

Jan. 6, 1942.

A. RAMSEY

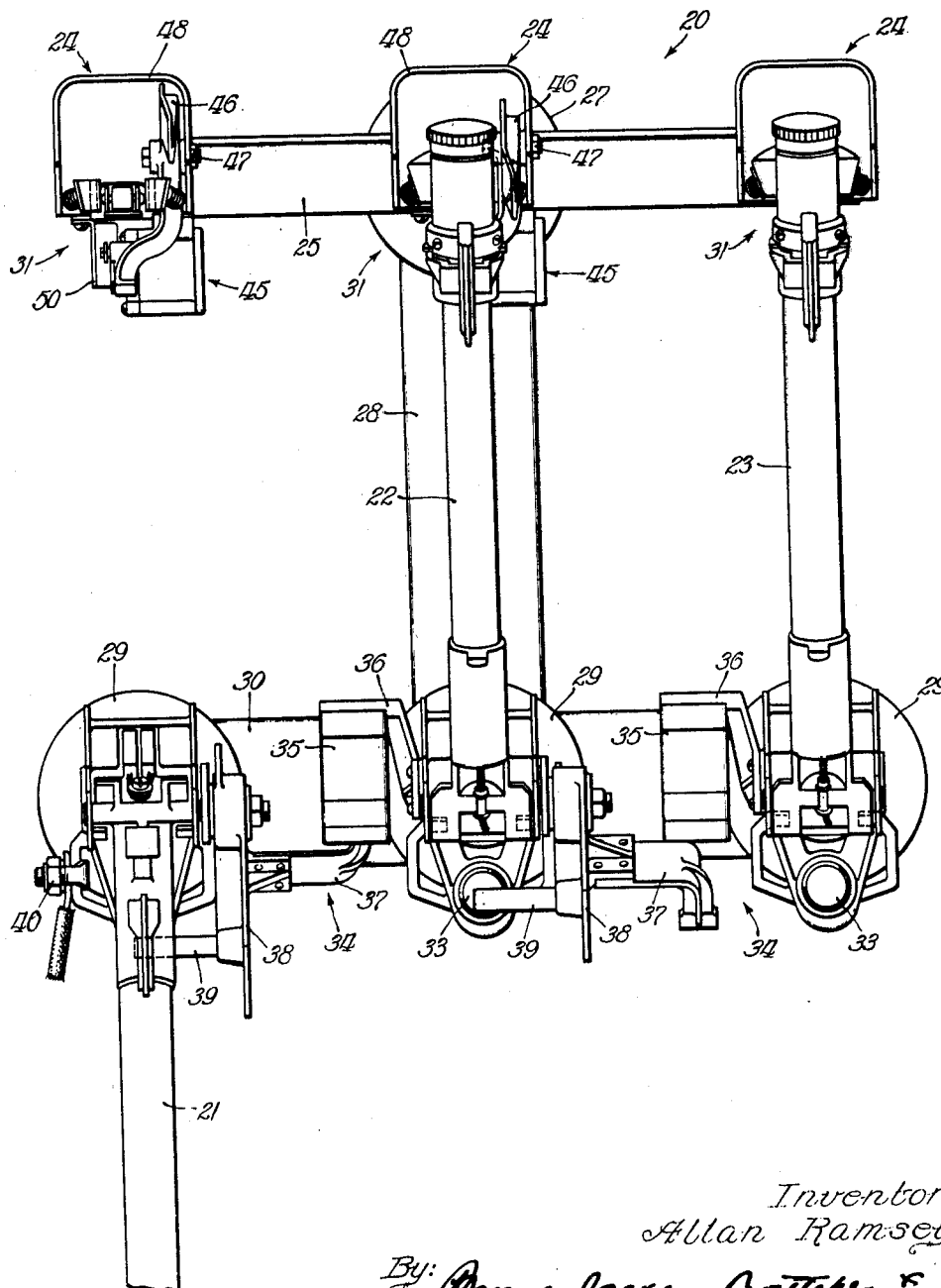
2,268,899

TIME DELAY RECLOSING FUSE MECHANISM

Filed Oct. 8, 1936

8 Sheets-Sheet 1

Fig. 1.



Inventor:
Allan Ramsey

By: *Mowbray & Bate*
Attorneys

Jan. 6, 1942.

A. RAMSEY

2,268,899

TIME DELAY RECLOSING FUSE MECHANISM

Filed Oct. 8, 1936

8 Sheets-Sheet 2

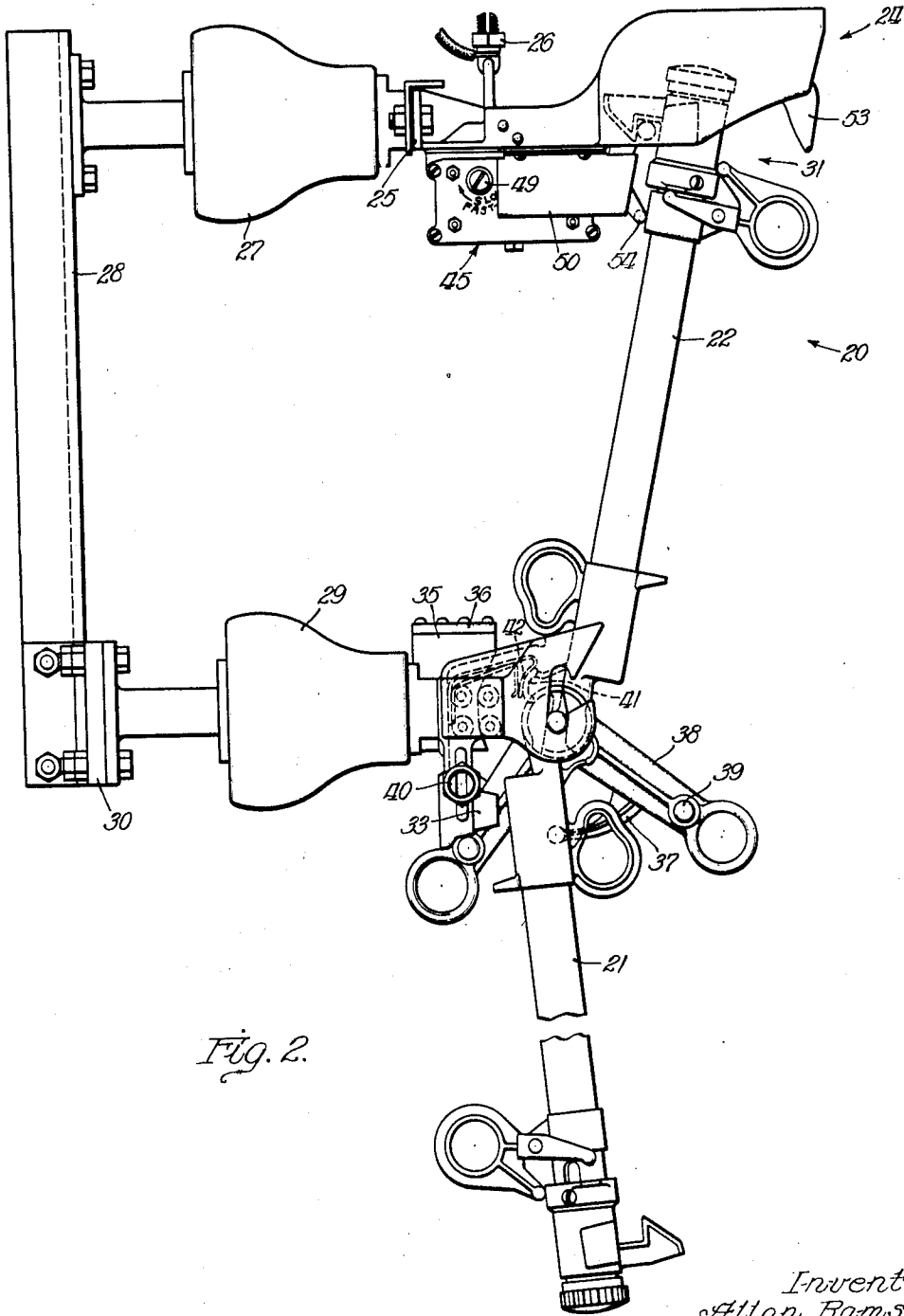


Fig. 2.

Inventor.
Atlan Ramsey

By: Morgan Jackson Bottcher, Brewer
H. H. S.

Jan. 6, 1942.

