

June 9, 1931.

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1,809,020

SIGNAL CODE SENDING DEVICE AND SYSTEM

Filed Jan. 3, 1927

4 Sheets-Sheet 1

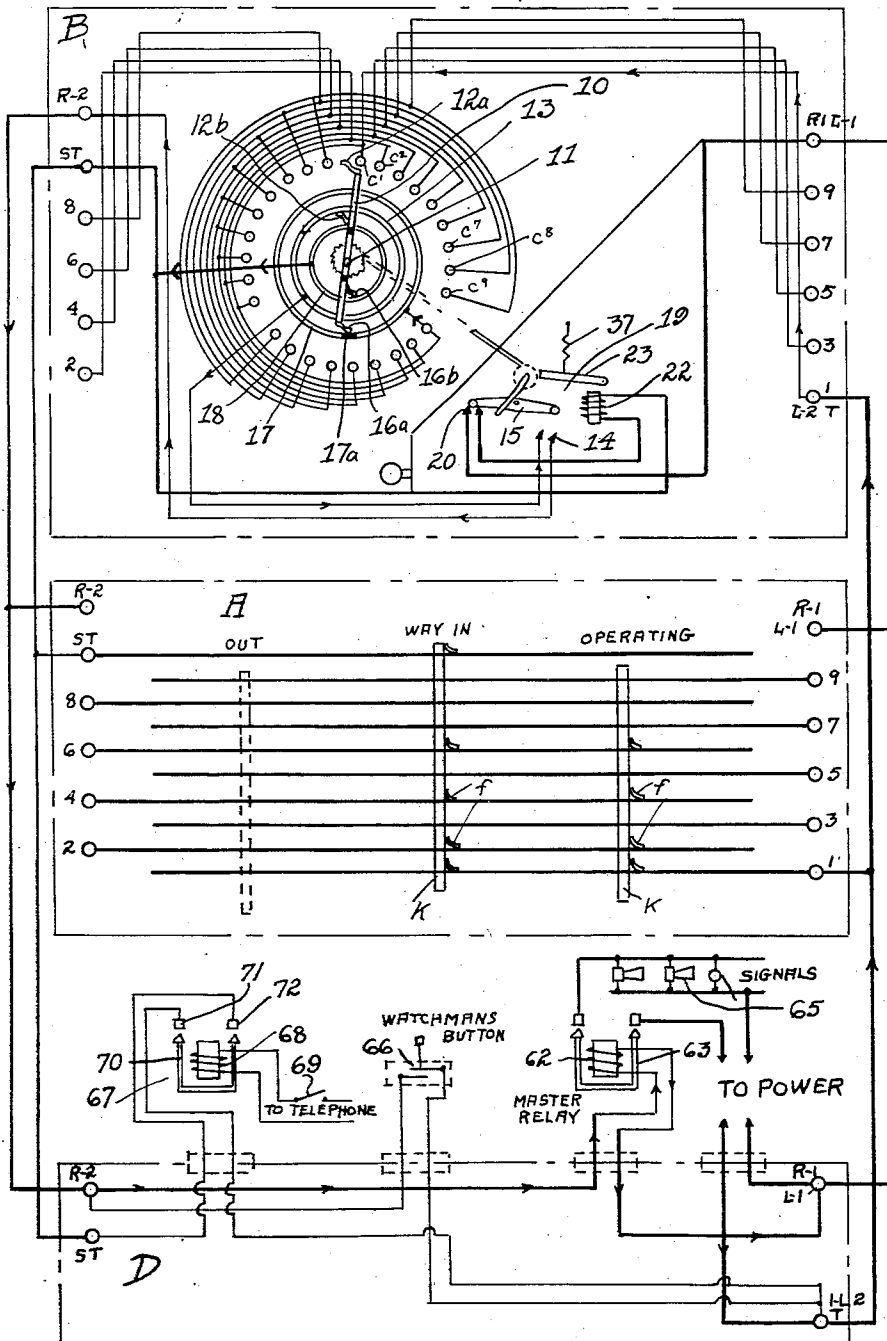


Fig 1

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