

Feb. 1, 1944.

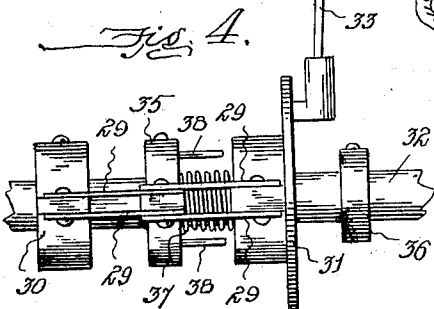
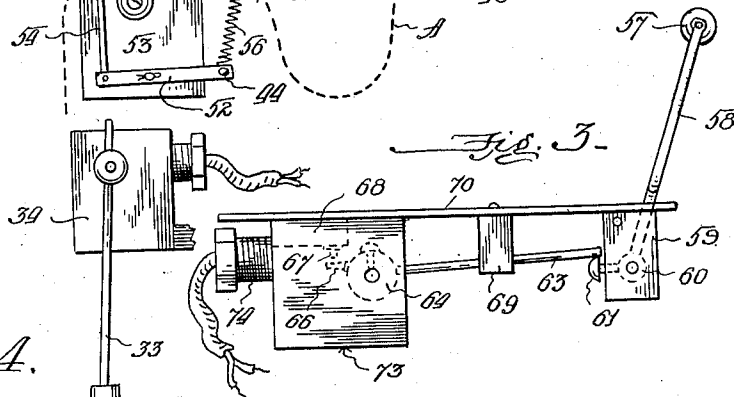
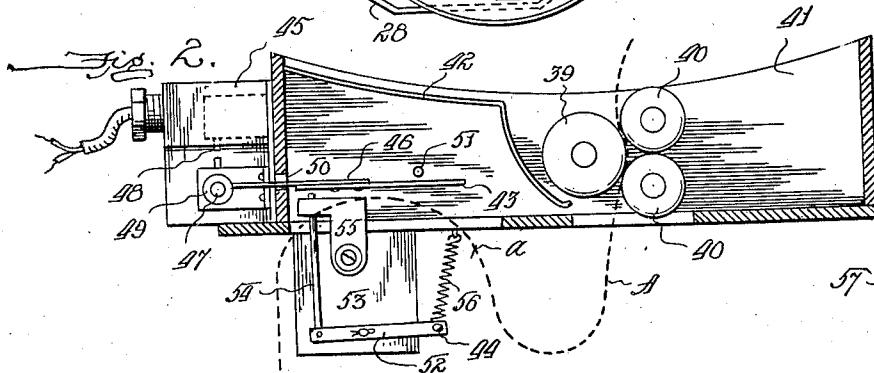
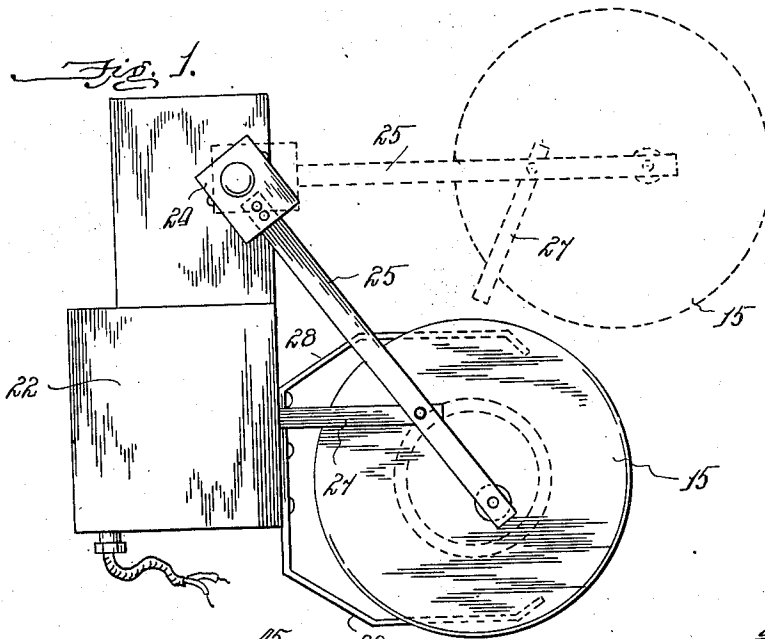
W. J. BUSHMIRE, JR