A. RAMSEY

2,268,899

TIME DELAY RECLOSING FUSE MECHANISM

Filed Oct. 8, 1936

8 Sheets-Sheet 3

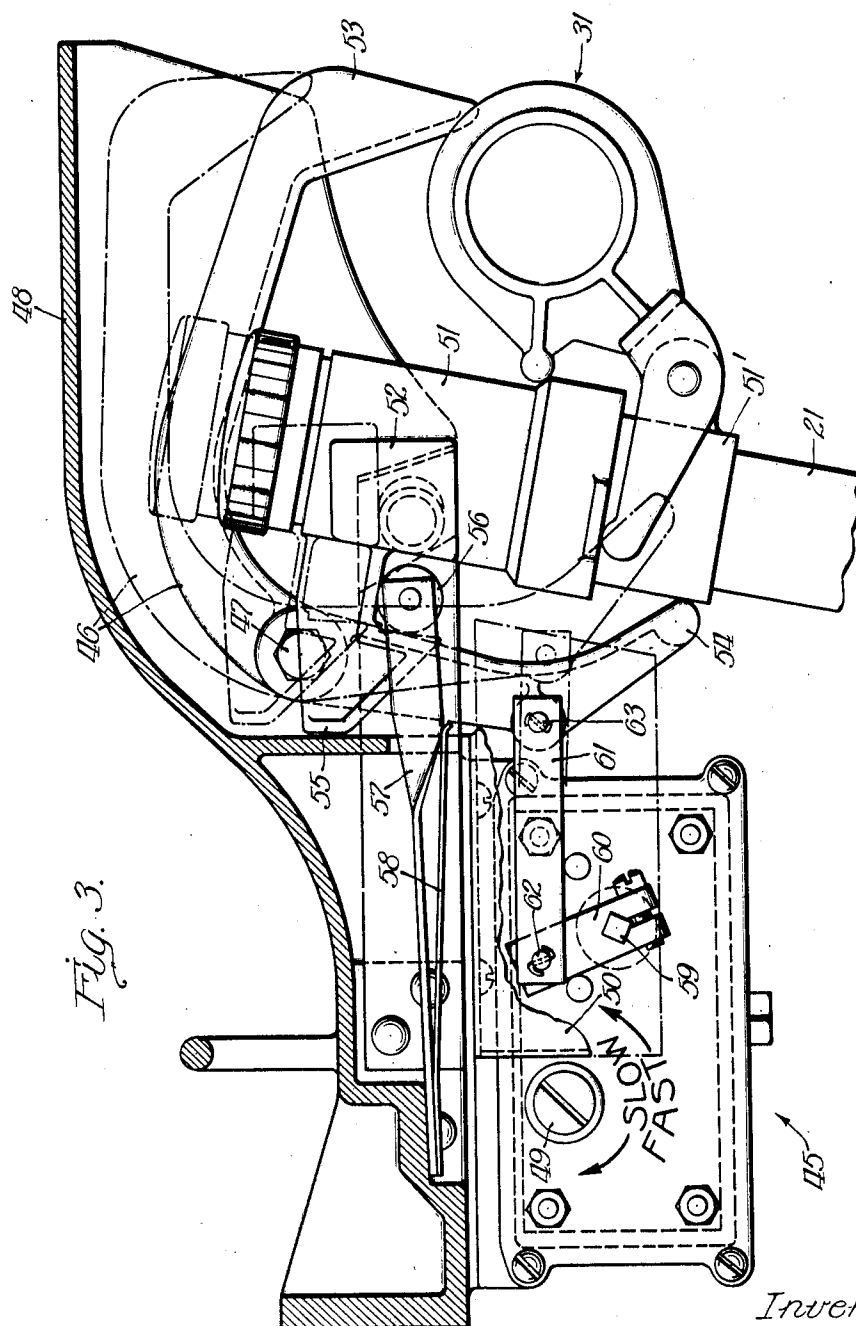


Fig. 3.

Inventor:
Allan Ramsey

By:
Muir Jackson Ritchie - Deane

Attys.

Jan. 6, 1942.

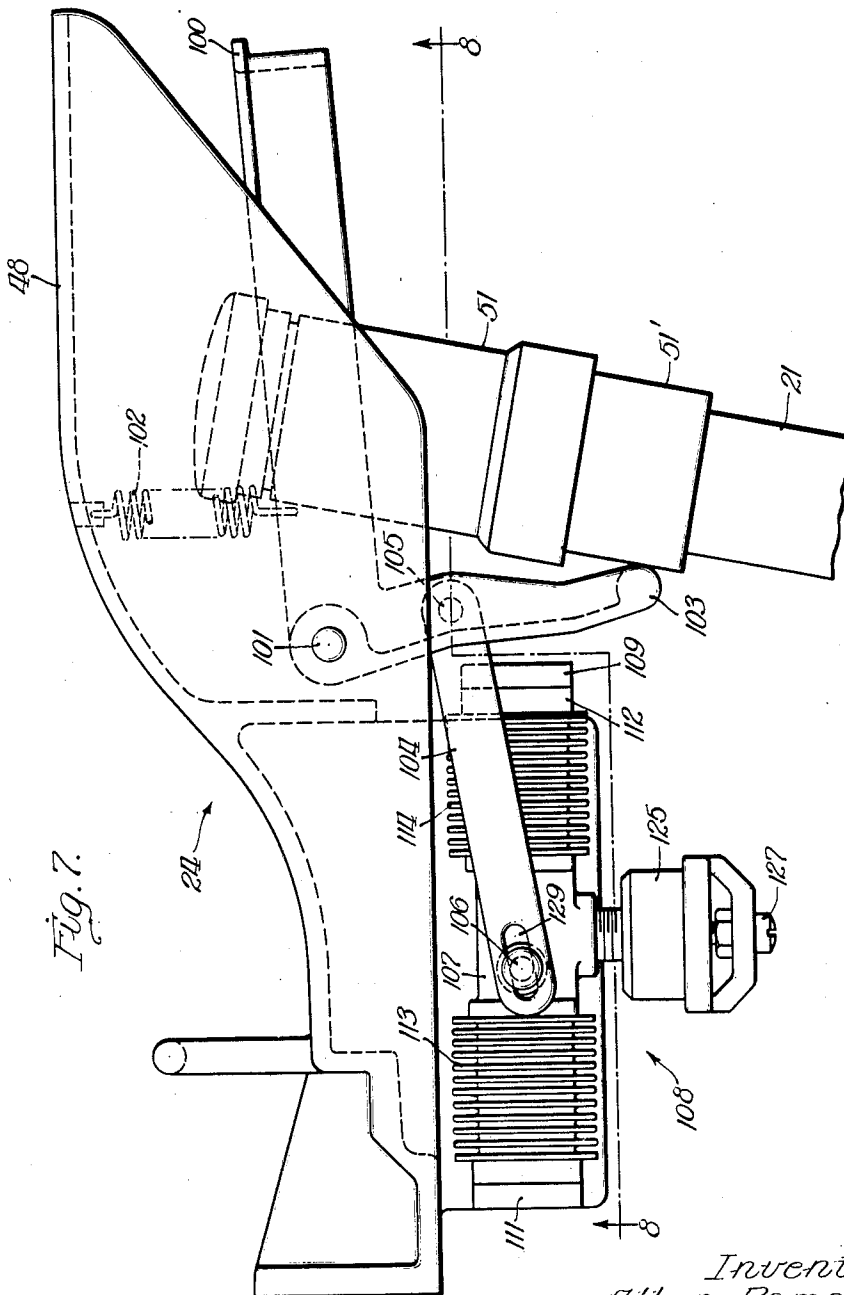
A. RAMSEY

2,268,899

TIME DELAY RECLOSING FUSE MECHANISM

Filed Oct. 8, 1936

8 Sheets-Sheet 5



Inventor:
Allan Ramsey

By: Marvin Jackson Bortles - Deener

Attys.

Jan. 6, 1942.

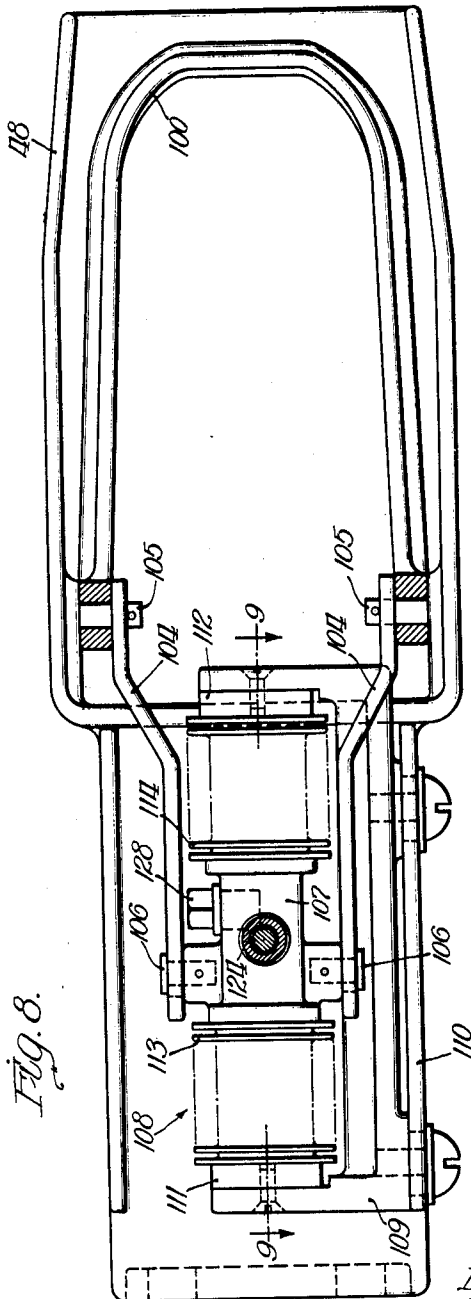
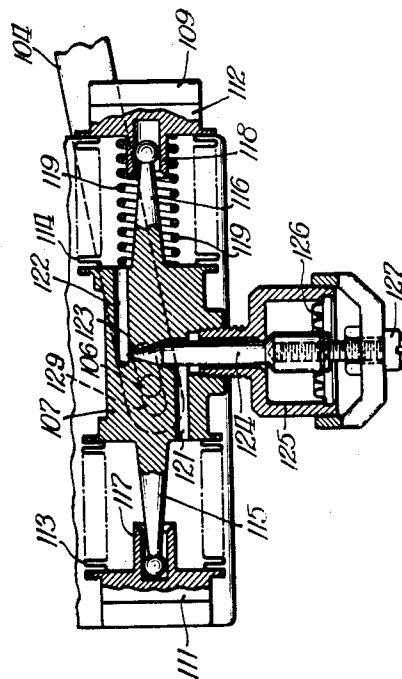
A. RAMSEY

2,268,899

TIME DELAY RECLOSING FUSE MECHANISM

Filed Oct. 8, 1936

8 Sheets-Sheet 6



Inventor:
Atlan Ramsey

By: *Max Jackson Bortner*
Drewer *Atty.*

Jan. 6, 1942.