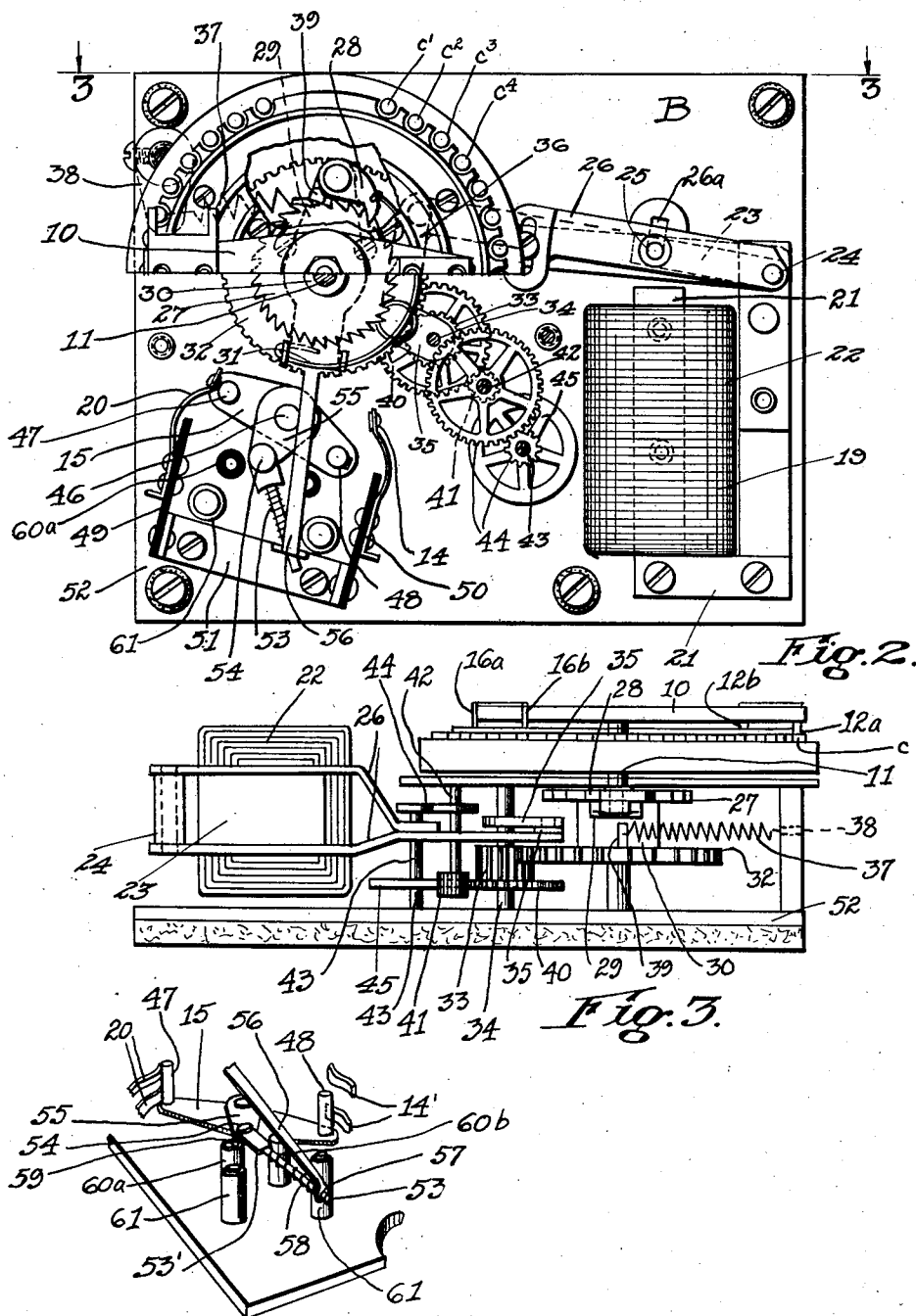


Fig. 4.

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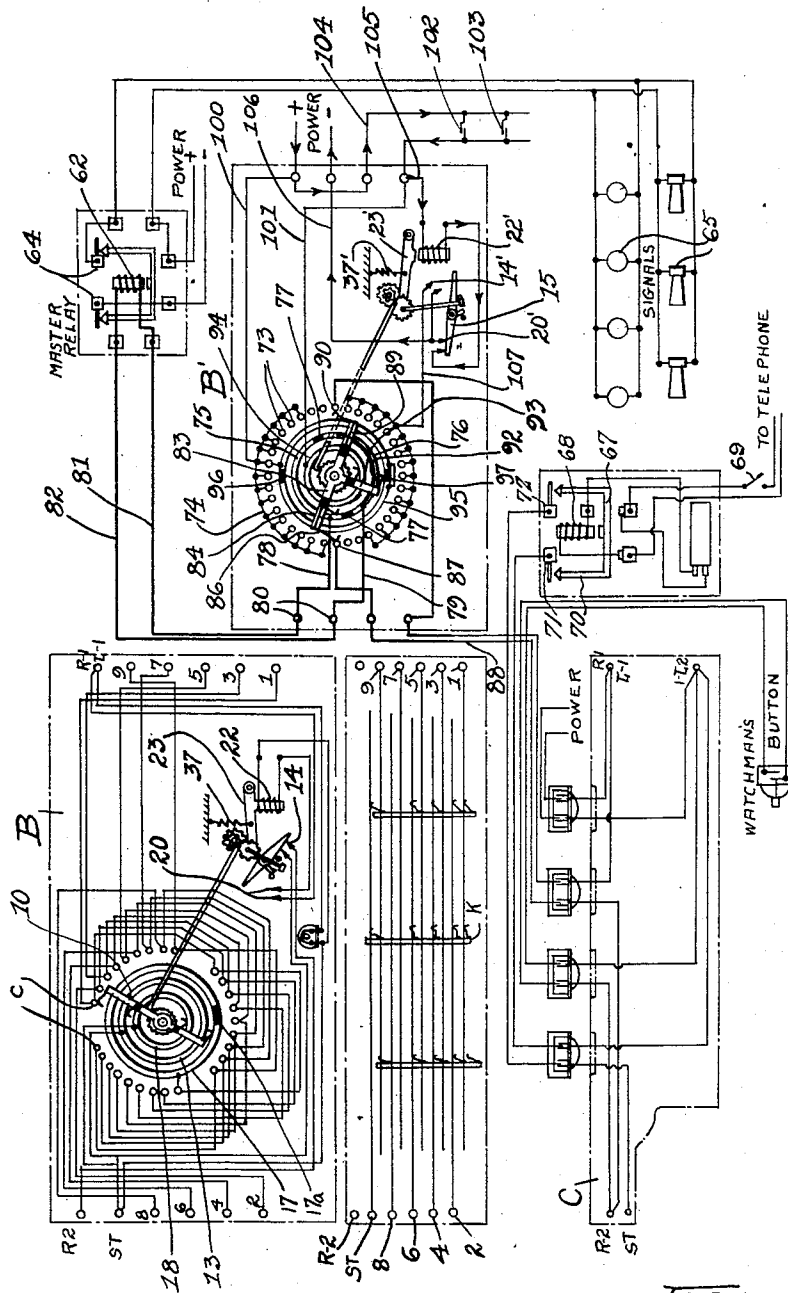
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SIGNAL CODE SENDING DEVICE AND SYSTEM

