

June 8, 1926.

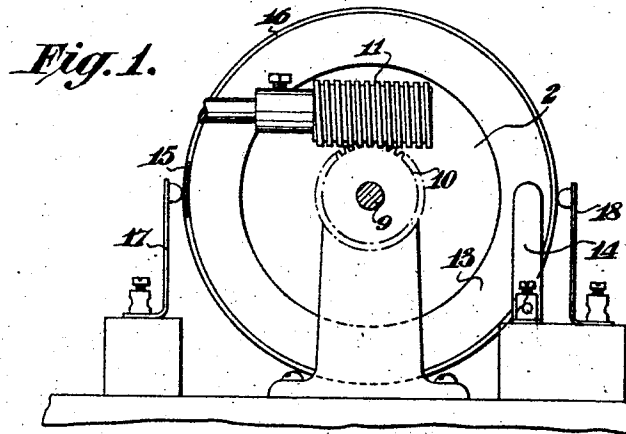
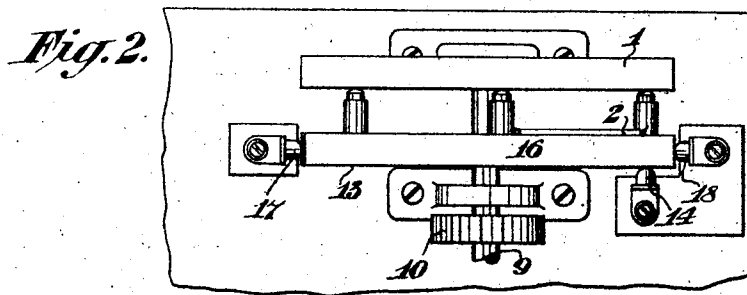
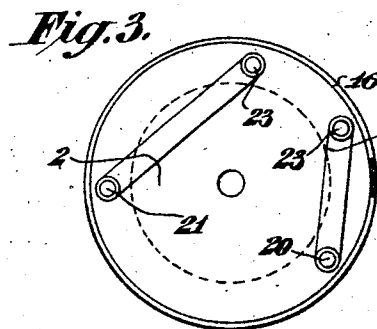
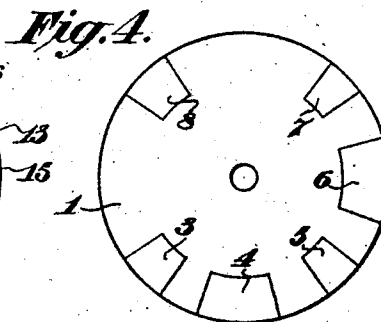
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1,588,087

WARNING DEVICE FOR USE WITH ELECTRICALLY CONTROLLED MACHINERY

Filed August 7, 1925

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

Fig. 5.

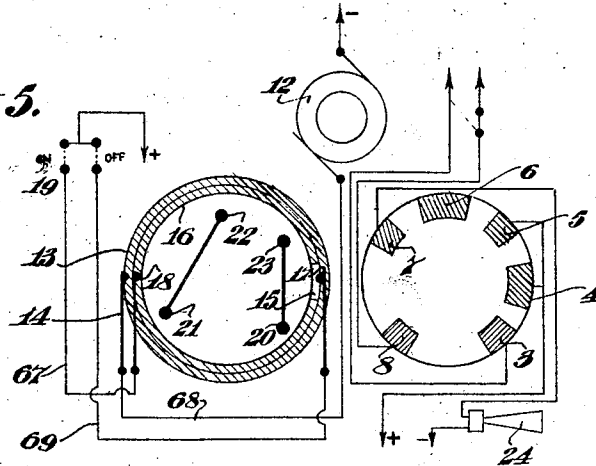


Fig. 6.