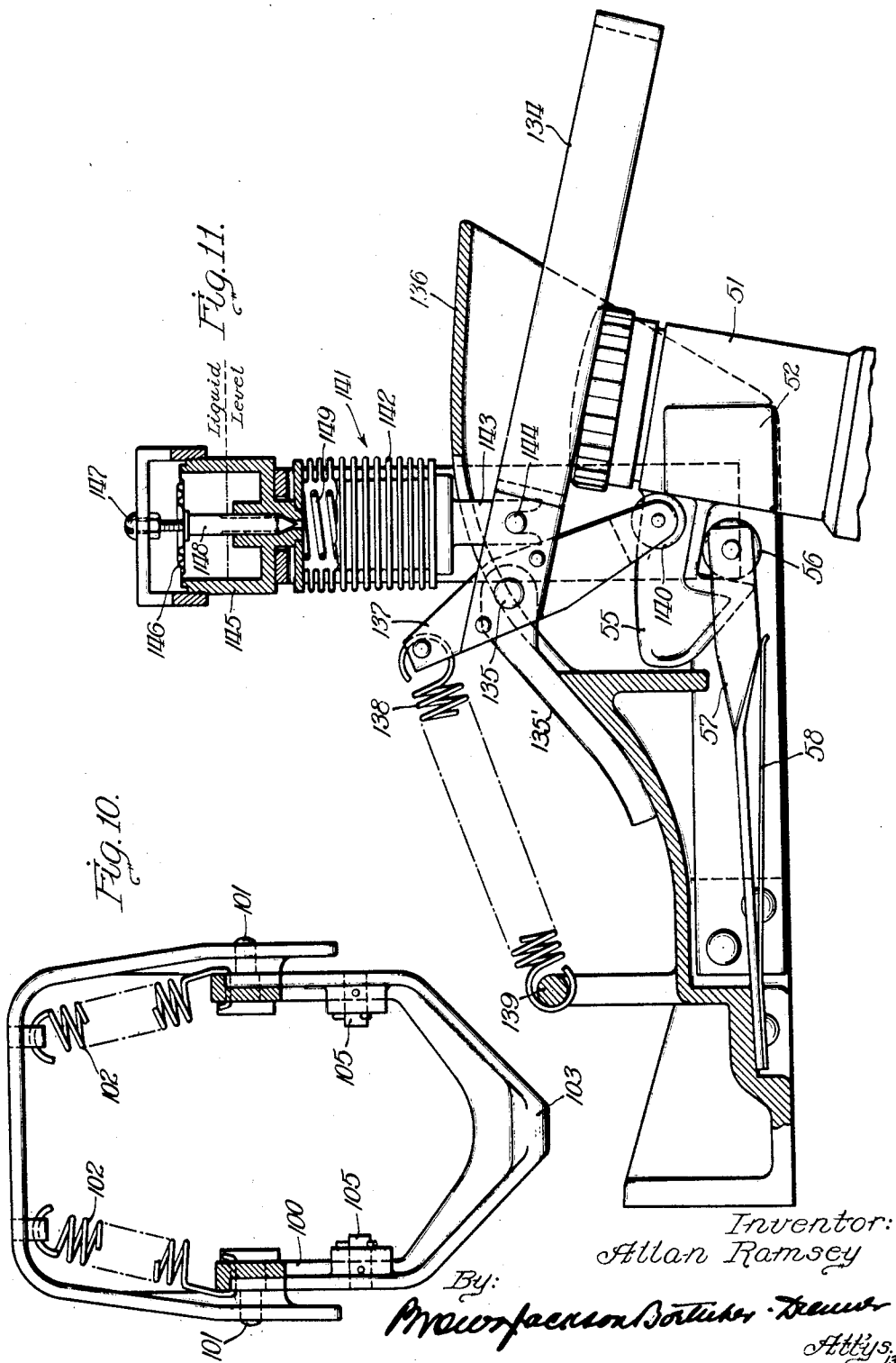
A. RAMSEY

2,268,899

TIME DELAY RECLOSING FUSE MECHANISM

Filed Oct. 8, 1936

8 Sheets-Sheet 7



Jan. 6, 1942.

A. RAMSEY

2,268,899

TIME DELAY RECLOSING FUSE MECHANISM

Filed Oct. 8, 1936

8 Sheets-Sheet 8

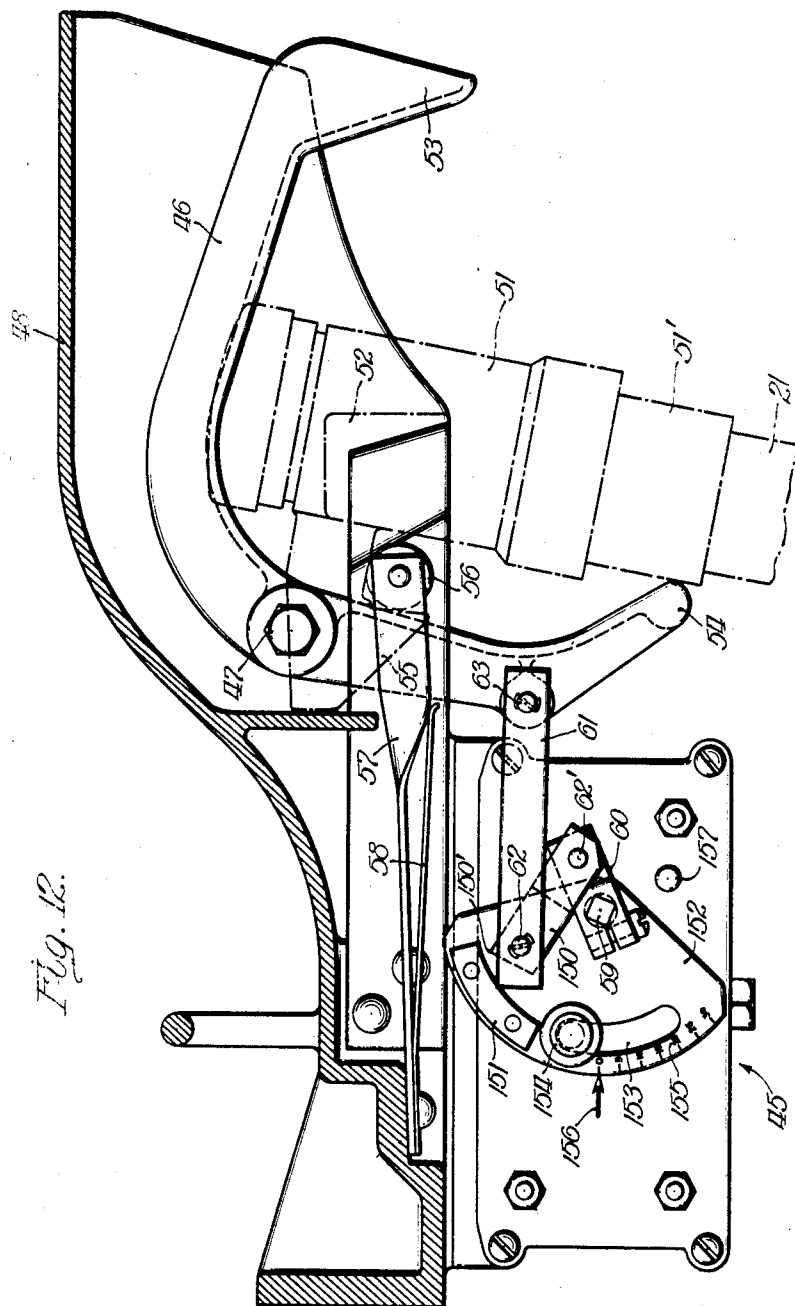


Fig. 12.

Inventor:
Allan Ramsey

By:
Manufacturers & Engineers
Attys.

UNITED STATES PATENT OFFICE

2,268,899

TIME DELAY RECLOSING FUSE
MECHANISMAllan Ramsey, Evanston, Ill., assignor to
Schweitzer & Conrad, Inc., Chicago, Ill., a
corporation of Delaware

Application October 8, 1936, Serial No. 104,594

38 Claims. (Cl. 200—126)

My invention relates generally to electric fuses, and it has particular relation to dropout fuse cutouts of the repeating type.