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4 Sheets-Sheet 3



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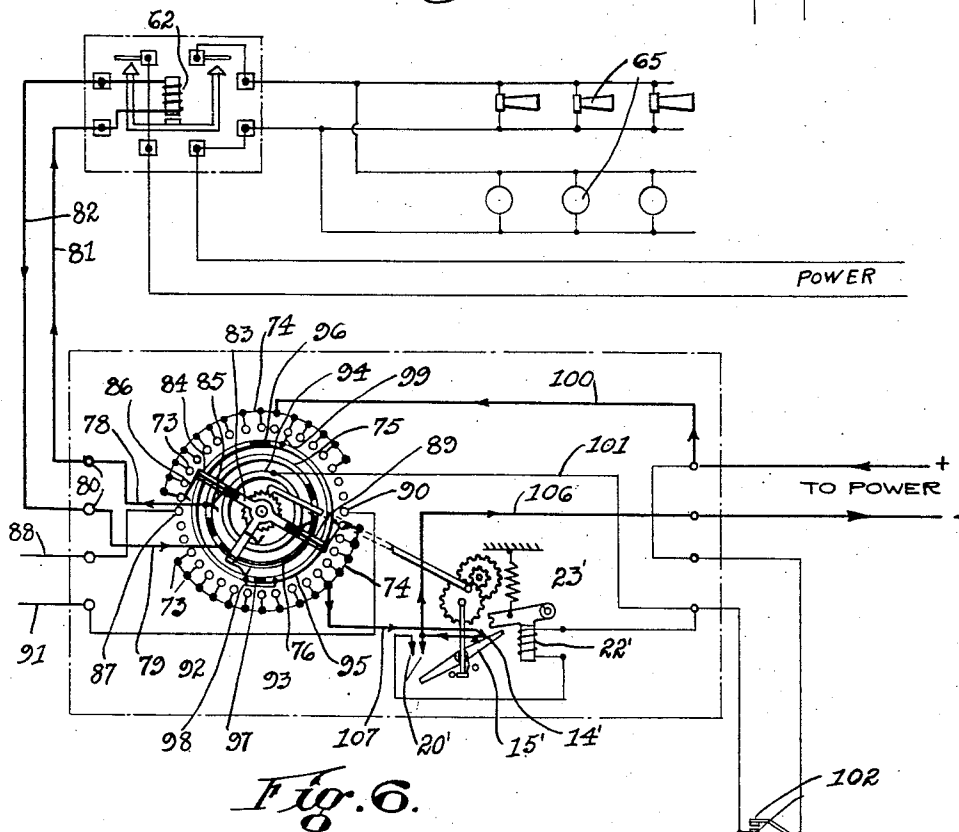
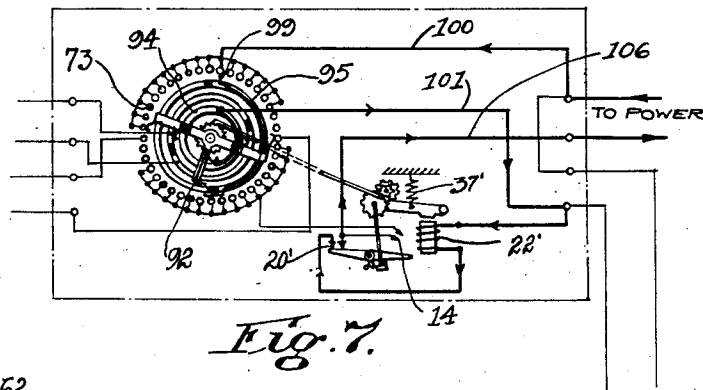
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SIGNAL CODE SENDING DEVICE AND SYSTEM

Filed Jan. 3, 1927

4 Sheets-Sheet 4



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SIGNAL CODE SENDING DEVICE AND SYSTEM

Application filed January 3, 1927. Serial No. 158,665.

My present invention relates to an improved signal code sending device and system of the type commonly used for controlling, usually from a distance, the operation of various kinds of apparatus for sounding or displaying a multiplicity of different signals at stations throughout industrial establishments. Calling and locating individuals by code number and sounding of fire alarm, or time signals are well known uses.

In my copending application No. 148,464, filed November 15, 1926, I have shown and described a code setting device for signal systems, and for purposes of illustration there is shown in the present application portions of the code setting device shown in the aforesaid copending application, the function of the code setting device being to determine the selection of signals sounded by the code sending device.

The code sending device of the present invention primarily consists of an electric current commutating mechanism and one object of the present invention is to provide an improved electro-motive means for operating the commutating device so as to operate the signals in the sequence determined by the code setting device.

Another object of my invention is to provide an improved signal system employing code sending apparatus of my improved type, which system is capable of sounding either selective code call signals for locating individuals, or for the sounding of fire alarm or time signals comprising a sequence of impulses readily distinguishable from any of the code signal sequences within the range of the selective code device.

In my improved system the same gongs, or other signal announcing apparatus, are employed for both the selective code signal calls and the alarm or time impulses, and accordingly my system provides means for preventing the simultaneous or jumbled operation of code call signal impulses combined with the alarm or time signal impulses, without, however, delaying the commencement of the fire or other alarm which, of course, must function promptly and substantially instantly when set into operation.

Another object of my invention is to provide a signal system in which any code call signal operating at the time of interruption by the special alarm or time signal may automatically resume its normal operation after the alarm signal has been completed.

The above and other advantageous features of my invention will hereinafter more fully appear, with reference to the accompanying drawings, in which—

Fig. 1 is a diagrammatic view showing the electrical connections and relative positions of my improved code sending device when used in connection with my code setting device in a signal system.

Fig. 2 is a plan view of the code sending device, a portion of the commutator disk being broken away to show the operating mechanism.

Fig. 3 is a vertical sectional view along the line 3—3 of Fig. 2.

Fig. 4 is a perspective view of the toggle switch shown in Fig. 2.

Fig. 5 is a circuit diagram of a combined selective code call and alarm signal installation shown in position for effecting a code signal call.

Fig. 6 is a diagrammatic view illustrating the manner of sounding an alarm signal.