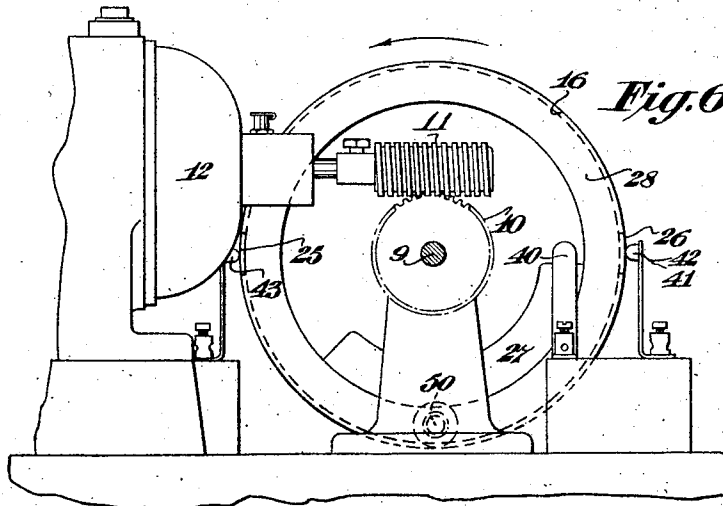
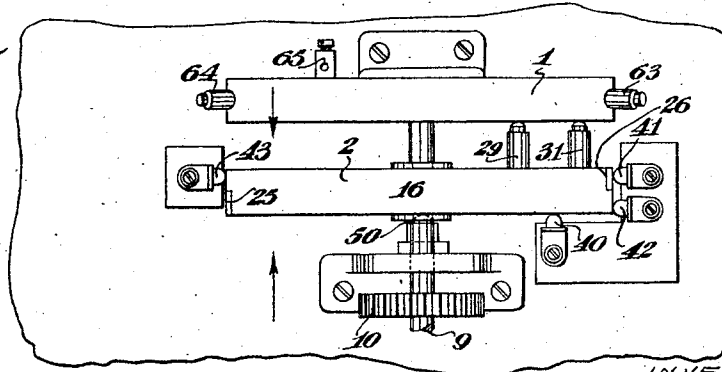


Fig. 7.