In my copending application, Serial No. 740,057, filed August 16, 1934, I have disclosed a repeating fuse cutout comprising three fuse devices, each of which is rotatably mounted at its base for movement from its normal operating position at a slight inclination from the vertical. Under ordinary operating conditions the three fuse devices are in this position and an electric circuit is established through one of them, the other two fuse devices being disconnected at their lower ends from the circuit. A transfer switch is provided at the base of each of the first two fuse devices for establishing the circuit through the next fuse device when the preceding fuse device blows. The blown fuse device is released at the top and, while rotating downwardly, it engages the operating arm of its transfer switch, thereby closing the switch and reestablishing the circuit, this time through the next fuse device. Such a construction affords two reclosures for the circuit, after which the circuit remains in the open condition until the fuse devices are re-fused and restored to the normal operating condition.

There are some operating conditions under which it is not desirable to reestablish the circuit through the next fuse device as quickly as will be accomplished by a repeating fuse cutout of this construction. While there is a slight time delay involved in effecting the circuit transfer, which is caused by the time required for the fuse device to fall and to close the transfer switch, this inherent time delay may be insufficient to permit the circuit fault to clear itself before the circuit is restored, with the result that the next fuse device immediately blows. If a slightly longer time were permitted to elapse before the circuit is completed through the next fuse device, it is entirely possible that the trouble on the circuit will have cleared, with the result that the next fuse device will not be blown as soon as the transfer switch connects it into the circuit.

Fuse cutouts of the repeating type are ordinarily installed at isolated locations on power lines which are remote from the headquarters of the line repair men. An example of such an installation may be found where a small rural community is dependent on a single power line for its electric power supply. Ordinarily, no repairmen will be stationed in the immediate vicinity and a considerable time is required to ob-

tain the services of one for restoring one or more blown fuse devices. Since continuity of service is of paramount importance, fuse cutouts of the reclosing type are often installed. However, on the occurrence of a temporary fault, the time interval between the blowing of the circuit fuse device and the connection of the next fuse device may be too short to permit the fault to disappear and, consequently, the next fuse device blows as soon as it is connected into the circuit. The purpose of the repeating fuse cutout is then defeated, to a certain extent.

Accordingly, it is the principal object of my invention, as herein disclosed, to provide for increasing the time that must elapse after one fuse device of a repeating fuse cutout blows, before the next fuse device is connected in the circuit.

An important object of my invention is to provide for delaying the falling of a blown fuse device for a predetermined interval to delay the operation of a transfer switch operated thereby for connecting the next fuse device in the circuit.

Another object of my invention is to provide for storing energy in a mechanical time delay device, when a fuse device rotatable about its base is placed in its operative position, and for employing the mechanical time delay device in retarding the falling of the fuse device after it has blown until the expiration of a predetermined interval.

Another object of my invention is to increase the range of operation of a mechanical escapement device without altering the adjustment of the device itself by providing an externally adjustable control of the linkage attached thereto.

A further object of my invention is to provide a calibrated externally adjustable control of the linkage of an escapement device thereby requiring no alteration in the functioning of the device itself to obtain a wide range of timing control.

Still another object of my invention is to provide for employing the resistance to movement offered by an escapement mechanism in delaying the falling of a dropout fuse device after it has blown.

A further object of my invention is to provide a lost motion connection between an escapement time delay mechanism and the fuse device which is delayed in falling, thereby to prevent the escapement mechanism from offering resistance to the movement of the fuse device while it is being placed in its operative position.

Other objects of my invention will, in part, be obvious and in part appear hereinafter.

My invention, accordingly, is disclosed in the embodiments hereof shown in the accompanying drawings, and it comprises the features of construction, combination of elements and arrangement of parts which will be exemplified in the constructions hereinafter set forth and the scope of the application of which will be indicated in the appended claims.

For a more complete understanding of the nature and scope of my invention, reference may be had to the following detailed description, taken in connection with the accompanying drawings, in which:

Figure 1 is a view, in front elevation, of a repeating fuse cutout constructed in accordance with my invention, one of the fuse devices being illustrated in the position to which it rotates after it has blown and operated its transfer switch to connect the next fuse device in the circuit.

Figure 2 is a view, in side elevation, of the repeating fuse cutout shown in Figure 1;

Figure 3 is a view, at an enlarged scale, in side elevation, illustrating the construction of the upper end of one of the fuse devices to which the mechanical escapement time delay mechanism is applied, the sleet hood being shown in section;

Figure 4 is a view, in end elevation, of the construction illustrated in Figure 3;

Figure 5 is a view, in top plan, of the mechanical escapement time delay mechanism, the cover being removed in order to more clearly illustrate the various elements;

Figure 5—A is a view of the anchor and shaft therefor that are employed in the time delay mechanism shown in Figure 5;

Figure 6 is a sectional view taken along the line 6—6 of Figure 5;

Figure 7 is a view, in side elevation, of a hydraulic escapement mechanism which may be employed for delaying the falling of one of the fuse devices in place of the mechanical time delay mechanism illustrated in Figure 3;

Figure 8 is a sectional view taken along the line 8—8 of Figure 7, the upper end of the fuse device being omitted;

Figure 9 is a sectional view taken along the line 9—9 of Figure 8;

Figure 10 is a view, in end elevation, of the sleet hood and latching lever or bail shown in Figure 7, a portion of the latching bail being shown in section;

Figure 11 is a view, partly in side elevation and partly in section, of another embodiment of the hydraulic escapement mechanism which may be employed in practicing my invention; and

Figure 12 is a detail view, in side elevation, of a modified form of linkage which may be employed in connection with the mechanical escapement device to permit calibrated external adjustment for a wide range of operation.

According to my present invention, as herein disclosed, I have provided a time delay mechanism at the upper end of each of the first two fuse devices, each of which is arranged to delay the falling of its fuse device until the expiration of a predetermined interval. Each time delay mechanism is arranged to permit a slight rotation of its fuse device after it has blown in order to make certain that it is free of its latching mechanism. After a predetermined interval the fuse

device is permitted to fall freely to its lowermost position.

A transfer switch is provided at the base of each of the first two fuse devices and is arranged to be operated by the movement of its individual fuse device after it has blown for transferring the circuit to the next fuse device. It will be apparent that the energy which is stored in each of the first two fuse devices when they are placed in position is released by their time delay mechanisms to effect the operation of the transfer switches and the consequent reestablishment of the circuit.

According to one embodiment of my invention a mechanical escapement time delay mechanism is provided. This mechanism comprises a clock movement having a spring which is energized by the placing of the fuse device associated therewith in operative position. As soon as the fuse device is blown, the spring is released to drive an escapement mechanism which controls the movement of a latching lever. The latching lever is positioned in the path of the fuse device and prevents its movement during the delay interval. When the interval has elapsed, the latching lever is moved out of the path of the fuse device and it is permitted to freely rotate.

According to another embodiment of my invention a movable wall is positioned between two fixed walls and is hermetically sealed thereto by means of two flexible bellows. Passageways are provided in the dividing wall through which a liquid, such as alcohol and glycerine may flow at a speed depending upon the adjustment of a needle valve. The dividing wall is connected by a lost motion link to a bail which is disposed in the path of the upper end of the falling fuse device. When the fuse device is blown, it is unlatched and starts to fall but encounters the bail. Springs are provided for biasing the bail out of the path of the falling fuse device, but its movement under their influence is retarded by the dividing wall which requires an appreciable time for movement because of the restricted flow of liquid therethrough. When the dividing wall has moved to a predetermined position, the bail is moved out of the path of the fuse device and it is permitted to fall freely.

In another embodiment of my invention a hydraulic escapement device comprising a single bellows filled with a suitable liquid is arranged to delay the movement of a bail for a time depending upon the flow of the liquid from the bellows into an evacuated chamber. The speed with which the liquid flows is controlled by a needle valve. When a predetermined amount of the liquid has flowed into the evacuated chamber, the bail will have moved out of the path of the fuse device and it is permitted to fall freely.

Referring now particularly to Figures 1 and 2 of the drawings, it will be observed that the reference character 20 designates, generally, a repeating fuse cutout comprising fuse devices 21, 22 and 23, which are arranged to engage at their upper ends with contact assemblies 24. The contact assemblies 24 are commonly mounted on a suitable bus connector 25 which has connected thereto a terminal 26 for connection with a circuit. The bus connector 25 is mounted on an insulator 27 which, in turn, is mounted on a support channel 28 that may be mounted on a cross arm or the like for installation purposes. The fuse devices 21, 22 and 23 are individually rotatably mounted on insulators 29 at the lower ends thereof, which are carried by a cross strap 30

mounted at the lower end of the channel 28. A suitable latching mechanism, illustrated generally at 31, is provided for latching the fuse devices in position and for manually removing them therefrom, if desired. Resilient bumpers 33, preferably formed of rubber, are provided for absorbing the impact of the fuse devices on falling thereof after they have been blown.

