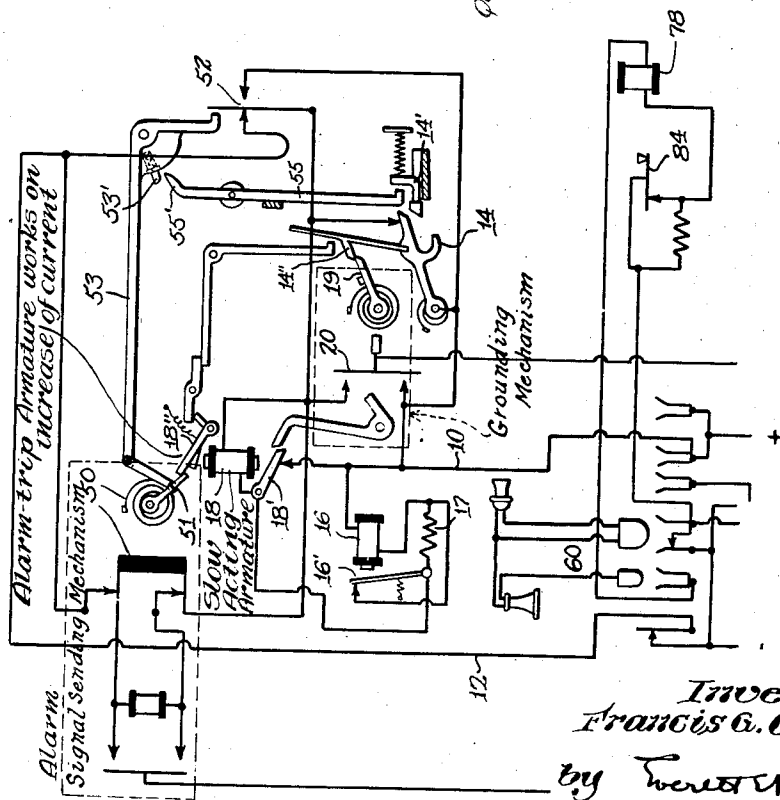


Fig. 2.

A



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2,152,535

ALARM SYSTEM

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3 Claims. (Cl. 177—360)

This invention relates to improvements in alarm systems.

It is illustratively described herein as it may be applied to a city fire alarm system of a type which is expected to afford the most numerous opportunities for its installation. But its utility is not limited to that service; and it will be observed that it may be applied in alarm or call systems installed for other purposes, as for riot calls, or for burglar, vault or sprinkler alarms, or messenger calls, or wherever there is occasion to transmit, or to distribute, as from a central office, a signal, call or message originating in a circuit which is not normally connected to the transmitting system.

The invention permits a person to start the operation, herein called pulling the box, at any one of the prepared stations, herein called an alarm box or station, at any time, without waiting for the transmitting system to be ready to take and transmit its message, herein called an alarm; but with assurance that a central operator is instantly notified that the message is waiting; and with ability of the station and message to wait in readiness and to be sent directly, by relay through the transmitter, without human or further set-up and repetition, whenever the operator adjudges that the transmitter is available, and makes the suitable electrical connection.

For explaining the principle, and the mode of application of the invention, I show the construction and action as it may be applied to city fire alarm systems which include individual alarm boxes, distributed in series, each box having its signal-sending mechanism, and the electrical circuit of each series of boxes leading to a central station whence the alarm is set out to fire protection companies and to other persons interested.

As heretofore commonly installed in communities where the frequency of alarms (six hundred or more per year, for example as in class A of the Regulations of the National Board of Fire Underwriters) is such as to require the attention of a central station operator, the box delivers its alarm signal only as a message to the central station; and an operator there must await the completion of the signal before he can set up and start the transmitting apparatus for relaying the alarm over the wide spread city circuits to summon apparatus and for the general information of those concerned.

The invention provides improvements which eliminate much of the delay which is now customary between the instant of the pulling of an

alarm box and the actual sounding of the alarm; and which eliminate the dangers of human errors from the setting up of the transmitting apparatus; and which require of the central station operator only a plugging in and the turning of a key, upon signal, in order to set the box of origin into direct connection for sending the alarm around the city.