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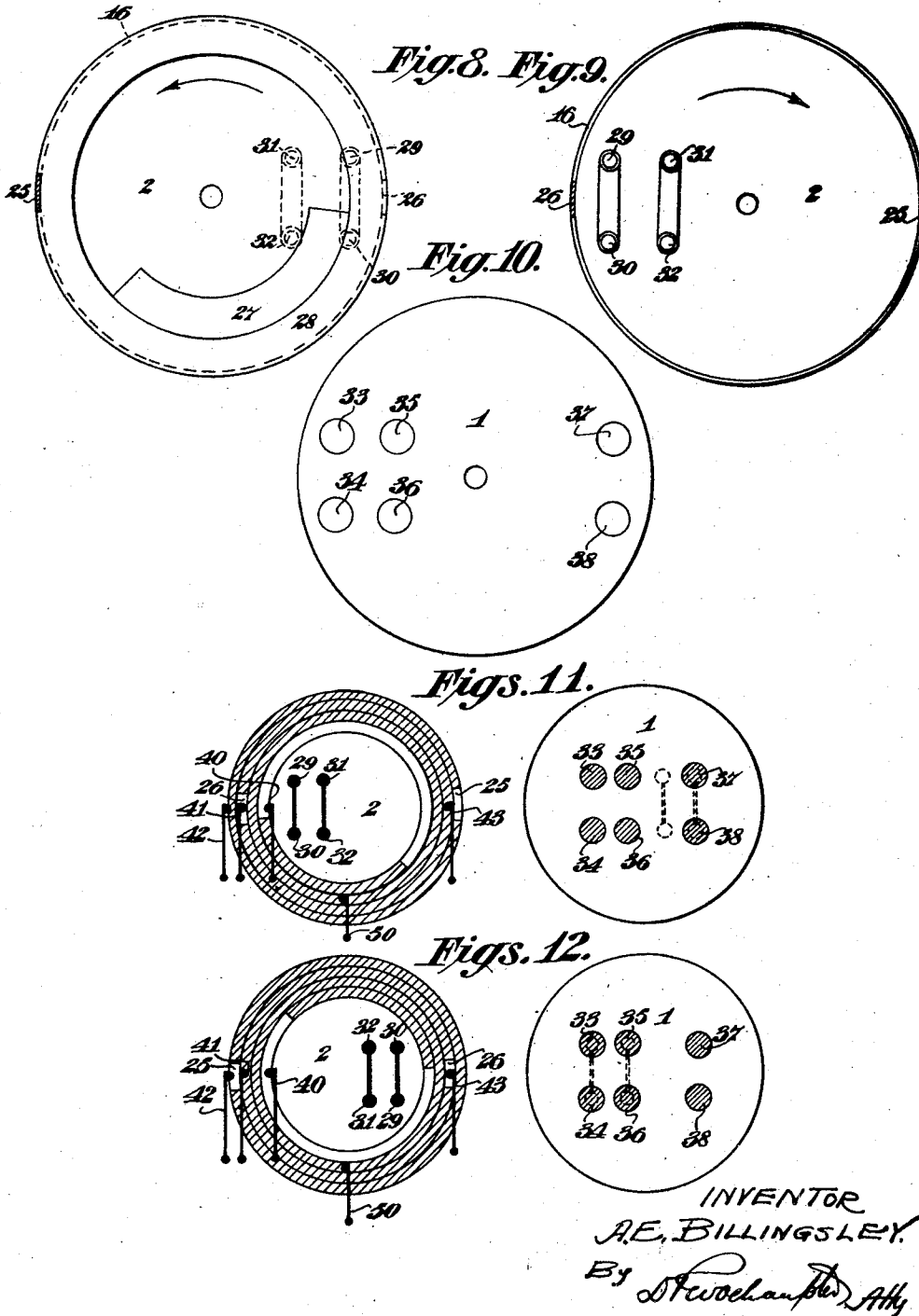
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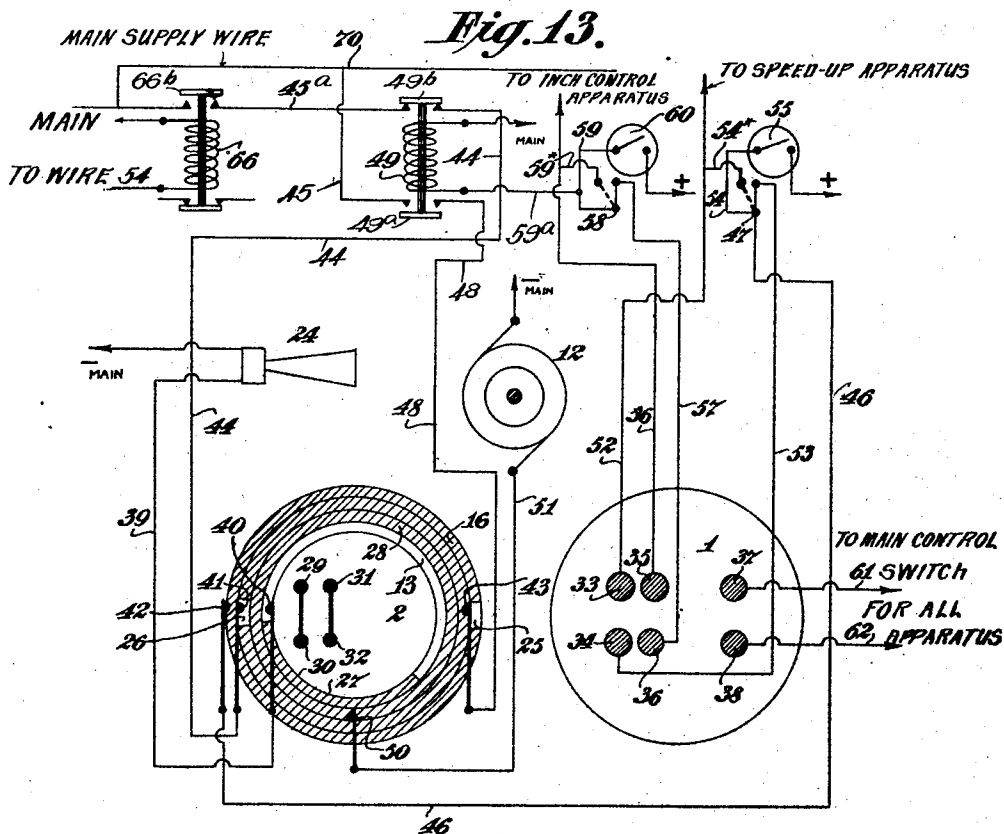
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WARNING DEVICE FOR USE WITH ELECTRICALLY CONTROLLED MACHINERY

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4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE.

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WARNING DEVICE FOR USE WITH ELECTRICALLY-CONTROLLED MACHINERY.