Fig. 7 is a view similar to Fig. 6, showing the energization of the propelling magnet of the alarm signal commutator.

Like reference characters refer to like parts in the different figures.

Referring first to Fig. 1, there is shown diagrammatically the essential parts of the code setting and code sending devices as they are employed in my system, one code setting unit being indicated at A, while the base outline of the commutator of the code sending device is indicated B. As clearly set forth in my aforesaid copending application No. 148,464, the code setting unit provides a series of parallel bus bars numbered 1 to 9, inclusive, and St, which are connected by terminals to correspondingly numbered terminals on the base B. There is also provided an instrument base indicated at D and certain terminals designated L¹—R¹, I—L², R² and St are connected to correspondingly

designated terminals on the commutator base B by conductors extending vertically through the code setting unit A.

The commutator provides three groups of contacts c^1 to c^9 inclusive, which are connected to the bus bar terminals 1 to 9 inclusive, the corresponding contacts of each group being interconnected so that when any contact of the first group is energized the correspondingly numbered contact of each of the other groups is also energized. The commutator also provides a brush arm 10 rotatable clockwise with a shaft 11 centrally located with respect to the groups of contacts c^1 to c^9 inclusive. The brush arm 10 carries at one end a double brush 12 which provides a pair of spring fingers 12a and 12b, the outer finger 12a riding over the signal contacts c while the inner finger 12b rides over an annular contact ring 13. The ring 13 is adapted to be connected to the terminal R^2 only when a pair of normally open contacts 14 are bridged by a pivoted switch bar 15, the operation of which will be hereinafter described.

The brush arm 10 carries at its other end a double brush 16 which provides a pair of spring fingers 16a and 16b, the outer one 16a of which is adapted to ride over an annular contact ring 17 that is permanently connected to the contacts c^1 that are in turn connected to the bus bar 1 and the line terminal L^2 . The ring 17 provides an insulated gap at 17a which the finger 16a engages when the device is at rest. The inner brush finger 16b is connected to an annular contact ring 18 that is permanently connected to the terminal St . The terminal St is also permanently connected to one terminal of the coil 22 of an electro-magnet 19 which forms part of the impelling mechanism for the commutator shaft 11. The other terminal of the coil 22 is connected to line terminal L^1 through a pair of contacts 20 which are normally bridged by the switch bar 15 as will hereinafter appear.

Referring now to Fig. 2, the electro-magnet 19 is shown as of the alternating or direct current type and provides a laminated core 21, a coil 22 and a laminated armature 23 pivotally supported on the core 21 by a pin 24. The free end of the armature 23 has a bolt 25 extending therethrough, the ends of which are received in the parallel sides of a brass yoke 26, the ends of which are also supported by the pivot pin 24. Thus the yoke 26 is adapted to move with the armature 23 when the latter is attracted by energization of the coil 22, and this movement of the yoke is utilized to effect a step-by-step movement of the commutator brush arm 10, as will now be described.

For this purpose the shaft 11 of the brush arm 10 is provided with a ratchet wheel 27 secured thereto, the spacing of the teeth on

the wheel 27 corresponding to the spacing between consecutive commutator contacts c . The ratchet wheel 27 is adapted to be operated by a pawl 28 pivoted on an arm 29 that extends from a collar 30 loose on the shaft 11. A spring 31 anchored at one end on the arm 29 serves to maintain the pawl 28 in engagement with the teeth on the wheel 27. The collar 30 of the pawl arm 29 also carries a gear 32 which is in mesh with a pinion 33 on a shaft 34. The shaft 34 carries a crank arm 35 which is connected by a link 36 to the free end of the armature yoke 26.

By the construction just described, each time the electro-magnet 19 attracts its armature 23 the movement of the latter will, through the yoke 26, impart a turning movement to the shaft 34. This movement of the shaft 34 will cause the pinion 33 to turn the gear 32 enough to step the ratchet wheel 27 forward through the space of one tooth. When the circuit of the coil 22 is interrupted by means about to be described, the armature 23 will be moved upwardly from the core 21 by the pull of a coil spring 37 anchored at one end to a lug 38 and connected at its other end to a stud 39 on the large gear 32. The spring 37 is tensioned when the armature 23 is attracted, so that the spring 37, acting through the gear 32, the shaft 34 and the linkage, will always return the armature 23 to its upper position when the coil 22 is de-energized. The movement of the armature 23 by the spring 37 will also return the pawl carrying arm 29 to its initial position, thereby causing the pawl 28 to ratchet over the next succeeding tooth preparatory to the next stepping operation.

The above described mechanism for imparting a stepping movement to the commutator brush arm 10 is particularly designed so as to obtain the stepping movement with the development of a minimum amount of power by the electro-magnet 19. It is known that an alternating current magnet developing its maximum power with a small air gap will tend to make a considerable buzz and chatter which would be undesirable in a signal sending device of this type. Consequently, the electro-magnet 19 is operated with a relatively large air gap between the armature 23 and core 21 so that when the coil 22 is energized the armature 23 is attracted without objectionable buzzing. In my improved device it is possible to effectively operate the commutator shaft 11 with a relatively small amount of power developed by the electro-magnet 19, by the multiplication of this power through the linkage and the leverage obtained by the pinion 33 driving the large gear 32. With this arrangement, it is possible to turn the commutator shaft 11 with the development of a considerably smaller amount of power by the electro-magnet, than would be possible should the arma-

ture yoke 26 be connected directly to the gear 32. In order to provide for adjustment of the yoke 26 on the armature 23, the yoke has a slot 26a through which the bolt 25 extends.

The pinion shaft 34 also carries a gear 40 in mesh with a pinion 41 on a countershaft 42, and this shaft 42 is in turn connected to a flywheel shaft 43 by means of step-up gearing 44, so that the flywheel 45 on the shaft 43 is driven at a greatly increased speed, as compared to the pinion shaft 34. The flywheel 45 acts as an inertia governor so as to store up energy of rotation when the armature 23 is moved, the energy so stored being utilized to complete the motion of a make and break device for controlling the energization of the winding 22 and the sounding of the signals, as will now be described.