In fire alarm systems of the said general classification, problems are involved to provide against interference of one alarm box with another in the same line which may happen to be pulled at about the same time; and there are numerous incidental requirements as, that the system be capable of being tested, and of being used for telephoning, and that it be safeguarded against failing to send its alarm even though disorders of various possible sorts may occur. It is a part of the present invention that it provides means to accomplish its own particular main improvement without interfering disadvantageously with any of these numerous incidental attributes of the successful and comprehensive systems which are at present in use.

It is important that there be as little lapse of time as possible from the instant of the tripping of a box to the actual giving of the alarm. Ordinarily the pulling of a street box merely warns a central station operator; and that person, after the completing of the box number sent by the street box, is required to set up a transmitting apparatus to relay that signal over the alarm circuit. A substantial delay thus occurs. This interruption, lapse of time, and reliance upon the deliberation of a human agency, have been essential to satisfactory functioning of such fire alarm systems heretofore, so far as I am aware. The human element introduces possibilities of error in the receiving and in the relaying of a particular box number. Furthermore, the cost of apparatus for thus relaying a box number to the various fire stations is a substantial element in the total expense of a system.

It is among the objects of the present invention to make alarm systems of the general class A type above mentioned, more efficient and more dependable, by providing so that mechanism at a street box can send its number straight through an electrical relay to the fire stations, without the present interruption which requires a setting up of the number in a transmitting apparatus at a central station by a station operator. As it may not be deemed wise to dispense entirely with the presence and attention of a human operator, the invention is illustrated herein in that

variety in which the signal sent by a street box functions first to call attention of the operator that it is ready and waiting to send its number. The operator then needs only to plug in a connection, for the street box number to begin and to send through a relaying transmitter to the places where the alarm is desired to be received. The operator needs only to make sure that the relaying transmitter is not already in use by some other line.

Another object is to provide improved means so that the series-connected street boxes will be non-interfering in action, so that when one box is sending its number, and another box is pulled, the second box waits in readiness to send its number as soon as the first box completes its signal.

Still another aspect of the invention provides so that the station operator may prevent alarms from boxes which may have been pulled for a single fire for which one box has already been pulled and has transmitted its alarm.

A further object is to provide so that the usual telephone circuit for communication between the station operator and any desired alarm box can function without upsetting the main alarm features and circuits.

It is, moreover, an important feature that my improvements may be embodied in present systems at a cost which is relatively small, as compared with the large cost of the relay mechanism of prior art, a typical variety of which is disclosed in U. S. Patent 526,356, and with savings in maintenance cost of the system as a whole.

In attaining the above objects and results I provide, at each street alarm box, a signalling device which the pulling of the box by a citizen sets into operation. The signal notifies the central station operator that the particular box is ready to send an alarm. The box circuit being normally closed through the central station as heretofore, the said signalling device at the box is made to cause merely a surging on the line without a breaking of the circuit. If a rheostat in this circuit is set to maintain the current at about one hundred milli-amperes, which is a value that may advisably be chosen, and is used herein illustratively (with variations of proportional order, which are also illustrative and not restrictive) the mentioned surging ordinarily may be between the normal one hundred milli-amperes and sixty milli-amperes.

An outgoing distributive alarm circuit with normal current of one hundred milli-amperes being ready with a transmitting relay therein; there is provision for a current regulator to be cut in on the box circuit to increase the current to about one hundred and thirty or one hundred and forty milli-amperes.

When the station operator receives a signal that a street box is ready to send an alarm, and the transmitting relay is seen to be free and ready, he interconnects the box circuit with the transmitting relay circuit. The current in the box circuit was continuing at its normal one hundred milli-amperes because of the rheostat in this circuit. But the operator's throwing the alarm key for the interconnection shunts out the said rheostat and cuts in the current regulator, and an increased current of one hundred and thirty or forty milliamperes then passes through the box circuit, operates a trip magnet at the box which sets the sending mechanism at the box in action to send the box number direct to the transmitting relay, through which the

alarm goes out distributively to the stations which are arranged to receive the alarm, as for example to all of the fire stations in a municipality. The increase of current for tripping the box alarm mechanism need be but momentary and the alarm key is quickly returned to its normal position so that the rheostat comes back into the circuit.

The invention provides means at each box for preventing interference in case a second or third box connected in the same series is pulled before a first-pulled box has completed the sending of its number. Magnets are interposed in the system whereby a later pulled box stands in readiness to signal the operator but does not signal until the alarm of the first pulled box has been completed.