Application filed August 7, 1925, Serial No. 48,813, and in Great Britain May 8, 1924.

This invention has reference to a warning device for use with electrically-controlled machinery, and is primarily intended for use in connection with printing machines, but is also applicable for use with textile machinery controlled by push-buttons.

With electrically-controlled machinery it often happens that when the machine is started up, on pressing a button or operating other suitable devices, the attendant operator is unaware that said machine is being started, with the result that, in many cases, accidents occur.

The object of the present invention is, by the application and use of the device as hereinafter set forth, to prevent such accidents by giving a warning to the operator that the machine is about to be started up, or stopped, as the case may be. The said warning device, according to the invention, includes a switch-operating auxiliary motor under the control of the machinery press-button system with automatic switch gear mechanically operated by, and electrically controlling said motor, and warning means operated by said switch gear; the latter includes a pair of contact discs relatively rotatable and furnished with brushes and contacts to switch in the said warning means before making or breaking the circuit to the main motor driving the machinery, and to switch out said warning means when the machine is in full motion or stopped. Thus, in use, when the starting up button or equivalent for the machinery is operated, before the machinery gets into motion a warning signal or signals is or are sounded or shown, and there is a pause prior to the actual starting of the machinery.

In order that the said invention may be readily understood, reference is to be had to the following description and accompanying sheets of drawings, wherein:—

Figure 1 is a front view of the automatic switch gear of a warning device in accordance with the invention.

Figure 2 is a plan view of Figure 1.

Figure 3 is a rear view of the rotatable disc of said switch gear.

Figure 4 is a front view of the fixed disc of said switch gear.

Figure 5 is a diagram of the wiring of said warning device.

Figure 6 is a side view illustrative of a modified arrangement of switch gear.

Figure 7 is a plan view thereof.

Figures 8 and 9 are, respectively, front and rear views illustrative of the rotatable disc of said modified switch gear.

Figure 10 is a face view of the fixed disc thereof.

Figures 11 and 12 are diagrams showing the position of contact brushes in "on" and "off" positions.

Figure 13 is a wiring diagram of said modified warning device.

In carrying out the invention, and referring first to Figs. 1 to 5 of the drawings, the automatic warning device includes in its organization two circular discs or members 1 and 2 made of suitable insulating material, the disc 1 being fixed and for convenience called a terminal disc or member, and the disc 2 being rotatable and called a contact disc or member. As will be observed from the drawings the said terminal and contact members 1 and 2 respectively are suitably spaced apart and face each other.

On the inner face of the member 1 are provided six suitably spaced terminal pieces 3, 4, 5, 6, 7 and 8. The terminals 3 and 8 are preferably called apparatus terminals since they are connected by wires which lead to the apparatus which is to be manually controlled, such for example as the push button of the button boxes on the main control board, or any other apparatus or contrivance, forming no part of the present invention, but acted upon through the medium of the present device. The terminals 4 and 5 are wired together and also the terminals 6 and 7 are wired together, and all of said terminals may be generally called warning terminals since they are in circuit, or may be placed in circuit with the horn or hooter which gives the signal as to the state of the apparatus in connection with which the present device is used.

The rotatable disc 2, which is carried by a spindle 9 operably connected by worm wheel 10 and worm 11 to a switch operating auxiliary electric motor 12, is on its outer face and at its edge provided with a contact piece constituted by a flat ring 13 of copper, on which is adapted to rub a carbon brush 14 which is connected up to the motor 12 aforesaid, while the rim of said rotatable disc 2 is, with the exception of an insulating portion 15 therein, provided with a flat ring 16 of copper on which two carbon brushes, respectively 17 and 18, are

adapted to rub, which brushes 17 and 18 are connected up to the push-button switch 19.

On the inner face of the rotatable disc 2 aforesaid and extending perpendicular thereto are four conveniently spaced apart contacts 20, 21, 22 and 23, adapted when said disc 2 is rotated, to engage the terminals 3, 4, 5, 6, 7 and 8 of the fixed disc 1, and of said contacts 20, 21, 22 and 23, the contacts 20 and 23 are paired and positioned one to each side of the insulating portion 15 of the rim of the rotatable disc 2 and are wired together, while contacts 21 and 22 are also paired and wired together.

The above arrangement is such that all of the brushes are normally out of action.