The fuse devices 21 and 22 are provided with transfer switches, shown generally at 34, for successively shifting the circuit from one fuse device to the next one in order to reestablish the circuit to provide continuity of service. Each of the transfer switches 34 comprises a stationary enclosed contact member 35 depending from a suitable arm 36 which is carried by the next fuse device, as illustrated. A switch arm 37, carried by a switch operating lever 38, is provided for engaging the stationary contact member 35. A transverse pin 39, carried by the switch operating arm 38, is provided in the path of each of the fuse devices 21 and 22 for operating the transfer switch 34 individual thereto on movement thereof from the normal circuit closing position. A connector 40 is provided for establishing the necessary connection to the electric circuit. A contact finger 41 is provided near the lower end of each of the fuse devices for engagement with spring fingers 42 carried by the insulators 29 for connection therewith. The spring fingers 42 may serve also to bias the fuse devices to the open position, in addition to the force of gravity, when they are released after having been blown. It will be understood that the circuit extends from the connector 26 to the contact assemblies 24 and that normally it extends through the fuse device 21 to the connector 40. On blowing of the fuse device 21 in response to a fault, the circuit is reestablished through the fuse device 22 on operation of the first transfer switch 34 by the fuse device 21. In like manner, on operation of the fuse device 22, the circuit is extended to include the fuse device 23, on operation of the second transfer switch 34. The foregoing repeating fuse apparatus is essentially that disclosed in my copending application hereinbefore referred to. Since a detailed description of the various parts of the apparatus is fully set forth in this copending application, and further, since it forms no part of the present invention, a further description thereof will not be set forth herein except as is necessary to describe the present invention.

With a view to providing for delaying the falling of the fuse devices 21 and 22 for a predetermined interval after they have blown, mechanical escapement time delay devices, shown generally at 45, are provided underneath the upper terminal assemblies 24 of these two fuse devices, as illustrated. These devices are arranged to control the movement of the latching levers 46, which are pivotally mounted on bolts 47 extending through sleet hoods 48 which are provided to protect the contact assemblies 24 from the elements. A screw 49 is provided in the housing of the time delay mechanism which may be removed to permit access to adjusting means therein for controlling the length of the time interval in a manner which will be apparent hereinafter. A shield 50 is arranged to cover the externally operating parts of the time delay mechanisms 45. The arrangement of the time delay mechanism 45 with the upper end of the fuse device 21 is illustrated more clearly in Fig-

ures 3 and 4 of the drawings, to which reference will now be had.

As illustrated, the upper end of the fuse device 21 is provided with a ferrule 51 having outwardly extending ears 52, one of which is arranged to engage the hook-shaped end 53 of the latching lever 46. As set forth in my copending application, hereinbefore referred to, the ferrule 51 is slidably mounted on the upper end of the fuse device 21. The ferrule 51 is slidably mounted on a fixed ferrule 51' with which the other end 54 of the latching lever 46 is arranged to engage. A hook 55 is provided as an integral part of the ferrule 51 for engagement with a roller 56 carried by arms 57, only one of which is shown, and which are biased upwardly by a leaf spring 58. When the fuse device blows, the ferrule 51 is moved upwardly to its position as illustrated by the broken lines and, in this position, the hook 55 no longer engages the roller 56. The fuse device 21 is then free to rotate until the ear 52 engages the downwardly extending hooked end 53 of the latching lever 46. The time delay device 45 is provided with a shaft 59, the outer end of which is square, as illustrated, and which has mounted thereon an operating arm 60. A link 61 is connected between the operating arm 60 and the latching lever 46 by pins 62 and 63, as shown. When the fuse device 21 is installed in the position shown in the drawings the lower end 54 of the latching lever 46 is engaged by the fixed ferrule 51' and is moved to the left, as viewed in Figure 3 of the drawings, to move the operating arm 60 to the position illustrated. When the fuse device blows and starts to fall, the fixed ferrule 51' moves out of engagement with the end 54 of the latching lever 46 and permits rotation thereof in a counterclockwise direction. The time delay mechanism 45 retards the movement of the operating arm 60 and consequently the movement of the latching lever 46 to the position illustrated by the broken lines is delayed. When the operating arm 60 has rotated in a clockwise direction to a position corresponding to that of the latching lever 46, as illustrated by the broken lines, the hook shaped end 53 of the latching lever 46 is moved out of the path of the right hand ear 52 and the fuse device 21 is permitted to fall freely for closing its transfer switch 34 and connecting the fuse device 22 into the circuit.

The details of construction of the time delay mechanism 45 are illustrated more clearly in Figures 5 and 6 of the drawings. As there shown, the shaft 59 is journaled between two frame plates 66 and 67 and it has mounted for rotation therewith a short drum 68 having radial openings 69 therein for receiving one end of a coil spring 70, the other end of which is secured by bolts 71 to the frame plate 65. A ratchet wheel 72 is also mounted for rotation with the shaft 59 and is arranged to cooperate with a pawl 73 carried by a gear wheel 74. A spring wire 75 carried by the gear wheel 74 is arranged to bias the pawl 73 into engagement with the ratchet wheel 72. It will be understood that the ratchet wheel 72 and the pawl 73 permit relative movement between the drum 68 and the gear wheel 74 when the shaft 59 is rotated in a counterclockwise direction to wind up the spring 70 and permit the spring 70 to drive the gear wheel 74 when the restraining force applied to the shaft 59 is released, as by the blowing of the fuse 21 and the release of the latching lever 46 for movement under control of the time delay mechanism 45.

The speed of rotation of the gear wheel 74 as driven by the spring 70 is controlled for the purpose of introducing the desired time delay action of the mechanism. For this purpose the gear wheel 74 is arranged to drive a pinion 76 that may be integrally formed with a shaft 77 which has positioned for rotation therewith a gear wheel 78, as illustrated. The gear wheel 78 is positioned in driving engagement with a pinion 79, integrally formed with a shaft 80 and having mounted thereon for rotation therewith a gear wheel 81. The gear wheel 81 meshes with a pinion 82 formed with a shaft 83 having mounted thereon a scape wheel 84. An anchor 85 is provided with pallets 86 and 87 for cooperating with the teeth of the scape wheel 84. The anchor 85 is mounted for oscillation with a shaft 88 having a square section, as illustrated in Figure 5—A, to which a plate 89 is secured for supporting weights 90 and 91 that are secured in position by screws 92 and 93. It will be observed that screws 92 and 93 are mounted in slots in the plate 89 in order to adjustably position the weights 90 and 91 to secure the desired operation of the anchor 85 in bringing the pallets 86 and 87 into engagement with the teeth of the scape wheel 84. It will be understood that the shafts 77, 79 and 83 are journaled in the frame plates 66 and 67 and that one end of the shaft 88 is journaled in the plate 66, as illustrated.

With a view to permitting adjustment of the time interval the distance between the shafts 83 and 88 is changed. This adjustment is provided by means of a cam 94 which is rotatably mounted in the frame plate 67 and which is arranged to carry one end of the shaft 88 in a position eccentric from its axis. A shaft 95, mounted for rotation with the cam 94, is provided with a slotted end in which a screw driver may be inserted for effecting the desired adjustment when the screw 49 that is mounted in the cover of the time delay mechanism 45 is removed, as will be readily understood. Suitable stops are provided for limiting the movement of the shaft 95 so that the movement of the shaft 88 relative to the shaft 83 will take place only within a range which will permit operation of the scape wheel 84.

It will now be apparent that the spring 70 is wound by movement of the lower end 54 of the latching lever 46 when the fuse device 21, for example, is restored to its normal operating position. This movement is translated by the link 61 to the arm 60 to cause rotation of the shaft 59. When the hook 55 moves out of engagement with the roller 56 on blowing of the fuse device, the restraining force is no longer applied to the operating arm 60 and it is free to move under the influence of the spring 70 as controlled by the mechanical escapement mechanism just described. A corresponding movement of the latching lever 46 takes place until it has been moved to its alternate position as shown by the broken lines whereupon the fuse device 21 will be released for rotation under the influence of gravity.

One embodiment of a hydraulic escapement device and its application to delay the dropping out of a fuse device are illustrated in Figures 7, 8, 9 and 10 of the drawings to which reference now may be had. Since the latching arrangement for holding the fuse device 21, for example, in the operative position before it is blown may be as illustrated and described hereinbefore, only the outline of the slidable ferrule 51' and the fixed ferrule 51' is shown. When the fuse device

21 is released at its upper end it rotates slightly in a clockwise direction until it engages a bail 100 which is pivotally mounted on pins 101 which are located in opposite sides of the sleet housing 48. Springs 102, which are connected between suitable depending lugs from the sleet housing 48 and the opposite arms of the bail 100 are provided for biasing its lower end 103 into engagement with the fixed ferrule 51', as illustrated. As long as the fuse device 21 remains in its operative position and is not blown, the springs 102 are stressed and tend to rotate the bail 100 in a counter-clockwise direction. However, this movement is restrained by the engagement of the lower end 103 of the bail 100 with the fixed ferrule 51'.

With a view to providing for delaying the rotation of the bail 100 when the fuse device 21 blows, links 104 are provided which are connected between pins 105 extending inwardly from the opposite sides of the bail 100 and pins 106 secured to the opposite sides of the dividing wall 107 of a hydraulic time delay mechanism, shown generally at 108. The hydraulic device 108 is mounted in a C-shaped bracket 109 which may be mounted on a depending flange 110 from the underside of the contact assembly 24 and secured thereto by any suitable means such as the screws illustrated. End walls 111 and 112 are secured to the opposite ends of the bracket 109 and they are connected to the dividing wall 107 by flexible bellows 113 and 114. Preferably sealed joints are provided between the flexible bellows and the dividing and end walls in order to provide a hermetically sealed unit. As is illustrated more clearly in Figure 9 of the drawings, the dividing wall 107 is provided with oppositely extending guide arms 115 and 116 which are arranged to be guided in suitable cylindrical extensions 117 and 118 formed integrally with the end walls 111 and 112. A spring 119 may be provided around the guide arm 116 for biasing the dividing wall 107 toward the left. However, if sufficient inherent resiliency is provided in the flexible bellows 113 and 114 it may be unnecessary to employ the spring 119. The dividing wall 107 is provided with passageways 121 and 122 opening into the chambers formed by the bellows 113 and 114 and a connecting passageway 123 serves to connect these two passageways. A needle valve 124 is arranged to control the effective size of the connecting passageway 123. The needle valve 124 is mounted in a suitable housing 125 which is sealed at its outer end by a flexible diaphragm 126 to permit adjustment by an adjusting screw 127. A filler plug 128, Fig. 8, is provided in the dividing wall 107 to permit filling of both of the chambers formed by the flexible bellows 113 and 114 with a suitable liquid such as a mixture of alcohol and glycerine.