The means for interrupting the electromagnetic motor circuit between contacts 20 after each step of advance and which permits the spring return of the armature preparatory to the next step of advance, is preferably mechanically interlocked by the bar 15 with anti-arcing switch contacts 14 connected in circuit, preferably in series, with the signaling contacts *c* of the commutator, so as to prevent sparking at the latter. For this purpose, I mount the insulated double-ended bar 15 on a support 46 and provide current carrying contact posts 47 and 48 at the opposite ends thereof. Contact post 47 in circuit closing position establishes a bridging connection between the spring contacts 20 which are mounted on an upstanding insulating support 49 and are electrically connected to one terminal of the electromagnet coil 22 and to R¹—L¹. Spring contacts 14 on support 50 coact with post 48, one contact 14 being connected to the ring 18 of the commutator block and the other to the relay terminal R² which leads through the signal unit stack to the master relay. The upstanding insulating contact finger supports 49 and 50 are riveted to the upstanding arms of a support bracket 51, attached to the metal base 52.

The double-ended switch bar 15 is oscillated by a toggle snap action to close the anti-arc contacts 14 through post 48 and to open the motor circuit contacts 20 when the armature 23 is attracted, and conversely to reclose the motor circuit contacts 20 and open the signal contacts 14 when the armature is retracted by its spring 37. The toggle action comprises a link 53 pivoted at 54 to a crank 55 rigidly secured to the middle of the switch bar 15. The pawl stepping arm 29 has a long extension 56 with a downturned eye 57 through which the extremity of the toggle link 53 extends, a coil spring 58 about the toggle link intervening between said eye and a shoulder 53' on said toggle link. Stop pins 59 with insulating rollers 60a and 60b limit the stroke of the crank 55 and, therefore, of the contact posts 47 and 48 to prevent move-

ment thereof beyond circuit making position. Cushioned stop posts 61 may also be provided to limit the stroke of the toggle actuating arm extension 56. The mechanical operation of the toggle is such that when the coil 22 is energized to turn the pawl arm 29, the link 53 turns on the roller 60a very easily, thereby breaking the toggle as the extension 56 lines up with pivot pin 54. This snaps the post 47 away from contacts 20 to deenergize coil 22, but the energy stored in flywheel 45 is sufficient to throw the toggle all the way so that the crank 55 engages the right hand roller 60b. This causes the post 48 to bridge the signal contacts 14 momentarily, until the spring 37, acting on gear 32, returns the arm 29 and breaks the toggle again.

Having described the various parts entering into my invention the operation thereof will now be described, with reference to Fig. 1, in which parts of the electro-motor of the commutating device is shown schematically. In Fig. 1 there is also shown a key *k* of the code setting device in three different positions, as indicated, the operation of this key being fully shown and described in my aforesaid copending application, Serial No. 148,464. It is therefore not believed necessary to more fully describe the key *k* herein, other than to say that when the key *k* is in its inoperative position or "out" none of the fingers *f* on the bus bars engage the same, whereas when the key *k* is depressed to its operating position, the fingers on the bus bars 1, 2, 4 and 6 are in electrical contact therewith to sound the signal "211". The key *k* is also adapted to assume a "way in" position momentarily, in which the finger on the bus bar *St* also engages the key.

As previously pointed out, the brush finger 16a is in engagement with the insulated portion 17a of the commutator ring 17 when the device is not operating, so that even though the contacts 20 are bridged by the post 47, no current can flow through the brush 16 from the energized commutator ring 17 to the coil 22. However, when the operator pushes the key *k* all the way in before releasing it, the coil 22 will be immediately energized by current flowing from one side of the power source at the terminal I—L² and from thence through the bus bar 1 and the key *k* to the terminal *St* of the commutator. From the terminal *St* the current flows to the coil 22 through the then closed contacts 20 and from thence to the other side of the source at the terminal R'—L' as shown in heavy lines.

When the winding 22 is so energized the armature 23 will be attracted to move the brush arm 10 through the space of one ratchet tooth, thereby moving the brush 16a off the insulation at 17a into engagement with the energized commutator ring 17. This move-

ment momentarily breaks the circuit of the coil 22 at the contacts 20, but as previously described, the spring 37 returns the armature 23, thereby reestablishing the circuit of the coil 22 at the contacts 20. Current then flows from the continuously energized commutator ring 17 through the brush 16 to the other commutator ring 18, as indicated by heavy arrows, and it is obvious that the coil 22 will be thus energized each time the contacts 20 are bridged by the post 47 on the bar 15. Thus the armature brush arm 10 will have a step-by-step clockwise movement imparted thereto until it has made one complete revolution, whereupon the brush 16a will again engage the insulating gap 17a in the ring 17 and the parts will come to rest.

As the brush arm 10 is stepped around, the brush 12a carried thereby will engage the contacts *c* consecutively, and it is apparent that when the brush 12a engages the first contact *c*¹ of the first group, current will flow from the terminal I—L² through the brush 12 and commutator ring 13 to one relay terminal R² through the then closed contacts 14, as indicated by small arrows. The terminal R² is connected through the base D to one terminal of the winding 62 of a master signal relay, the other terminal of which is connected to the source of power through the terminal R¹—L¹. When the relay winding 62 is so energized its armature 63 will engage the stationary contacts 64 and thereby connect a plurality of signals 65 to a source of power not shown, thus sounding the signals 65 throughout the establishment.