On starting up the motor 12, by operating the push-button or circuit closer 19, the disc 2 is moved in an anti-clockwise direction, so that the warning contacts 21 and 22 thereof first connect across warning terminals 4 and 6 of the fixed disc 1, giving a first and long warning; then there is a momentary stop of the hooter 24; then warning contacts 21 and 22 connect terminals 5 and 7 of the fixed disc 1, giving a short and final warning before supplying current to the wires leading to the apparatus or main motor (not shown). When contacts 20—23 connect terminals 3 and 8 on the fixed terminal disc 1 current is available to start the main motor. Simultaneously with the bridging of the apparatus contacts 3 and 8, the insulation 15 registers with brush 18, breaking the circuit established when manually controlled switch or circuit closer 19 was closed to the on position and cutting out the auxiliary motor 12.

On stopping the machine the manually operated or safety control push button 19 is pushed to the off position (Fig. 5), and the circuit to the motor 12 is then closed through lines 68—69 thereby causing the disc 2 to move back to its normal position. While the disc 2 is returning to its normal position the contacts 20—23 carried thereby connect the warning terminals 4 and 6 giving a warning to the operator that the apparatus is to stop.

From the foregoing it will be apparent that when the manually operated push button 19 is closed to the on position the contact member 2 will rotate through an arc of 180° to first give a long and then a short warning signal and then connect the apparatus terminals 3 and 8. When the apparatus terminals 3 and 8 have been connected the motor 12 is automatically cut out by reason of insulation 15 engaging with brush 18. On desiring to stop the apparatus the switch 19 is thrown to the off position whereupon the circuit is closed through the brush 17 to the motor 12 and the same continues to rotate through the remaining 180° of its cycle until the insulation 15 again

registers with brush 17 whereupon the motor 12 is automatically cut out. The brush 14 is the common brush for the motor 12, always remaining in contact with the ring 13 on the member 2.

The switch 19 is a two-way switch so that when the same is pushed to the on position it automatically breaks contact at the off position and vice versa. Thus, by pushing the button to the on position, see Fig. 5, current flows by way of wire 67 to brush 18, rim 16, brush 14, wire 68, auxiliary motor 12 to main. The auxiliary motor 12 then starts and rotates the disc 2 (while so doing the hooter 24 has sounded) and after the warning signal has been given, the insulated portion 15 has reached brush 18, cutting out said auxiliary motor 12, and the contacts 21 and 22 are at rest and connect across terminals 3 and 6 of the fixed disc 1, which is acting as a switch to give current to the speed-up and inch buttons.

On the apparatus being stopped by the operator, the off button 19 is pushed home, current then flowing by way of wire 69, brush 17, metal rim 13, brush 14, wire 68, auxiliary motor 12, which will start up and rotate disc 2 back to its normal position, that is, when the insulated portion 15 reaches brush 17, whereupon the auxiliary motor 12 is cut out again.

Referring now to the modified arrangement of device shown in Figures 6 to 13, use is made, as in the previous arrangement, of the fixed terminal disc 1, the rotatable contact disc 2 driven by worm 11, worm wheel 10 and spindle 9 from motor 12, but the brushes and contacts for said discs are differently arranged to include other devices in the circuit, such for example as an inch button for control of inch apparatus on the main board, and a speed-up button to control speed-up apparatus on said main board with their respective switches, and in this modified arrangement of device the final hooter or like warning is, or may be, dispensed with, but a starting warning is given according as the individual buttons are operated.

The rotatable disc 2 is provided with a copper rim 16 with oppositely disposed insulating portions, respectively 25 and 26, therein, see Figures 6 to 8, and on the front face of said disc 2 there is provided a copper strip or contact piece 27 and also a copper band 28 which is connected to said contact 27 and the rim 16 aforesaid, and on the back of said disc 2 are four contacts, respectively 29, 30, 31 and 32—see Figures 8, 9, 11, 12 and 13—and of said contact 29 and 30 are wired together, while the contacts 31 and 32 are wired together, and on the front face of the fixed disc 1 are six terminal pieces, respectively 33, 34, 35, 36, 37 and 38—see Figures 10, 11, 12 and 13.

The paired contacts 29—30 and 31—32 may be called warning and motor control contacts (referring to motor 12) and the paired terminals 33—34 and 35—36 may be called warning and motor control terminals while the contacts 37—38 function as apparatus contacts.