The invention also provides for non-interference as between the alarm system and the usual associated telephone system. The resistance in the signalling device, required to be introduced for notifying the operator that a box is ready to transmit, will be great enough, and the resistance introduced by the telephone circuit small enough, so that the introducing of the latter, in order to use the telephone will not affect the alarm system. Also the pulsations of the alarm system are so sufficiently rapid, relative to the slowness with which a telephone current relay acts, that the alarm system does not interfere with the telephone. Thus each is protected against interference from the other although both are interconnected in a main line circuit.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings:

Figure 1 is a diagrammatic representation of a fire alarm system embodying features of the invention;

Figure 2 is a diagram of electrical devices and circuits at a fire alarm box, and showing certain features of the invention in greater detail than at the left of the assembly view of Figure 1, and showing a telegraph key connected in the telephone circuit;

Figure 3 is a diagram indicating how a telegraph key and a recording tape device may be connected, at the central station, in the telephone circuit;

Figure 4 is an elevation, in section on 4—4 of Figure 7, of a well-known non-interference signal box mechanism modified to embody features of the present invention, the view being diagrammatic in part;

Figures 5 and 6 are similar views of the same, in section respectively on 5—5 and 6—6 of Figure 7; and

Figure 7 is an elevation of the same, in section on 7—7 of Figure 4.

Referring to the drawings, the devices and electrical connections of an alarm box are represented diagrammatically at A in Figure 1, and the devices and electrical connections at a central station are represented diagrammatically at B in the same figure. A number of the street alarm boxes A', A'', similar to A, suitably distributed over the area to be protected by the alarm system, may be connected in series in the closed circuit 10, 12, leading between the respective street alarm boxes and the central station.

Normally the circuit 10, 12 is closed across the usual hook 14 which constitutes the means for a

citizen to pull the box when it is desired to send an alarm.

According to the invention, the pulling down of hook 14 breaks the circuit 10, 12 across the hook and diverts the current through a pulsator 16 and a trip magnet 18. This diversion initially is shunted so as to avoid the pulsator for a reason which will appear, hereinafter, the current passing direct to the lower armature 18' of the trip magnet 18 and thence through the magnet, which begins to attract armature 18' to break the shunt circuit and require the current to pass through the pulsator 16 in reaching the trip magnet.

The trip magnet 18 has two armatures, at opposite ends thereof, the one 18' being of a known slow-acting sort which requires a continued, steady current to attract it and which is not attracted by a pulsating current in the magnet caused by operation of the pulsator 16. The other armature 18'' is of a known sort which resists attraction more strongly than does armature 18'. In other words, the normal 100 milliamperes of the circuit is insufficient to attract it.

As hook 14 is pulled down it automatically becomes latched in the down position by a usual means 14' (Fig. 2) which is well known. In moving down, its projecting part 14'' engages a means 19 for releasing a well-known type of three-fold clock-work 20, of the general type disclosed in U. S. Patent 1,999,859 and indicated therein by the reference character 78, which intermittently closes one side of the circuit and then the other through ground, for testing the circuit. When the armature 18' of trip magnet 18 is pulled up to start the pulsator 16 into action, the three-fold clockwork 20 comes thereby locked in its then position. If there is no break in the circuit, the clockwork becomes locked without shorting the circuit through ground. But if the clockwork found a break in the circuit and the circuit was completed through ground, the clockwork becomes locked with the circuit in this condition, so that the pulsator 16 can signal the operator.

The circuit 10, 12, is a closed circuit through the central station, and herein is illustratively assumed to be normally of about 100 milliamperes which current is maintained by the setting of rheostat 13 at the central station. If the current suddenly changes as much as 20 milliamperes above or below normal, a low-current relay 15 promptly signals the operator and rheostat 13 may be adjusted to bring the line back to normal.

The pulsator 16 has its armature 16' arranged to be resiliently resisting attraction by the pulsator magnet, as by a spring of such strength that this spring pulls the armature away from the magnet as soon as the current through the magnet is reduced by being made to pass through resistance 17. The reciprocating action of the pulsator 16 does not break the circuit, but causes the current to pass through a resistance 17 when the pulsator armature 16' intermittently is attracted by the pulsator magnet, and thus it merely introduces surges on the line. On the assumption made, of a normal current of 100, resistance 17 will be of a nature to reduce the current from that normal to about sixty milliamperes at the intermittent periods, during pulsator action when the current is passing through resistance 17.