It will be observed that the links 104 are provided with slotted openings 129 for cooperating with the pins 106 of the dividing wall 107. A lost motion connection is provided by these slotted openings between the dividing wall 107 and the bail 100 to permit movement of the fuse device 21 into its operative position and movement of the bail 100 to a corresponding position without encountering the time delay action of the hydraulic time delay mechanism 108. The spring 119 moves the dividing wall 107 slowly to its original position at a speed which is governed by the rate of flow of the fluid past the needle valve 124 from the bellows 113 to the bellows 114.

When the fuse device 21 blows, it is released

at its upper end, as has been described hereinbefore, and it rotates in a clockwise direction until it engages the outer end of the bail 100. Since the lower end 103 of the bail 100 is released it is moved in a counterclockwise direction by means of the springs 102. Its movement in this direction is retarded by the hydraulic escapement device 108. The time delay results from the movement of the dividing wall 107 to the right thereby causing a flow of the liquid from the chamber formed by the flexible bellows 114 to the chamber formed by the flexible bellows 113. It will be understood that the speed of movement is controlled by the adjustment of the needle valve 124 which may be positioned to permit larger or smaller quantities of the liquid to flow from one chamber to the other in a given time. When the interval has elapsed for which the device is adjusted, the bail 100 will have been moved out of the path of the fuse device 21 and it will be permitted to fall freely. The bail 100 remains in the position to which it is operated by the springs 102 until the fuse device 21 is restored to its normal operating position. When it is so restored the fixed ferrule 51' carries with it the lower end 103 of the bail 100 to move it back to the position shown in Figure 7 of the drawings. Because of the provision of the slotted openings 129 in the links 104 no opposition to this movement is provided by the time delay mechanism 108, which would otherwise be the case if this lost motion were not provided. The dividing wall 107 returns slowly to its original position as fast as it is permitted to do so by the flow of liquid from the chamber formed by the flexible bellows 113 to the chamber formed by the flexible bellows 114 and influenced by the biasing force of the spring 119 or, if it is omitted, by the inherent resilient effects of the flexible bellows 113 and 114 themselves.

Another embodiment of the hydraulic time delay mechanism which is suitable for delaying the falling of the fuse device after it has blown is illustrated in Figure 11 of the drawings. As there shown, a bail 134 is rotatably mounted on a shaft 135 carried by a support 135' on a sleet housing 136. The bail 134 is provided with a pair of arms 137, only one of which is shown, which may be secured thereto by any suitable means such as rivets. One end of the pair of arms 137 is biased to rotate the bail 134 in a counterclockwise direction by means of a tension spring 138, which may be secured to a loop 139 formed integrally with the sleet housing 136. The other end of each of the arms 137 is provided with a roller 140 for engaging the ferrule 51, as illustrated. As soon as the fuse device blows, it begins to rotate in a clockwise direction, carrying with it the ferrule 51 and thereby releasing the rollers 140 to permit the spring 138 to rotate the bail 134 in a counterclockwise direction. This rotation is delayed by the hydraulic escapement device, illustrated generally at 141. By means of this device the bail 134 does not immediately rotate out of the path of the ferrule 51 and consequently the rotation of the fuse device is delayed.

The escapement device 141 comprises a flexible bellows 142 which is filled with a suitable low freezing point liquid. Depending from the underside of the bellows 142 is a bifurcated member 143 which is arranged to cooperate with a transverse pin 144 extending across the bail 134. Under the influence of the spring 138 the flex-

ible bellows 142 is moved upwardly and the liquid contained therein is forced to flow through a suitable small passageway into a housing 145 which is closed at its upper end by a flexible diaphragm 146. An adjusting screw 147 is provided for positioning a needle valve 148 in the small passageway in order to control the speed with which the liquid flows therethrough to the housing 145, as will be readily understood. A compression spring 149 is positioned inside of the bellows 142 for restoring it to the extended position when the bail 134 is operated to the position shown in the drawings by the replacement of the fuse device. The housing 145 is preferably partially evacuated to permit the ready flow of liquid into it. It will be understood that it is unnecessary to seal the housing 145 insofar as the operativeness of the device is concerned. However, in order to protect it from the weather and to prevent evaporation of the liquid it is preferable to seal it, as illustrated.

It is desirable to provide a wide range of calibrated adjustment for the mechanical escapement device 45 that is illustrated in connection with the repeating fuse mechanism shown in Figures 1 and 2 of the drawings. In the construction of the escapement mechanism 45 described hereinbefore, adjustment is obtained by rotating the cam 94. A further adjustment may be obtained by shifting the positions of the weights 90 and 91, and a still further adjustment may be obtained by changing these weights to use heavier or lighter ones, as may be desired. It is necessary to use various combinations of all of these adjustments in order to obtain a range of operation from approximately one second to thirty seconds. It will be obvious that it is impractical to provide such a wide range of adjustment in the field and that it would be necessary to return the mechanism to the manufacturer in order to obtain the desired adjustment.

In Figure 12 of the drawings, I have illustrated a construction whereby adjustment over the entire range may be obtained in a simple manner and by means which do not require the services of a skilled mechanic. As there shown, I have provided a second link 150 between the operating arm 60 and the link 61, the former being mounted for rotation with the shaft 59 and the latter being connected to the latching lever 46 which is engaged by the fixed ferrule 51' of the fuse device 21. The second link 150 is pivotally mounted on the operating arm 60 and the link 61 by pins 62 and 62', and the upper edge 150' of the left hand end is arranged to engage an arcuate block or cam 151 that is mounted on a sector 152. It will be observed that the sector 152 is mounted for adjustment about the shaft 59 and that it is provided with an arcuate slot 153 in which a thumb screw 154 is positioned and threaded into the housing of the mechanism 45. By loosening the thumb screw 154, the sector 152 can be rotated in either direction as limited by the slot 153. A scale 155, which may be divided into units corresponding to seconds, is provided along a portion of the periphery of the sector 152 and cooperates with an index 156, formed by a raised arrow-shaped boss on the housing of the time delay device 45, to indicate the particular adjustment thereof.

As shown in Figure 12 the sector 152 is held in the zero time position as indicated by the index 156 opposite the zero point of the scale 155. With this adjustment on release of the latching

lever 46, the shaft 59 rotates in a clockwise direction and at the same time the link 150 rotates in the same direction, the edge 150' at once clearing the arcuate block 151 thereby permitting the fuse device 21 to immediately fall to the open position. In any other position of the sector 152, for example, the ten second position, the arcuate block 151 will be placed in the path of the edge 150' and the link 150 and the latching lever 46 will be delayed in their movement by the shaft 59 governed by the time delay mechanism previously described.

In operation, the time delay device 45 is adjusted at the factory to provide the maximum time interval, for example thirty seconds. The required portion of this total interval may be employed as desired by adjusting the sector 152. The time delay device 45 will be effective to control the outward movement of the latching lever 46 as long as the upper edge 150' of the second link 150 remains in engagement with the inner surface of the arcuate block 151. When the fuse link in the fuse device 21 blows, it falls forwardly until its ear 52 engages the outer end 53 of the latching lever 46. The weight of the fuse device 21 against the latching lever 46 tends to extend the linkage 61—150—60, which extension is prevented as long as the edge 150' engages the arcuate block 151. Thus, the edge 150' is held against the arcuate block 151 while the link 150 is rotated in a clockwise direction. As soon as the arcuate block 151 is disengaged, the linkage unfolds and the outer end 53 of the latching lever 46 is moved out of the path of the ear 52 by the weight of the fuse device 21. It is then free to fall, as previously described. The operating arm 60 continues to rotate for the remainder of the time interval for which the device 45 is originally set and until it engages a stop pin 157. When the fuse device 21 is restored to its normal position, the fixed ferrule 51' engages the lower end 54 of the latching lever 46 and causes rotation of the operating arm 60 in a counterclockwise direction to wind up the spring 70, as will be readily understood.

Since certain further changes may be made in the foregoing constructions and different embodiments of the invention may be made without departing from the scope thereof, it is intended that all matter set forth in the foregoing description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. In combination, a fuse device rotatably mounted at one end for completing an electric circuit and disposed to be released at its other end on blowing thereof, switch means disposed to be operated by said fuse device as it rotates for completing a circuit between its terminals, time delay means, and holding means controlled by said time delay means for engaging said other end to restrain the rotation of said fuse device for a predetermined interval.

2. In combination, a fuse device rotatably mounted at its lower end for completing an electric circuit, means for releasing said fuse device at its upper end on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said fuse device as it rotates for completing a circuit between its terminals, time delay means, and holding means controlled by said time delay means for engaging said upper end to prevent rotation of said fuse device for a predetermined interval after engagement therewith.