The hooter, buzzer or the like 24 is connected by wire 39—see Figure 13—to brush 40 which is adapted to make rubbing contact with the segment or strip 27 of the rotatable disc 2. Brush 41 is connected by wire 44 to positive main 45; brush 42 is connected by wire 46 to switch 47 on the main board, whilst brush 43 is connected by wire 48 and relay 49 to the positive main 45 aforesaid. Brush 50—see Figures 6 and 7—which makes rubbing contact with the band 28 on the front face of the rotatable disc 2, is—see Figure 13—connected by wire 51 to the motor 12.

Of the terminals of the fixed disc 1, terminal 33 is connected by wire 52 to control wire of the speed-up control apparatus on the main board; terminal 34 is connected by wire 53 to switch 47 on said main board and from switch 47 by wire 54 to the speed-up button 55 and by wire 54* to control wire of the speed-up apparatus. Terminal 35 is connected by wire 56 to control wire of the inch control apparatus on main board and terminal 36 is connected by wire 57 to switch 58 on main board, and thence by wire 59 to inch button 60 on main board and by wire 59* to control wire of the inch control apparatus on said main board.

Terminal 37 and 38 are connected by wires 61 and 62 to a switch or apparatus not shown, on the main board of the apparatus, also not shown.

Referring to Fig. 7 it will be observed that 63 designates the binding posts for the terminals 37 and 38 of the fixed terminal disc 1, while 64 designates the binding posts for the terminals 33 and 34. Also the binding posts for the inch terminals 35 and 36 of the disc 1 are represented by the reference character 65. The terminals 33 and 34 are in circuit with the speed-up button or circuit closer 55, and as just indicated the terminals 35 and 36 are in circuit with the so-called inch button or circuit closer 60. The buttons 55 and 60 function as manually operated circuit closers in the same way that the push button 19 does in the form of apparatus shown in Fig. 5. That is to say, 55 and 60 are the manually operated circuit closers or switches which control the functioning of the main apparatus, and simultaneously control the present warning device to give an indication of the change in the operation of the main apparatus.

According to Fig. 11 the disks 1 and 2 are shown in the off position, the rotatable contact member or disk 2 being positioned so

that its contacts 29—30 connect with apparatus terminals 37—38 on member 1. These terminals 37—38 are connected by wires 61 and 62 to a switch on the main board for controlling the entire works or apparatus. When the contacts 29—30 are connecting terminals 37—38 the apparatus or works being controlled through the present device may work according to whether the inch or speed-up apparatus is in operating condition. It will be understood that the main works or main apparatus, usually a main motor, is in circuit with the inch and speed-up devices so that when the switch or the main board connected with wires 61 and 62 is opened, or the main motor is stopped, the circuit through the inch and speed-up devices will also be opened or broken.

By reference to Fig. 12 it will be observed that the terminal disk 1 and contact disk 2 are shown in the so-called on position, that is when the contacts 29—30 of disk 2 are connecting terminals 33—34, and contacts 31—32 are connecting terminals 35 and 36. In this position of the disks 1 and 2 the device is operative to function when either of the circuit closers 55 or 56 is operated. When the members 1 and 2 are in the other position, that is the off position as shown in Fig. 11 the motor 12 must be energized through the interlocking switches 49 and 66 due to the breaking of the circuit to the main apparatus. Briefly, therefor, the inch and speed-up buttons rotate the member 2 through a half circle, and then they are returned to the normal or on position of Fig. 12 upon the breaking or closing of the circuit in the main apparatus.

Bearing in mind that the elements 49 and 66 are switches of the interlocking type, that is the type in which one set of terminals is cut in when the other set is cut out, or vice versa, it may be pointed out that the element 49 operates in conjunction with the so-called inch button 60 and element 66 operates in conjunction with the so-called speed-up button 55. In practice the wiring connections for the interlocking switch 66 to circuit closers 55 are similar to those between interlocking switch 49 and circuit closer 60.