The surging of the current, made by pulsator 16, signals to the central station that some particular box on this particular circuit is ready to

send an alarm. As represented, and as a precautionary measure, three separate signals are provided, made at the central station: a tapper bell 32, and a buzzer 34 being made to attract the operator by sound, and a light 36 being adapted to flash intermittently.

The tapper bell 32 works as a direct result of the mentioned intermittent current drops, due to action of the pulsator 16. The buzzer 34 and light 36, on the other hand, are controlled by a signal relay 37, whose armature intermittently falls away and is drawn back to its magnet as a result of the mentioned surging on the line, and thus intermittently closes and opens a separate battery circuit through the buzzer and lamp.

Having been called by any one, and usually by all, of the signalling devices of a box circuit above described, and being cognizant that the alarm distributing system is free, the operator plugs into that box circuit at the jack 38 as a step toward connecting that box circuit across to the alarm relay circuit. The alarm relay circuit is indicated at 40, 42, and the alarm transmitting relay at 44. The mere plugging in at jack 38 results in no reaction at the alarm transmitting relay 44, because the pulsator surges do not let the current down sufficiently to actuate the transmitting relay. Neither does the mere interconnection of circuits at the jack 38 affect the alarm box circuit and its mechanism.

The operator next throws the alarm key 46 to shunt out the rheostat 13, and to pass the current through the current regulator 48 to enlarge the current so as to trip the alarm at the sending box. The tension spring of the armature on the regulator 48 having been adjusted to set the current at about 140 milliamperes, the current passing through the regulator jumps accordingly, this increase over the normal of the line being predetermined at a value sufficient to make the trip magnet 18 at the box pull down its upper and more reluctant alarm trip armature 18'' which in turn releases the alarm sending mechanism at the box. The alarm sending mechanism is represented diagrammatically at 50 and may be a usual and well known three-fold clockwork, such as is disclosed in said U. S. Patent 1,999,859 at 78 therein, having a rotary contactor for intermittently closing and opening the circuit, which now includes the alarm transmitting relay 44, that relays the makes and breaks, directly received from the box, to the desired point or points where the alarm is to be sounded. The increase of current through the regulator 48 need be but momentary in duration, since the tripping of the box is its primary purpose. Therefore, the alarm key 46 may be of a sort to spring back to its normal position after the momentary diversion of current through the regulator 48. The starting of the three-fold alarm transmitting mechanism 50 at the box, in response to actuation of alarm key 46 by the operator, results directly from the movement of armature 18'' as it is drawn toward the magnet of relay 18. This movement of armature 18'' also results in rocking bell crank 53 which shifts the contact at 52 to shunt out the pulsator 16 and the trip magnet 18. The circuit then is through line 10 to the three-fold mechanism 50 and thence direct to the shifted contact at 52 and back through line 12.

When the alarm mechanism at 50 is started, the bell crank 53 continues to be held in its shifted position after armature 18'' springs away from its magnet. The contact at 52 thus con-

tinues in shunting position during the sending of the alarm.

After the box has completed the sending of its alarm, the bell crank 53 returns to its normal position, permitting the contact at 52 to return to its position as shown in Figures 1 and 2. The return movement of bell crank 53 causes the spring latch 53' to engage lug 55' of lever 55 and to rock that lever in direction to shift latch 14', thereby to release hook 14 which springs to re-set position.

Then after the circuit becomes closed, following the alarm, a slow attracting relay 54 at the central station attracts its armature 54' to close a circuit through a signal lamp 56 and through the buzzer 34 each of which tells the operator that the particular box is through sending its alarm.

In case a second box is pulled before a first-pulled box has completed transmission of its alarm, the second box will not immediately signal the operator but will await completion of the alarm of the first-pulled box. The surgings in the circuit as a result of pulsator action at the first box diminish the current enough so that these prevent the slow-acting armature 18' of trip magnet 18 at the second box from being drawn up to cut in the pulsator of the second box. But, the magnet and armature 18' of each box are such that as soon as the first box completes its alarm, and a steady current of about one hundred milli-amperes flows in the circuit, that armature 18' will be drawn up by its magnet 18 to cut in the second pulsator 16; and this signals to the operator, as described for the first box, that this second box is ready to send an alarm.