3. In combination, a fuse device rotatably mounted at one end for completing an electric circuit and disposed to be released at its other end on blowing thereof, switch means disposed to be operated by said fuse device as it rotates for completing a circuit between its terminals, time delay means, restraining means disposed in the path of and spaced from said other end to permit limited rotation of said fuse device after it blows, and means operatively interconnecting said time delay means and said restraining means for shifting the latter out of the path of said fuse device a predetermined interval after engagement therewith.

4. In combination, a fuse device rotatably mounted at its lower end for completing an electric circuit, means for releasing said fuse device at its upper end on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said fuse device as it rotates for completing a circuit between its terminals, time delay means, holding means disposed in the path of and spaced from said upper end for permitting a limited rotation of said fuse device after it blows, and operating means interconnecting said time delay means and said holding means for effecting movement of the latter out of the path of said upper end a predetermined interval after engagement therewith.

5. In combination, a pair of fuse devices each rotatably mounted at one end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at the other ends on blowing thereof, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, time delay means, and holding means controlled by said time delay means for engaging the other end of said one fuse device to restrain rotation thereof for a predetermined interval after engagement therewith.

6. In combination, a pair of fuse devices each rotatably mounted at its lower end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at their upper ends on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, time delay means, and holding means controlled by said time delay means for engaging the upper end of said one fuse device to prevent rotation thereof for a predetermined interval after engagement therewith.

7. In combination, a fuse device rotatably mounted at one end for completing an electric circuit and disposed to be released at its other end on blowing thereof, switch means disposed to be operated by said fuse device as it rotates for completing a circuit between its terminals, a mechanical escapement time delay device, and holding means controlled by said time delay device for preventing rotation of said fuse device for a predetermined interval after it blows.

8. In combination, a fuse device rotatably mounted at its lower end for completing an electric circuit, means for releasing said fuse device at its upper end on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said fuse device as it rotates for completing a circuit between its terminals, a mechanical escapement time delay device, and holding means controlled by said time delay device for engaging said upper end to pre-

vent rotation of said fuse device for a predetermined interval after engagement therewith.

9. In combination, a pair of fuse devices each rotatably mounted at one end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at the other ends on blowing thereof, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a mechanical escapement time delay device, restraining means disposed in the path of and spaced from the other end of said one fuse device to permit limited rotation thereof after it blows, and means operatively interconnecting said time delay device and said restraining means for shifting the latter out of the path of said one fuse device a predetermined interval after engagement therewith.

10. In combination, a pair of fuse devices each rotatably mounted at its lower end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at their upper ends on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a mechanical escapement time delay device, holding means disposed in the path of and spaced from the upper end of said one fuse device for permitting limited rotation thereof after it is released, and operating means interconnecting said time delay device and said holding means for effecting movement of the latter out the path of said one fuse device a predetermined interval after engagement therewith.

11. In combination, a pair of fuse devices each rotatably mounted at one end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at the other ends on blowing thereof, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a spring operated mechanical escapement time delay device, restraining means disposed in the path of the other end of said one fuse device as it moves away from the circuit completing position and spaced therefrom to permit limited rotation after it blows, means operatively interconnecting said time delay device and said restraining means for shifting the latter out of the path of said one fuse device a predetermined interval after it is released, and means cooperating with said one fuse device as it is moved toward said circuit completing position for charging the spring of said time delay device.

12. In combination, a pair of fuse devices each rotatably mounted at its lower end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at their upper ends on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a spring operated mechanical escapement time delay device, holding means disposed in the path of the upper end of said one fuse device as it moves away from the circuit completing position and spaced therefrom to permit limited rotation after it is released, operating means interconnecting said time delay device and said holding means for effecting movement of the latter out of the path of said one fuse device a predetermined interval after it is released, and means cooperating with said one fuse device as it is moved toward said circuit

completing position for charging the spring of said time delay device.

13. In combination, a pair of fuse devices each rotatably mounted at one end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at the other ends on blowing thereof, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a spring operated mechanical escapement time delay device; a control lever pivotally mounted adjacent the other end of said one fuse device, one end of said control lever being positioned in the path of said one fuse device as it moves from the circuit completing position and spaced therefrom to permit limited rotation after it blows, and the other end of said control lever being positioned in the path of said one fuse device as it moves toward said circuit completing position; and a link interconnecting said time delay device and said control lever for shifting the one end thereof out of the path of said one fuse device a predetermined time after it is released and for translating the movement of said control lever to charge the spring of said time delay device when said one fuse device is moved toward said circuit completing position.

14. In combination, a pair of fuse devices each rotatably mounted at its lower end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at their upper ends on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a spring operated mechanical escapement time delay device; a control lever pivotally mounted adjacent the upper end of said one fuse device, one end of said control lever being positioned in the path of the upper end of said one fuse device as it moves from the circuit completing position and spaced therefrom to permit limited rotation after it is released, and the other end of said control lever being positioned in the path of said upper end as said one fuse device is moved toward said circuit completing position; and a link interconnecting said time delay device and said control lever for shifting the one end thereof out of the path of said one fuse device a predetermined interval after it is released and for translating the movement of said control lever to reset the spring of said time delay device when said one fuse is moved toward said circuit completing position.

15. In combination, a pair of fuse devices each rotatably mounted at one end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at the other ends on blowing thereof, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a hydraulic escapement time delay device, and holding means controlled by said time delay device for engaging the other end of said one fuse device to restrain rotation thereof for a predetermined interval after engagement therewith.

16. In combination, a pair of fuse devices each rotatably mounted at its lower end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at their upper ends on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the

other of said fuse devices, a hydraulic escapement time delay device, and holding means controlled by said time delay device for engaging the upper end of said one fuse device to prevent rotation thereof for a predetermined interval after engagement therewith.

17. In combination, a pair of fuse devices each rotatably mounted at one end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at the other ends on blowing thereof, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a hydraulic escapement time delay device; a control lever pivotally mounted adjacent the other end of said one fuse device, one end of said control lever being positioned in the path of said one fuse device as it moves from the circuit completing position and spaced therefrom to permit limited rotation after it blows, and the other end of said control lever being positioned in the path of said one fuse device as it moves toward said circuit completing position; resilient means for biasing said other end of said lever into engagement with said one fuse device, and connecting means between said time delay device and said control lever for translating the delay action of said time delay device thereto, whereby the rotation of said one fuse device is prevented for a predetermined interval.

18. In combination, a pair of fuse devices each rotatably mounted at one end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at the other ends on blowing thereof, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a hydraulic escapement time delay device; a control lever pivotally mounted adjacent the other end of said one fuse device, one end of said control lever being positioned in the path of said one fuse device as it moves from the circuit completing position and spaced therefrom to permit limited rotation after it blows, and the other end of said control lever being positioned in the path of said one fuse device as it moves toward said circuit completing position; resilient means for biasing said other end of said lever into engagement with said one fuse device, and lost motion link means interconnecting said time delay device and said control lever for translating the delay action of said time delay device thereto and permitting relative movement of said control lever and said time delay device when said one fuse device is moved toward the circuit completing position.

19. In combination, a pair of fuse devices each rotatably mounted at its lower end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at their upper ends on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a hydraulic escapement time delay device; a control lever pivotally mounted adjacent the upper end of said one fuse device, one end of said control lever being positioned in the path of the upper end of said one fuse device as it moves from the circuit completing position and spaced therefrom to permit limited rotation after it is released, and the other end of said control lever being positioned in the path of said upper end as said one fuse device is moved toward said circuit completing position;

resilient means for biasing said other end of said lever into engagement with the upper end of said one fuse device, and connecting means between said time delay device and said control lever for translating the delay action of the former to the latter, whereby the rotation of said one fuse device is prevented for a predetermined interval.

20. In combination, a pair of fuse devices each rotatably mounted at its lower end and one normally disposed to complete an electric circuit, means for releasing said fuse devices at their upper ends on blowing thereof for rotation under the influence of gravity, switch means disposed to be operated by said one fuse device as it rotates for completing said circuit through the other of said fuse devices, a hydraulic escapement time delay device; a control lever pivotally mounted adjacent the upper end of said one fuse device, one end of said control lever being positioned in the path of the upper end of said one fuse device as it moves from the circuit completing position and spaced therefrom to permit limited rotation after it is released, and the other end of said control lever being positioned in the path of said upper end as said one fuse device is moved toward said circuit completing position; resilient means for biasing said other end of said lever into engagement with the upper end of said one fuse device, and lost motion link means interconnecting said time delay device and said control lever and arranged and adapted to translate the delay action of said time delay device thereto and to permit relative movement therebetween when said one fuse device is moved toward the circuit completing position.

21. In fuse restoring apparatus, in combination, a rotatably mounted fuse device, and a rotatable member mounted in operative relation to said fuse device, said rotatable member engaging said fuse device when it is in the closed circuit position and arranged and adapted to retard rotation thereof as it rotates from said closed circuit position.

22. In fuse restoring apparatus, in combination, a rotatably mounted fuse device, a rotatable member mounted in operative relation to said fuse device, and spring means disposed to bias said rotatable member into engagement with said fuse device when it is in the closed circuit position, said rotatable member also being disposed in the path of said fuse device as it rotates from said closed circuit position.