From a consideration of the operation of the toggle switch it is evident that the signal contacts 14 will be bridged by the post 48 only momentarily before the spring 31 returns the armature 23 so that the signals 65 are only sounded for one short impulse. When the brush 12a on the arm 10 engages the next contact *c*², the master relay winding 62 is again energized, the current this time flowing from the bus bar 1 to the bus bar 2 through the key *k* and from thence to the terminal 2, the brush 12 and the relay terminal R². This sounds the signals 65 again, but on the next step of the arm 10 the signals are not sounded, owing to the fact that the bus bar 3 is not connected to the key *k*. When, however, the brush 12a engages the commutator contacts *c*⁴ and *c*⁵, the master relay winding 62 is energized each time, thus causing the signals 65 to be sounded a third and fourth time with an interval therebetween, these impulses representing the code call "211." After this the brush 12a passes over the remaining contacts *c* of the first group without sounding any more signals.

As the brush 12a is stepped over the second group of contacts *c*, the signals 65 are sounded in the same sequence as before, cor-

responding to the code number "211", and the same thing occurs when the brush 12a passes over the third group of contacts, whereupon the brush arm 10 comes to rest as the brush 16a engages the insulated gap in the ring 17 at 17a.

From the foregoing then it is apparent that each time a key of the code setting unit is pushed all the way in it will initiate the operation of the code sending device by momentarily energizing the coil 22 of the electro-motor, whereupon the commutator arm 10 will be stepped through a complete cycle without any further action on the part of the operator. As the arm 10 is turned it will cause the signals 65 to be sounded in accordance with the sequence determined by the arrangement of the fingers on the bus bars 1 to 9 inclusive, these fingers serving to connect the corresponding commutator contacts *c* to the continuously energized bus bar 1.

It will be noted that in the foregoing operation the snap switch contacts 14 are connected in series with all of the signal contacts *c*, when established, and that these snap switch contacts 14 are snapped to open circuit position by the action of the return spring 37 of the electro-magnetic motor when the latter resets the pawl 28 of the clockwork preparatory to the succeeding advance of the commutator brush arm 10. Thus the switch contacts 14 are brought to open position and the signalling circuit is interrupted prior to any stepping advance of the commutator arm 10, so that no sparking can occur at the commutator contacts *c*. After the electro-magnet has effected a step of advance of the commutator arm 10, the contacts 14 are immediately closed to permit a succeeding signal operation therethrough.

The governing flywheel 45 has considerable weight and its effective inertia is greatly increased by driving it through multiplying gears, thus the speed of the motor armature 23 is greatly reduced while, at the same time, power is stored up for carrying the peak loads, as when the armature 23 is forcing the switch toggle toward its dead center. The operation of the flywheel 45 so times the mechanism as to afford substantial intervals between successive steps of the commutator. This gives the master relay and the bells, horns, etc., time enough for each to complete its stroke or unitary impulse constituting a code element, before the next stepping stroke moves the commutator arm off the contact. Also, the stepping movement itself is deliberate, giving ample intervals between successive code elements, as is necessary for clearness and intelligibility of the code signal, as a whole. The adjustment between the armature 23 and yoke 26 permits changes in the timing of the mechanism.

In order to permit the signals 65 to be sounded in cases of emergency, as by a watch-

man when the telephone operator is absent, a push button 66 is provided which, when closed, is adapted to connect the master relay terminal R^2 to one side of the source at L^2 . By pressing the button 65 it is thus possible to sound the signals as desired independently of the code setting and sending devices.

There is also provided an auxiliary relay 67, the winding 68 of which is adapted to be energized from an outside telephone trunk line or extension when a knife switch 69 is closed. The armature 70 of the relay 67 is adapted to bridge the contacts 71 and 72 which are connected to the terminals S^1 and L^2 respectively. The purpose of the relay 67 is to permit the signals 65 to be operated by a telephone call coming in when the operator is absent, as after the close of business. When it is desired to utilize this telephone relay 67 the operator closes the switch 69 before leaving, after pushing in one of the keys bearing the watchman's or night superintendent's call. With the switch 69 closed, an incoming telephone call will energize the relay winding 68 and cause the armature 70 to bridge the contacts 71 and 72. When this occurs the terminal S^1 of the commutator will be connected to one side of the power source through the terminal L^2 thereby energizing the coil 22 and initiating a cycle of operation of the code sending device to sound the signals in accordance with the code determined by the key which is left depressed in its operating position.

Referring now to Fig. 5, there is shown diagrammatically the inclusion in the signal system of apparatus for causing the sounding of a fire alarm or time signals in connection with the operation of the code sending apparatus. In Fig. 5 there is shown diagrammatically at B' , a commutator, and operating instrumentalities therefor from which the time or fire alarm signals are controlled. The commutator stepping or operating mechanism B' is preferably of the identical construction as the mechanism diagrammatically shown at B herein, and I have accordingly employed the same reference numerals for the stepping mechanism of the B' commutator as for similar parts of the B commutator, primed however.

The alarm commutator B' is provided with a multiplicity of separate contacts 73 distributed about the entire periphery, and illustratively, I have shown a group of fifteen of these contacts electrically connected together by a common circuit connection 74 at one side of the commutator and a similar group of fifteen such contacts 73 similarly connected together by a conductor 74 at another part of the periphery of the commutator.

The master signal relay which in the system disclosed in Fig. 1 is connected directly to the conductors leading from "master relay" in the base D, is connected through the alarm

commutator B' in the present combined arrangement. To this end the alarm commutator B' provides a pair of relay segments 75 and 76 of equal length and diameter and spaced by insulating gaps 77, and these segments are connected respectively through conductors 78 and 79 to the master relay terminals 80, see Fig. 6. The terminals 80 are connected through connectors 81 and 82 to the solenoid coil 62 of the master relay. The circuit to the master relay commutator segments 75 and 76 is established by way of the commutator arm 83, said arm having a brush 84 with a finger 85 engaging segment 75 and a finger 86 engaging the fixed contact 87 to which one of the conductors 88 from the master relay terminal of the code calling apparatus is directly connected. Similarly the commutator arm 83 has a diametrically opposite brush 89 bridging from the other relay segment 76 to a commutator contact 90 which in turn is connected by conductor 91 to the other master relay terminal of the call apparatus. It therefore follows that as long as the alarm commutator arm 83 is in the position shown in Fig. 5 of the drawings the operation of the call system or apparatus takes place identically as previously described with reference to Fig. 1, and signal impulses will flow as shown by the heavy lines.