However, if the second box and subsequently pulled boxes are in the same general region as the one which has transmitted its alarm and in the judgment of the operator are probably for the same fire, the operator does not need to put through these probable duplicate alarms. At least they may be postponed in favor of signals from boxes on other circuits which may be waiting.

The main alarm circuit 10, 12, normally closed, may be traced from its source, indicated by the plus and minus signs a little to the left of telephone relay 64 at the central station, through relay 64, telephone jack 70, rheostat 13, jack 38, tapper bell 32, relay 15 and thence out of the station to the street box A, where it goes through the closed switch at hook 14, through shunting switch 52, and thence out and on through other similar street boxes, such as A', A'', whence it runs back to the central station and in through relay 37, to the negative side of the source of energy.

The alarm transmitting circuit 40, 42, normally closed, having a source of energy indicated slightly below relay 44, leads thence through relay 44, through the plug which coacts with jack 38, through alarm key 46 and thence through relay 54 to the negative side of the source of energy. Throwing alarm key 46 will connect the regulator 48 in the combined circuit 10, 40, 42, 12.

Summarizing the signalling and alarm operation, the pulling of hook 14 breaks the normal path of current in circuit 10, 12 thereby to divert the current temporarily through armature 18' to the trip magnet 18. As this trip magnet becomes energized, its lower armature 18' is drawn up, and so breaks this temporary path,

causing the current to be again diverted, this time through the signalling pulsator 16, and then through the armature 16' thereof, whence it goes to the trip magnet 18. But, armature 18' is slow-acting, so that the current thus diverted through pulsator 16 reaches the trip magnet before that armature 18' has fallen back to its normal position.

As soon as pulsator 16 becomes energized, its armature 16' is drawn away from its circuit contact, and the current then must pass through resistance 17 in reaching the trip magnet. The resulting reduction in current releases pulsator armature 16', and the return of this to its circuit contact cuts out resistance 17. But pulsator 16 almost immediately again attracts its armature 16' to cut the resistance 17 in again. Intermittent surges are thus caused by pulsator action; and these surges signal to the central station operator that the box is ready to transmit an alarm. They give this signal operating the tapper bell 32, buzzer 34, and light 36.

The operator, having thus learned that an alarm is ready to be sent, and having ascertained that the transmission circuit 40, 42 is available for use, plugs in at jack 38. This adds the transmitting circuit 40, 42 to the box circuit 10, 12; and all is thereby made ready for the sending of the alarm, which however, does not occur until the operator throws alarm key 46 and so enlarges the current sufficiently for trip magnet 18 to pull down its armature 18' whose descent releases the alarm mechanism at the box A as seen at 51 in Figure 2. The alarm being a distinctive count and rate of pulsations, caused by mechanism so well known that no details of it are shown, goes through the contacts and relay of the three-fold alarm mechanism 50 and, as heretofore described, then goes direct to the transmitting relay 44 at the central station and, without interruption or preliminary record, and without further human attention, goes on out through relay 44 to the desired points where the alarm is to be sounded.

The invention permits telephonic communication between the central station operator and persons at the respective alarm boxes, without interference with the signalling and alarm devices heretofore described. The telephone plug at the alarm box is represented diagrammatically at 60, and the telephone circuit at the central station is represented generally at 62.

If a fireman at the alarm box wishes to telephone to the station operator, he plugs in the telephone at the box. The resistance of the telephone immediately lowers the current in the circuit from its normal one hundred milli-amperes to about ninety-five milli-amperes. This drop in line current results in the armature 64' of a slow-acting telephone relay 64 leaving its magnet to close a battery circuit through a buzzer 66 and a light 68 for signalling the operator. Plugging in of the telephone does not lower the current in the circuit sufficiently to operate the signal relay 37 of the alarm circuit. And operation of the signalling and alarm devices does not lower the current for a period of time long enough to operate the slow-acting telephone relay 64.

Having been signalled as above, the operator plugs in at the telephone jack 70, and the telephone conversation may be carried on through a usual repeating coil 72. When the fireman disconnects the box telephone, the line current rises to its normal one hundred milli-amperes, and

a second telephone relay 74 draws its armature 74' to close a battery circuit through the buzzer 66 and a light 76, to signal the operator to pull out his plug at jack 70.