2,340,792

AUTOMATIC SAFETY CONTROL FOR MOVING-PICTURE MACHINES

Filed Aug. 15, 1941

4 Sheets-Sheet 1



Inventor:

William J. Bushmire, Jr.

By *Thomas A. Peace*
Attorney

Feb. 1, 1944.

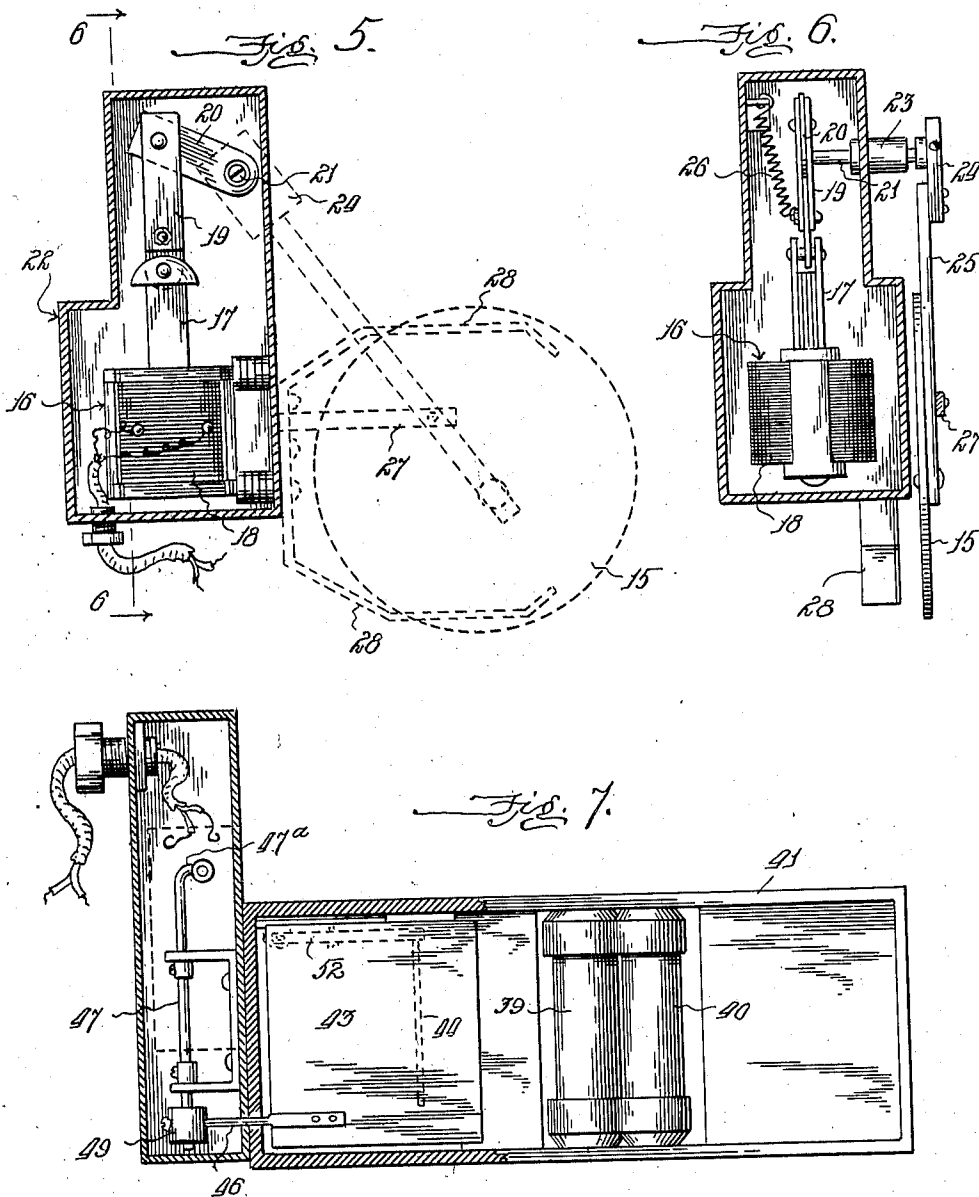
W. J. BUSHMIRE, JR

2,340,792

AUTOMATIC SAFETY CONTROL FOR MOVING-PICTURE MACHINES

Filed Aug. 15, 1941

4 Sheets-Sheet 2



Inventor:

William J. Bushmire, Jr.

By *W. C. O'Neal*
Attorney.