23. In fuse restoring apparatus, in combination, a rotatably mounted fuse device, a rotatable member mounted in operative relation to said fuse device, spring means disposed to bias said rotatable member into engagement with said fuse device when it is in the closed circuit position, said rotatable member also being disposed in the path of said fuse device as it rotates from said closed circuit position, and time delay means operatively connected to said rotatable member for retarding the movement thereof out of said path.

24. In fuse restoring apparatus, in combination, a fuse device rotatably mounted at one end and disposed to be released for rotation from its circuit closing position on blowing of its fusible element, a control lever rotatably mounted adjacent the other end of said fuse device, one end of said lever engaging said fuse device in its circuit closing position and the other end disposed in the path of said fuse device as it rotates therefrom for retarding said rotation, and spring means for biasing said control lever out of the path of

said fuse device, said other end of said control lever remaining out of the path of said fuse device until it is restored to said circuit closing position.

25. In fuse restoring apparatus, in combination, a fuse device rotatably mounted at one end and disposed to be released for rotation from its circuit closing position on blowing of its fusible element, a control lever rotatably mounted adjacent the other end of said fuse device, one end of said lever engaging said fuse device in its circuit closing position and the other end disposed in the path of said fuse device as it rotates therefrom for retarding said rotation, spring means for biasing said control lever out of the path of said fuse device, said other end of said control lever remaining out of the path of said fuse device until it is restored to said circuit closing position, and time delay means operatively connected to said control lever for delaying movement thereof out of said path for a predetermined interval after said fusible element blows.

26. In fuse restoring apparatus, in combination, a mechanical escapement timing device arranged and adapted to delay the completion of a circuit through the next fuse device when the preceding fuse device blows, and means for reloading said escapement device on replacement of said preceding fuse device in its circuit closing position.

27. In combination, a movably mounted fuse mechanism adapted to complete an electric circuit and disposed to be released for movement to an alternate position on blowing thereof, switch means operable in response to movement of said fuse device to said alternate position for completing said circuit through a second fuse device, a time delay device, holding means disposed to be controlled by said time delay device for preventing movement of said first mentioned fuse device to said alternate position for a predetermined interval after it blows, and adjustable connecting means between said time delay device and said holding means whereby a wide range of timing is obtained with a single adjustment of said time delay device.

28. In combination, a rotatably mounted fuse device for completing an electric circuit and disposed to be released for rotation on blowing thereof, switch means operable in response to the rotation of said fuse device for completing said circuit through a second fuse device, a mechanical escapement time delay device, holding means disposed to be controlled by said time delay device for preventing rotation of said first named fuse device for a predetermined interval after it blows, and an adjustable linkage interconnecting said time delay device and said holding means whereby a wide range of timing is provided with a single adjustment of said time delay device.

29. In fuse restoring apparatus, in combination, a rotatably mounted fuse device, a rotatable member mounted in operative relation to said fuse device, spring means biasing said rotatable member into engagement with said fuse device when it is in the circuit closed position, said rotatable member also being disposed in the path of said fuse device as it rotates from said closed circuit position, a time delay device, and adjustable connecting means between said rotatable member and said time delay device whereby said rotatable member is retarded in its movement out of the path of said fuse device over a wide

range of time adjustment with a single adjustment of said time delay device.

30. In fuse restoring apparatus, in combination, a dropout fuse mechanism, a movable member mounted in operative relation to said fuse mechanism, a timing device having a member rotatable through a predetermined distance at a predetermined speed, a linkage interconnecting said movable member and said rotatable member for operating the former to a position to release said dropout fuse mechanism a predetermined interval after blowing of a fusible element therein, and cam means cooperating with said linkage for determining the portion of the movement of said rotatable member controlling the length of said interval.

31. In fuse restoring apparatus, in combination, a rotatably mounted fuse device, a rotatable member mounted in operative relation to said fuse device, a timing device having an arm rotatable through a predetermined arc at a predetermined speed, a linkage interconnecting said rotatable member and said arm for operating the former to a position to release said fuse device a predetermined interval after blowing of a fusible element therein, cam means cooperating with said linkage for determining the portion of the arc of movement of said arm effective to delay the release of said fuse device, and means for adjusting the position of said cam means relative to said linkage whereby different intervals are obtainable.

32. A repeating fuse cut-out comprising, in combination; a pair of rotatably mounted fuse devices disposed to be released for rotation on blowing thereof, one of said fuse devices being normally connected in a circuit, a rotatably mounted switch device disposed to cooperate with said one fuse device on rotation thereof when it blows for transferring said circuit to the other of said fuse devices, a hydraulic escapement device for delaying the transfer of said circuit comprising a pair of flexible bellows members having end walls and a movable dividing wall therebetween having a restricted opening, a liquid filling said bellows members, means for operatively connecting one of said rotatably mounted devices during its rotation to said movable dividing wall whereby said liquid is forced through said restricted opening from one bellows member into the other bellows member, a compression spring disposed to cooperate with said one bellows member for biasing it against the movement thereof caused by said connecting means to restore it to its normal position when the force causing said movement is relieved, and externally operable adjusting means for changing the action of said escapement device in delaying the transfer of said circuit.

33. The combination, with a pair of rotatably mounted fuse devices and a transfer switch for shifting a circuit from one fuse device to the other in response to the rotation of said one fuse device after blowing thereof; of a hydraulic escapement time delay device disposed to prevent rotation of one of said fuse devices and thereby closure of said transfer switch for a predetermined interval after blowing of said one fuse device comprising a flexible bellows filled with liquid disposed to escape therefrom through a restricted aperture, and a spring inside said bellows for extending the same; spring means, rotatably mounted lever means biased by said spring means into engagement with said one fuse device and restrained thereby until it is blown,

and means operatively interconnecting said flexible bellows and said lever means in such manner that rotation of said lever means after being released by said one fuse device is delayed while said liquid is being forced through said aperture by contraction of said bellows by said spring means, said lever means being unrestrained by said bellows when the former is rotated to its normal position on rotation of said one fuse device to its normal operative position, said bellows thereupon being extended by said spring therein.

34. In fuse restoring apparatus, in combination, first and second fuse assemblies both normally located in operative position, said first fuse assembly being normally connected to a circuit and said second fuse assembly being normally disconnected from said circuit at one end and arranged and adapted to be automatically connected to said circuit at said one end after operation of said first fuse assembly, a member released for movement on operation of said first fuse assembly for effecting the connection of said second fuse assembly to said circuit after said member has moved through a predetermined extent, and a time delay mechanism operatively connected to said member for retarding its movement through said predetermined extent and including a gear train and means operated thereby for retarding rotation of the gears forming said gear train.

35. In fuse restoring apparatus, in combination, first and second fuse assemblies both normally located in operative position, said first fuse assembly being normally connected to a circuit and said second fuse assembly being normally disconnected from said circuit at one end and arranged and adapted to be automatically connected to said circuit at said one end after operation of said first fuse assembly, a member released for movement on operation of said first fuse assembly for effecting the connection of said second fuse assembly to said circuit after said member has moved through a predetermined extent, and a time delay mechanism operatively connected to said member for retarding its movement through said predetermined extent and including a gear train and means operated thereby for retarding rotation of the gears forming said gear train, said time delay mechanism being restored to its initial condition on restoration of said first fuse assembly to operative condition and connection in said circuit.

36. In fuse restoring apparatus, in combination, first and second fuse assemblies, said first fuse assembly being normally connected to a circuit and including a movable contact member adapted to be moved to an alternate position on operation of said first fuse assembly, said second fuse assembly being normally disconnected

from said circuit at one end and including a transfer contact member adapted to be engaged by said movable contact member in its alternate position for connecting said second fuse assembly to said circuit at said one end, and time delay mechanism associated with said first fuse assembly for delaying the engagement of said contact members for a predetermined time after said first fuse assembly operates, said time delay mechanism including a gear train and means operated thereby for retarding rotation of the gears forming said gear train.

37. In fuse restoring apparatus, in combination, first and second fuse assemblies disposed in upright side-by-side relation, said first fuse assembly being normally connected to a circuit and including a movable contact member at its lower end adapted to be rotated downwardly to an alternate position on operation of said first fuse assembly, said second fuse assembly being normally disconnected from said circuit at its lower end and including a transfer contact member thereat adapted to be engaged by said movable contact member in its alternate position for connecting said second fuse assembly to said circuit at its lower end, and time delay mechanism associated with said first fuse assembly for delaying the movement of said movable contact member and thereby the engagement of said contact members for a predetermined time after said first fuse assembly operates, said time delay mechanism including a gear train and means operated thereby for retarding rotation of the gears forming said gear train.

38. A repeating fuse cut-out comprising, in combination; a pair of rotatably mounted fuse devices disposed to be released for rotation on blowing thereof, one of said fuse devices being normally connected in a circuit, a rotatably mounted switch device disposed to cooperate with said one fuse device on rotation thereof when it blows for transferring said circuit to the other of said fuse devices, a hydraulic escapement device for delaying the transfer of said circuit comprising a pair of flexible bellows members having end walls and a movable dividing wall therebetween having a restricted opening, a liquid filling said bellows members, means for operatively connecting one of said rotatably mounted devices during its rotation to said movable dividing wall whereby said liquid is forced through said restricted opening from one bellows member into the other bellows member, and a compression spring disposed to cooperate with said one bellows member for biasing it against the movement thereof caused by said connecting means to restore it to its normal position when the force causing said movement is relieved.

ALLAN RAMSEY.