5 So long as the inside door of an alarm box is open (the switch contact represented at lower left in Figures 1 and 2 being the door contact, shown closed, as when the door is closed), which connects sounder 78 in the circuit, the operator 10 may signal a fireman at the box. The operator may plug in at telephone jack 70 and through ringing key 80, momentarily to shunt out the line rheostat 13 and to cut in the current regulator 82 which raises the line current to about 15 one hundred ten milli-amperes which is sufficient to operate sounder 78 at the box. The signal light 76 and buzzer 66 will be on while the telephone relay 74 has current passing through it, but, as soon as the telephone at the box is plugged in, in response to the sounder signal, the resistance of the telephone will cause relay armature 74' to pull away from its magnet, to open the buzzer and light circuit, which will notify the operator that his call has been answered. He 25 then comes on the line with his telephone set. When the conversation is complete and the box telephone is disconnected, relay 74 again closes the circuit through the buzzer 66 and light 76 to signal the operator that he may disconnect 30 at jack 70.

In Figure 2 a telegraph key 84 is represented in the telephone circuit at the box, and in Figure 3 I have indicated how the telephone circuit at the central station may be modified to adapt it 35 for telegraphic communication. At the station a telegraph key is shown at 86. Also, if desired, a recording device 88 may be in the telegraph circuit for recording all messages; and it may record as well the alarms sent out on the main 40 system. This circuit of Figures 2, 3 has therein the sounder 78 and key 84 at the box (Figure 2), and the key 86, and relay 64 at the central station. But the relay 64 in the embodiment of Figures 2 and 3 is a quick acting relay whose 45 armature 64' responds to the tappings at key 86, which intermittently reduces the current by causing it to pass through the resistance associated with the key. Armature 64' wavers back and forth to intermittently open and close the circuit through the buzzer 66, lamp 68 and recorder 88 at the central station. Similarly, at the box, tappings of key 84 cause the same operation 50 of relay 64.

The advantages and features of the invention 55 may, if desired, be combined with well known signal box mechanism, such as the "Gamewell" type of signal box disclosed in Patent No. 1,244,587, granted October 30, 1917, on application of Frederick W. Cole. In Figures 4 to 7 of the present drawings there are represented certain parts of signal mechanism as disclosed in the said Cole patent, with which are combined features of the present invention, shown diagrammatically; and, for conciseness of this present 60 specification, reference is hereby made to the said patent for a specific description of the mechanism of the patent and its operation. Except for the variations and additions herein shown and described, it may be assumed that 70 the mechanism as shown and described in the said Cole patent may be used in the combination now to be described; and, by so doing the signaling pulsations may be produced by mechanical drive instead of by the electrical means herein 75 before described.

For clearness and convenience, those parts of the present Figures 4-7 which are comparable to the parts of the said Cole patent disclosure, are given reference characters herein which are 100 more than the reference characters for corresponding parts in the said patent. Thus the winding shaft is indicated at 101 and the main spring at 102. A spur gear 110, driven by the winding shaft, through ratchet means, meshes with a pinion 114 on a signal wheel shaft 115. 10 These gears and the rest of the gear chain may be the same as in the said Cole patent. In the patent a signal wheel is connected to the shaft 115, and I provide a wheel at the same location, as at 116, but the teeth on my wheel are uniformly spaced around a major portion of the circumference, to serve as a pulsator wheel instead of as a signal wheel as in the patent. The cam 163 on the back of this wheel, with its detent, 15 may be the same as in the patent, for moving the prop 153 the same as is described in the patent. Also the pulsator key 145 for cooperating with the wheel 116 in making and breaking the contacts at 146 and 147 may be as disclosed in the Cole patent. In the patent the non-interfering magnet 20 controls the operation of the signal wheel, and a non-interfering magnet (not shown) would function similarly in the present case for control of the pulsator wheel 116.

I employ a locking member 139 for cooperating 30 with a grooved disk 136, the same as in the patent, this locking member being disengaged from a disk when the box is pulled by depressing the hook 141. When a box is thus pulled, the signal chain of gears starts and rotates the pulsator wheel 116. If the line is clear and conditions 35 otherwise are suitable for the transmission of a signal, the pulsator key 145 will be permitted to coact with the pulsator wheel for intermittent opening and closing of the contacts 146, 147. 40 If the circuit is busy, or is otherwise not ready for a signal, the non-interference magnet will prevent pulsator action in the same manner that it prevents signal wheel action in the patent disclosure.