In the time or fire alarm signal commutator B' the commutator stepping circuit is established through a brush 92 on a separate arm 93 moving with the main arm 83 of the commutator, said brush 92 bridging between a closed commutator ring 94 of diameter smaller than the relay controlling segments 75 and 76 and a ring 95 of diameter larger than the relay controlling segments. The outer ring 95 is preferably formed with two diametrically opposite gaps 96 and 97, each serving the function of gap at 17a in the call commutator B. With two gaps in ring 95 it follows that in the specific embodiment shown the alarm commutator arm 93 would turn through but a half revolution before its brush would reach an insulating gap causing the brush 92 to stop. A short conductor 98 connects the two segments of the outer ring 95 together.

The two parts of the outer motor stepping circuit ring 95 are connected through a conductor 99 to the common contact conductor 74 which is connected to a source of electro-motive power preferably the ordinary lighting circuit by way of conductor 100. The inner commutator ring 94 is connected by way of conductor 101 to the source of alarm control which may be either a hand or automatically closed fire alarm button contacts 102, or electrical contacts 103 controlled from a program clock, not shown, or both.

With the parts as shown in Fig. 5, let it be assumed that either the fire alarm circuit contacts 102 are closed, or that the contacts 103 controlled from the program clock are

closed. Current will pass from the power pole + through the conductor 104 to the program contacts 102 or 103 and then through 105 to the motor solenoid 22'; thence by way of closed contacts 20' and conductor 106 to the other - pole of the power source, as indicated by small arrows. The solenoid being energized attracts its armature 23', thereby turning the commutator arm clockwise one step and in particular moving the brush 92 from gap 97 onto the outer ring 95. At the same time the brush finger 86 leaves contact 87 and engages the first alarm contact 73 while the brush 89 leaves contact 90 to engage the diametrically opposite contact 73, see Fig. 6. This movement immediately breaks all connection between the code calling commutator B and puts the master relay winding 62 under the control of the alarm commutator B' entirely.

When the armature 23' is attracted it throws over the toggle switch arm 15' to open the motor stepping circuit at 20' and to close the signal controlling circuit at contacts 14' as shown in Fig. 6. The signal circuit is at this time closed as follows: from the source of power at + through conductor 100 and connector 74 to first alarm contact 73. Then by way of brush 84 to segment 75, and from thence by way of conductors 78 and 81 to relay solenoid 62. The return circuit from solenoid 62 is by way of conductors 82 and 79 to the other relay segment 76 of the commutator, thence by way of commutator brush 89 to contact 73. The circuit is then through common conductor 74 and conductor 107 to the then closed signal controlling contacts 14', and thence by way of conductor 106 back to the - pole of the power circuit.

The energization of the relay solenoid 62 effects closure of the contacts 64 thereof, and thereby closes circuit from the source of power to the various signal announcing devices 65. The spring 37' after the signal operation, immediately retracts the armature and causes the toggle switch to be returned to the position shown in Fig. 7, again energizing the solenoid 22' and causing the commutator arm to step forward through another step. At this time current passes from the + power pole through conductor 100 and connector 99 to outer commutator ring 95 and thence by way of commutator brush 92 (which has left the gap 97 in the starting step of Fig. 1) to the inner ring 94. From ring 94 current passes through conductor 101 to the solenoid coil 22' and thence by way of stepping contacts 20' through conductor 106 back to the other - pole of the power circuit.

Thus the operations of automatically stepping the commutator arm forward and effecting signal impulses continues until finger brush 92 has moved from gap 97 to gap 96. At that time the fire alarm contacts 102 or program contacts 103 will ordinarily no

longer be closed, so that the signal alarm will then cease.

There being fifteen of the contacts 73, fifteen signal impulses at uniform intervals will sound or flash when the program clock contacts 103 or fire alarm contacts 102 are closed. Preferably the solenoid 22' and the spring 37 are more powerful and the governor wheel lighter than in the commutator of the code calling apparatus so that the fire alarm commutator B' operates more speedily than does the code signalling commutator B, the fifteen signal impulses taking place in the rapid succession ordinarily desired for an alarm of this character.

Preferably the complete series of fifteen alarm signal impulses is announced in an interval less than that required for one set of code signalling impulses, that is at an interval less than that required for the code signalling commutator arm 10 to traverse but one of the three groups of contacts c.

Should the code signalling commutator B be in operation at the instant that the fire alarm or program clock contacts 102 or 103 are closed, the alarm commutator B' will immediately take away the control of signals from the former. As soon as the solenoid 22' has attracted its armature 23' the arm 83 is moved to the position shown in Fig. 6 so that its fingers are out of engagement with contacts 87 and 90 and the circuit from the selective code commutator B to the master relay is broken. Although the control of the signal announcing apparatus is taken away by alarm commutator B' from code commutator B, the stepping motor of the latter, continues to operate and the commutator arm 10 continues to step around for the rest of its cycle until brush 16a has reached gap 17a.

The alarm signalling operation is completed when arm 83 has moved through one half revolution, at which time its brush 89 will be in engagement with contact 90 and brush 84 with contact 87. Therefore, if the call commutator arm 10 is still stepping around when the alarm commutator B' has reached a neutral position, the control of the signal announcing apparatus will be restored to said selective commutator B and the selective signal will be announced for the balance of the cycle of operation of said selective commutator, through a circuit readily understood from Fig. 5. By way of example, assuming that the selective code signalling apparatus is in operation and that the first of the three repeated sequences of signal operations is in progress when the program clock contacts 103 are closed, the call signal will immediately cease and the rapid succession of alarm signal impulses will be completed before the selective commutator arm 10 has moved to the end of the second group of its contacts c. It follows that without further manual operation, after the alarm signal has

ceased that at least one complete selective code signalling or call sequence will sound.