The speed-up button 55 and the inch button 66 are examples of circuit closers that may be used, each circuit closer including an interlocking switch in its circuit, and the entire system being in circuit or series with a main switch which controls the entire works or apparatus, said main switch being connected for example to wires 61 and 62. Thus, if the main apparatus is stopped by an operator opening the main switch connected with 61 or 62, the interlocking switches 49 and 66 (according to which circuit closer 55 or 60 has been manually operated) will automatically change terminals

to energize the motor 12 of the present warning device and bring the rotary member 2 back to its normal position.

The operation may be described briefly as follows:

Suppose for example the entire works are at rest, meaning the members 1 and 2 and motor 12 as well as all of the machinery in conjunction with which the warning device is intended to function. Then suppose, it is desired to start the main works or machinery slowly (the members 1 and 2 being in the "on" position shown in Fig. 12) the "inch" button or circuit closer 60 will be closed. Current will then flow from the main line indicated by the plus (+) sign Fig. 13 through the circuit closer 60 to line 59 and thence through line 59^a to interlocking switch 49 causing switch member 49^a to close the circuit from the main wire 70—45 through 49^a to line 48 leading to brush 43. From brush 43 the current passes through insulating strips 16 and 28 to brush 50 and thence through line 51 to the motor 12 thus starting the disk 2 to rotate and causing segment 27 (energized by contact with 28) to supply current to the brush 40 which is wired with the horn 24 through the wire 39. When the disk 2 makes a half revolution the insulation 26 will engage brush 43, thus breaking the circuit to the motor 12 furnished through the line 48 and interlocking switch 49. When insulation 26 reaches brush 43 contacts 29 and 30 bridge terminals 37 and 38 and thus close a circuit between wires 61 and 62 which connect with the main switch (not shown) which controls the entire works. The main apparatus will then continue to inch due to the closing of terminals 37 and 38 because when circuit closer 60 was first closed the current from 59 passed through switch 58 line 57 and across the terminals 36—35 through contacts 31 and 32 to wire 56 which leads directly to the inch control apparatus.

The inch control apparatus as well as the main switch are in circuit and the apparatus or main works will continue to run slowly or inch as long as desired. However, when the operator opens the circuit of the main motor or other apparatus the circuit which includes the interlocking switch 49 just described will be broken. In other words when the circuit of the main piece of machinery is opened the circuit will be automatically broken through the circuit closer or inch button 60 which will have the effect of deenergizing the coil of interlocking switch 49 and automatically causing the switch member 49^b to close the circuit between the main wire 45 and the wire 44 leading to brush 41. Brush 41 it will be remembered is now in contact with the metallic strip 16 due to the fact that insulation 26 in Fig. 13 has been moved by

the previous operation of member 2 into position to engage brush 43 whereupon the circuit was broken after the circuit was closed across terminals 37 and 38. The wire 44 and brush 41 therefore energize strips 16, 28, 27, and since brush 50 is in electrical contact with strip 28 the circuit will be closed to the motor 12 through wire 51 and motor 12 and will rotate member 2 to bring it back to normal position, that is with contacts 29 and 30 engaging terminals 33—34, and contacts 31—32 engaging terminals 35 and 36. When the rotary member 2 reaches this position insulation 26 again comes into engagement with the brush 41 thus breaking the circuit to the motor 12, the fact that 49^b of interlocking switch 49 closes the circuit from 45 to 44 making no difference.

Again assuming that the members 1 and 2 are in their normal or on position shown in Fig. 12 and it is desired to start the apparatus to operate fast and the speed-up button or circuit closer 55 is closed. Current will then pass from the positive main wire through the circuit closer 55 to wire 54 and thence through switch 47 to wire 46, to brush 42, contact strips 16 and 28 to brush 50 and thence to motor 12. Simultaneously, however, with the closing of this circuit to the motor 12 the circuit to the control wire of the speed-up apparatus is closed through wire 53 and terminals 34 and 33 (due to contacts 29 and 30) thence to wire 52 which as indicated, serves the speed-up apparatus. The closing of the circuit to the motor 12 obviously rotates the disk or member 2 closing the circuit to the horn 24 through brush 40 and wire 39 as the disk moves to place contacts 29 and 30 across terminals 37 and 38. Simultaneously with the placing of the contacts 29 and 30 across terminals 37 and 38 insulation 25 engages brush 42 and therefore breaks the circuit to the motor 12 so that the motor 12 stops and the disk stops. The main works or apparatus is then set for fast operation due to the speed-up apparatus having been energized by the closing of the circuit through the wire 52 as previously explained. As long as the main works or apparatus continues to run contacts 29 and 30 will bridge terminals 37 and 38, but upon the opening of the circuit to the main works or apparatus to stop the same, the coil of interlocking switch 66 will be de-energized and permit the switch part 66^b to close the circuit to wire 45^a from main wire 70 and since switch element 49^b of interlocking switch 49 also connects wire 45^a with wire 44 current will be supplied to the brush 41 which will in turn energize the motor 12 through brush 50 and wire 51 and thus cause the motor 12 to rotate the disk 2 back to its normal position, that is until insulation 26 engages with brush 41. At this time