I provide, however, so that the locking mechanism 45 is held at rest during the pulsator action, and until the central station operator plugs into the circuit and boosts the current therein. Here, again, I provide a trip magnet 18, as in the 50 forms of the invention heretofore described, which controls the starting of the locking mechanism, whose function is to release the disk 136 for a single revolution. Its armature 18^a cannot be attracted by the normal current in the system. 55 It has a projection 18^b normally standing in the path of a pawl 200 which may be mounted on gear 120, and which carries a pin 130 corresponding to the pin for engaging the dog 131 of the Cole patent. Thus when a box is pulled and the 60 signal chain of gears starts in operation, the arm 18^b of armature 18^a engages the pawl 200 and throws pin 130 to position in which it cannot engage the dog 131, and the stopping mechanism remains at rest until such time as the armature 65 has been attracted by its trip magnet in response to a boost of line current at the central station. As soon as the armature is attracted the pin 130 can engage the dog 131 and start the locking mechanism in operation, for permitting the 70 single revolution of disk 136.

The locking or stopping mechanism may be the same as in the Cole patent except that I provide on the locking disk 136 a projection 204 for controlling a shunt 206 as shown in Figure 4. 75

When the box is at rest the projection 204 closes the circuit through the pulsator contacts 146, 147 as illustrated. When the box is pulled the same situation exists until such time as the trip magnet 18 is operated by boost of current at the central station to start the locking mechanism in action. When this occurs, the locking disk 136 starts rotating and its projection 204 leaves the shunt 206, resulting in the pulsator contacts 146, 147 being shunted out of the circuit. The signal contacts 208, 210 then become effective for transmitting a signal.

Figures 6 and 7 illustrate the signal wheels which cooperate with the signal contacts 208, 210 for sending the signal. I duplicate the signal key and its control mechanism of Figure 4, and may mount them on a common shaft 212 as in Figure 7, but each can move about the shaft independently of the other, so that action of one will not affect freedom of action of the other.

Also I provide for sending second, third and fourth alarms by the mere manual shifting of a sleeve along the shaft 115, and for locking in operative position a selected one of several signal wheels carried on that sleeve, after which the box may be pulled and will indicate by the selected signal that the alarm going out in manner heretofore described is the second or what other. The four signal wheels may be grouped on a single sliding sleeve 214, for adjustment as a unit against a coil spring 216. A pivoted shifting means 218 may be provided having suitable teeth 220 in any of which the tooth 221 of lever 223 may engage for selective locking of a particular signal wheel in operative position. And a cam lug 225 on locking wheel 136 is located to engage lever 227 when the mechanism comes to rest, thereby to unlatch the signal wheels and permit their return to normal if they have been set for other than a first alarm.

When a box is pulled and the pulsator key 145 coacts with the pulsator wheel 116 to intermittently open and close the contacts 146, 147, the normal current in the circuit is intermittently lowered by being shunted through the resistance 222 (Figure 4). This pulsating current signals the central station operator that a particular box is ready to send in an alarm. He then plugs into the circuit and so boosts the current therein as was described in connection with Figures 1-3.

When the current is boosted the trip magnet 18 lifts its armature 18^a which corresponds to 18'' of Figures 1 and 2, and the locking mechanism is permitted to operate and shunt out the pulsator contacts. The circuit is now through the signal contacts 208, 210 with the signal key 145' coacting with one of the signal wheels on sleeve 214 for sending a signal through the central station as heretofore described.

All of the non-interfering features of the said Cole patent may be retained in my improved mechanism, the non-interfering magnet of that patent being herein utilized for controlling the pulsator mechanism as a preliminary to signal action.