Thus by my system I have avoided the need for separate signal announcing instruments, one set for the code and another set for the time or fire signal, a common set of said instruments serving for operation for either purpose. The jumbling effect of a fire or time signal superposed upon a selective code signal is wholly avoided. In the case of the repeated sequence of code signal impulses of which my system is capable, ordinarily only one of the group of three or more sequences is interrupted by the interposition of a fire or time signal breaking into the operation of a selective code signal.

Various modifications in the construction and arrangement of apparatus in my system are possible within the range of the following claims and it may be noted in this connection that my system may be carried forward by providing three or more separate signalling or controlling commutators or equivalent apparatus interconnected in circuit according to the principle herein disclosed.

The code commutator shown and described herein is claimed in my copending application 329,601, filed Dec. 31, 1928.

I claim:

1. A signal installation comprising an announcing instrument, a commutator having three sets of contacts, the corresponding contacts of each set electrically connected together, a commutator arm adapted to be stepped around said contacts in sequence, selective means for establishing circuit to various selected combinations of said contacts, an alarm commutator having a plurality of contacts, and a brush rapidly stepping therearound, the duration of movement of the brush over a complete set of alarm commutator contacts being no greater than that for stepping the brush of the code commutator from any contact of one set to the corresponding contact of the next set of code signal contacts, the circuit to the announcing instrument from the code commutator passing through certain of said alarm commutator contacts closed in normal inoperative position of the alarm commutator, whereby signals controlled by the code commutator will be inhibited throughout the period of operation of the alarm commutator, and whereby regardless when the alarm breaks into the announcement of a code signal, at least one signal sequence thereof will be announced in normal manner.

2. In a signaling circuit, in combination, a pair of electrical commutating devices, one providing a number of series of contacts for controlling an intermittent selective code signal and the other providing a single series of contacts for controlling a special alarm signal of no greater duration than the dura-

tion of a series of code signals, signal announcing devices connected in operating circuits from said commutating devices, the circuit from the code signaling commutator normally passing through closed contacts of the alarm signaling commutator when the latter is inoperative, whereby the alarm signaling commutator effects opening of said code signaling circuit at the commencement of the operation thereof and thereby takes away the control of the signals from the code signaling commutator.

3. A signal installation comprising in combination an announcing instrument, a code signal commutator providing a plurality of sets of stationary contacts with the corresponding contacts of each set electrically connected together, a commutator arm, means for stepping said commutator arm around said signal commutator contacts, an alarm commutator providing a single set of stationary contacts, a brush for engaging said contacts, means for rapidly stepping said brush around said alarm commutator contacts in a period no greater than that required for stepping the brush of the code commutator from any contact of one set to the corresponding contact of the next set and circuit connections extending from said announcing instrument to said code commutator passing through a pair of said alarm commutator contacts when the alarm commutator is inoperative, whereby the alarm commutator effects opening of the connections from the announcing instrument to said code commutator at the commencement of the operation of the alarm commutator and thereby takes away the control of the signals from the code signaling commutator.

4. In a signalling system, a current supply, an announcing circuit, an electromagnet, a first commutator system operated by said electromagnet, means controlled in the operation of said commutator system for alternately switching said current from said electromagnet to said announcing circuit, a second commutator system also for controlling said announcing circuit, and means effective in the operation of the second commutator system for disconnecting the announcing circuit from the first commutator system.

5. In a signalling system, a current supply, an announcing circuit, two mechanically independent commutator systems, an electromagnet respectively for operating each commutator system, respective means controlled in the operation of each commutator system for alternately switching the current from the respective electromagnet to the announcing circuit, and means responsive in the operation of one of said commutator systems for disconnecting said announcing circuit from the other commutator system.

6. In a signalling system, an announcing circuit, code determining means and a com-

mutator system conditioned thereby, means to render said commutator system effective successively to repeat a code signal into said announcing circuit, a second commutator
5 system including means for applying a non-code signal to said announcing circuit, and switching means controlled in the operation of the second commutator system for suspending a code signal of the first mentioned
10 commutator system during the interval only of the non-code signal.

7. In a signalling system, a first, a second and a third signalling circuit, a first and a second commutator system, a stepping mag-
15 net for each of said commutator systems, a current supply, means responsive in said first signalling circuit for connecting said current to the magnet of the first commutator in effecting an initial step thereof, means
20 thereafter responsive in the operation of the first commutator system alternately to switch said current to said second signalling circuit and to the stepping magnet of this commutator, means in said third circuit to con-
25 nect said current to the magnet of the second commutator system in effecting an initial step of that commutator, means thereafter controlled in the operation of the second commutator system for alternately switching its
30 magnet and said second circuit to said current supply, and means effective on the initial response of said second commutator system for disconnecting said second circuit from the first commutator system.

35 8. A signal installation comprising a code commutator having three sets of contact segments, connections for multiplying corresponding segments of the sets, a commutator arm adapted to be stepped over said seg-
40 ments in sequence, selective means for determining circuits to various combinations of said segments, an alarm commutator having a first plurality of contacts, a brush for traversing said contacts, stepping means for ad-
45 vancing said brush over said first plurality of contacts during an interval not longer than an interval required for stepping the arm of the code commutator from a contact segment of one set to the corresponding con-
50 tact segment of the next set of contact segments of the code commutator, additional contacts for said alarm commutator, an announcing circuit normally completed through said additional contacts for control
55 by said code-commutator in successively repeating a call, and means effective in the operation of said alarm commutator for controlling said additional contacts to supersede said code commutator in the control of said
60 announcing circuit in such a manner that less than all of the signalling sequences of a call through the code commutator may be inhibited.

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