the rotary member 1 will be reset, again ready for operation upon the closing of either the button 55 or button 60 leading respectively to the speed-up and inch control devices.

The wires 54* and 59* cooperate with switches 47 and 58 respectively to cut the members 1 and 2 out of action if desired.

From the foregoing it will be apparent that the present invention is directed to a warning device adapted to be energized by the manual closing of a circuit which in turn operates other devices for controlling a main apparatus or machinery. Such other apparatus or machinery may of course assume different forms but the present invention is directed particularly to the novel combination and arrangement of parts which relate to the warning device.

I claim:—

1. A warning device adapted for use with manually controlled electrically operated machinery including relatively rotatable terminal and contact members, warning terminals and apparatus terminals on said terminal member, warning and apparatus contacts carried by the contact member, a motor for moving the contact member, brush contacts carried by the contact member, brushes for engaging said brush contacts, a warning device included in circuit with the warning terminals of the terminal member, and a manually controlled switch for closing the circuit to said brushes.

2. A warning device adapted for use in connection with electrically operated machinery manually controlled from a single station, including a fixed member and a rotatable member mounted in spaced relation, terminals carried by the fixed member, contacts carried by the rotatable member and adapted to engage the said terminals, a motor for operating said rotatable member, an electrical warning device, contact strips carried by said rotatable member, brushes engaging said contact strips, certain of said brushes being included in circuit with the motor, and other of said brushes being included in circuit with the electrical warning device, and a manually operated circuit closer adapted to close the circuit to said motor through one of said brushes and one of said contact strips thereby to operate the rotatable member and close the circuit between certain of the contacts carried thereby and the terminals on the fixed member to supply current to the electrical warning device.

3. A warning device adapted for use in connection with electrically operated machinery manually controlled from a single station, including a fixed member, a rotatable member, terminals carried by the fixed

member, contacts carried by the rotatable member and adapted to engage said terminals, a motor operatively connected to the rotatable member, an electrical warning device, a plurality of contact strips carried by the rotatable member, a contact segment electrically connected with said strips, insulating means arranged at diametrically opposite points in two of said contact strips, and one of said strips being electrically continuous, a brush contacting with said electrically continuous strip and connected to said motor, a brush adapted to contact with said segment and electrically connected with said warning device, and manually operated circuit closing means electrically connected with said brushes which engage with the said strips having the insulating means arranged therein at diametrically opposite points.

4. A warning device adapted for use in connection with electrically operated machinery controlled from a single station including a fixed terminal member, a contact member rotatably mounted with reference to the fixed terminal member and including a shaft having a gear thereon, a motor having driving means engaging the gear on the shaft of the contact member, a pair of apparatus terminals on the terminal member, a plurality of warning terminals also on the terminal member, spaced connecting pairs of contacts carried by the contact member and adapted to rotate with the contact member to alternately bridge said apparatus terminals and certain of said warning terminals, brush contacts carried by the contact member, brushes for engaging said brush contacts and included in circuit with said motor, a warning device adapted to be included in circuit with the warning terminals of the terminal member, and push button control means for closing the circuit through the warning and motor contacts and terminals and also through the brush contacts and brushes to the motor and to the warning device.

5. A warning device adapted for use with manually controlled electrically operated machinery, including in combination, interlocking switch means, relatively rotatable contact and terminal members, a motor for moving the contact member, a warning device, and a manually controlled circuit closer included in circuit with said interlocking switch, and the motor, and means for automatically breaking the circuit to the motor until it is again reestablished through the interlocking switch.

In testimony whereof I have affixed my signature hereto this 24th day of July 1925.

ARTHUR ERNEST BILLINGSLEY.