In case pulsator and signal action are delayed after a box has been pulled, for as much as a certain pre-determined length of time, which may be due to a busy circuit, or for any other reason, I provide so that the mechanism will then automatically end its operation, and be re-set ready for a fresh alarm. For this I may employ a ratchet wheel 180 and control means similar to those of the said Cole patent, the wheel being loosely mounted on shaft 101 and being advanced

one step for each revolution of the shaft 115. The ratchet wheel has a long tooth 181 whose function it is to stop the gear train when the ratchet wheel has made a full revolution. A pin 175 on gear 120 advances the ratchet wheel step by step until the long tooth 181 engages a pivoted compound lever 222 and lifts it and so mechanically raises armature 18^a of trip magnet 18. This results in the locking mechanism being connected and driven by the gear train. As locking wheel 136 rotates, its notch moves to position for lever 139 to snap into it and stop the train. And a projecting part 139' of lever 139 engages armature 18^a to force it away from trip magnet 18 thereby assuring that all parts will be in readiness for a subsequent pulling of the box.

It will be seen that the invention provides a practicable and efficient system for direct transmission of alarms from distributed alarm boxes, through an alarm transmitting relay, to the place or distributed places of actual giving of the alarm. Adequate provision is made for non-interference as between individual boxes, and as between the signalling devices and alarm devices, and associated telephone circuits. The eliminating of the heretofore necessary expensive number-relaying machine, the eliminating of the possibility of human error in hearing and/or relaying a box number, and the substantial elimination of all delay are matters of considerable importance as affecting practicability and reliability of such systems.

The signal from alarm station to central station may be sent by means other than pulsations, and the means of communication is not necessarily over the alarm circuit, but these are preferable because of economy and greater certainty.

I claim as my invention:

1. In an alarm system having an alarm box circuit, an alarm-transmitting circuit and a central station, the combination therewith of a pulsator in the alarm box circuit, and a trip magnet having one armature controlling the pulsator action and having another armature controlling the alarm mechanism of a box; means whereby only the pulsator controlling armature responds to pulling of the box, thereby to signal the central station; a transmitting relay in said alarm-transmitting circuit; means at the central station for inter-connection of the two said circuits when called by a pulsator signal; and means at the central station for boosting the current in the box circuit, after said inter-connection of circuits, to cause actuation of the alarm armature of said trip magnet, thereby to release the alarm mechanism for transmitting of the alarm direct to the said alarm-transmitting circuit; and means responsive to movement of said alarm armature for shunting said pulsator out of the circuit during sending of the alarm.

2. In an alarm system having a central station and a normally closed electrical circuit in which are one or more alarm stations each having an alarm sending mechanism with an element for initiating an alarm, the combination therewith, at an alarm station, of signalling means whereby an actuating of the initiating element signals to the central station that an alarm is ready to be sent; means at the alarm station, responsive to a change of current in said circuit, to initiate the sending of alarm; and a telegraph key in said circuit, at the alarm box, having resistance associated therewith whereby actuation of the key produces pulsations in said circuit for telegraphing a message to the central station;

said telegraph resistance providing for intermittent change in current in the circuit of character insufficient to affect the said signalling means and alarm sending mechanism.

- 5 3. In an alarm system having a central station and a normally closed electrical circuit in which are one or more alarm stations each having an alarm sending mechanism with an element for initiating an alarm, the combination
10 therewith, at an alarm station, of signalling means whereby an actuating of the initiating element signals to the central station that an alarm is ready to be sent; means at the alarm station, responsive to a change of current in said circuit, to initiate the sending of alarm; transmitting means for distributing the alarm to points
15 removed from the central station, having terminals

at the central station; means at the central station for connecting these terminals into said circuit for extending said circuit through the transmitting means; means at the central station for making the said change of current in the circuit; and a telegraph key in said circuit, at the alarm box, having resistance associated therewith whereby actuation of the key produces pulsations in said circuit for telegraphing a message to the central station; said telegraph resistance providing for intermittent change in current in the circuit of character insufficient to affect the said signalling means and alarm sending mechanism; and recording means at the central station for recording all pulsations of current in said circuit.

FRANCIS G. COLLINS.

CERTIFICATE OF CORRECTION.

Patent No. 2,152,535.

March 28, 1939.

FRANCIS G. COLLINS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 6, second column, line 71, claim 2, after the word and semicolon "alarm;" insert the following words and semicolon -

transmitting means for distributing the alarm to points removed from the central station, having terminals at the central station; means at the central station for connecting these terminals into said circuit for extending said circuit through the transmitting means; means at the central station for making the said change of current in the circuit;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of May, A. D. 1939.

Henry Van Arsdale

Acting Commissioner of Patents.

(Seal)