Feb. 1, 1944.

W. J. BUSHMIRE, JR

2,340,792

AUTOMATIC SAFETY CONTROL FOR MOVING-PICTURE MACHINES

Filed Aug. 15, 1941

4 Sheets-Sheet 3

Fig. 8.

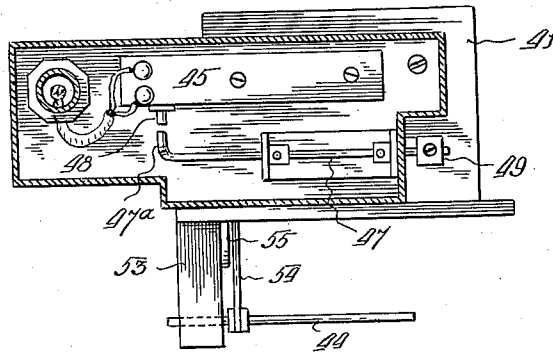


Fig. 9.

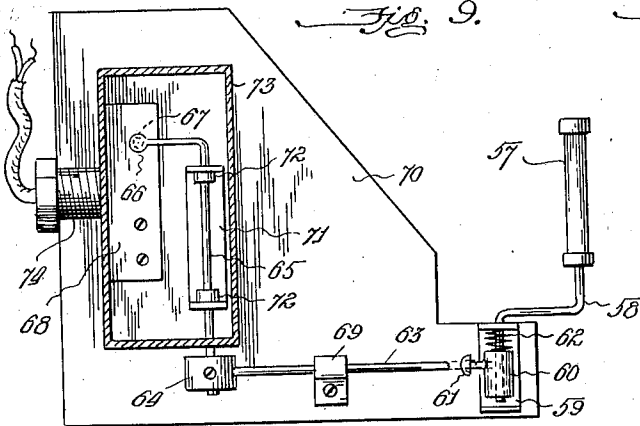


Fig. 10.

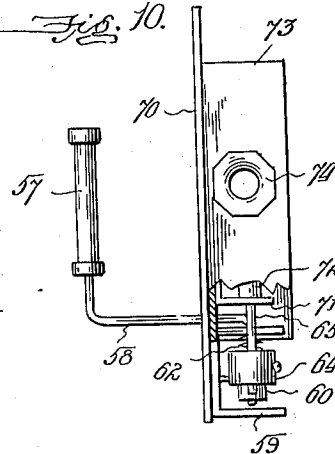
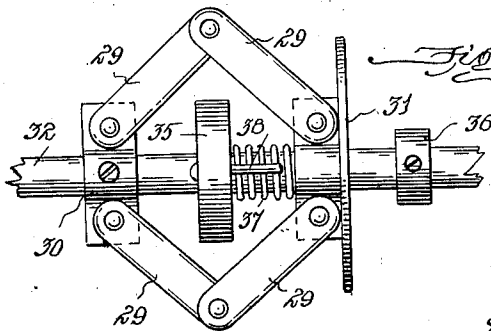


Fig. 11.



Inventor

William J. Bushmire, Jr.

By *Thomas A. Pease*
Attorney

Feb. 1, 1944.

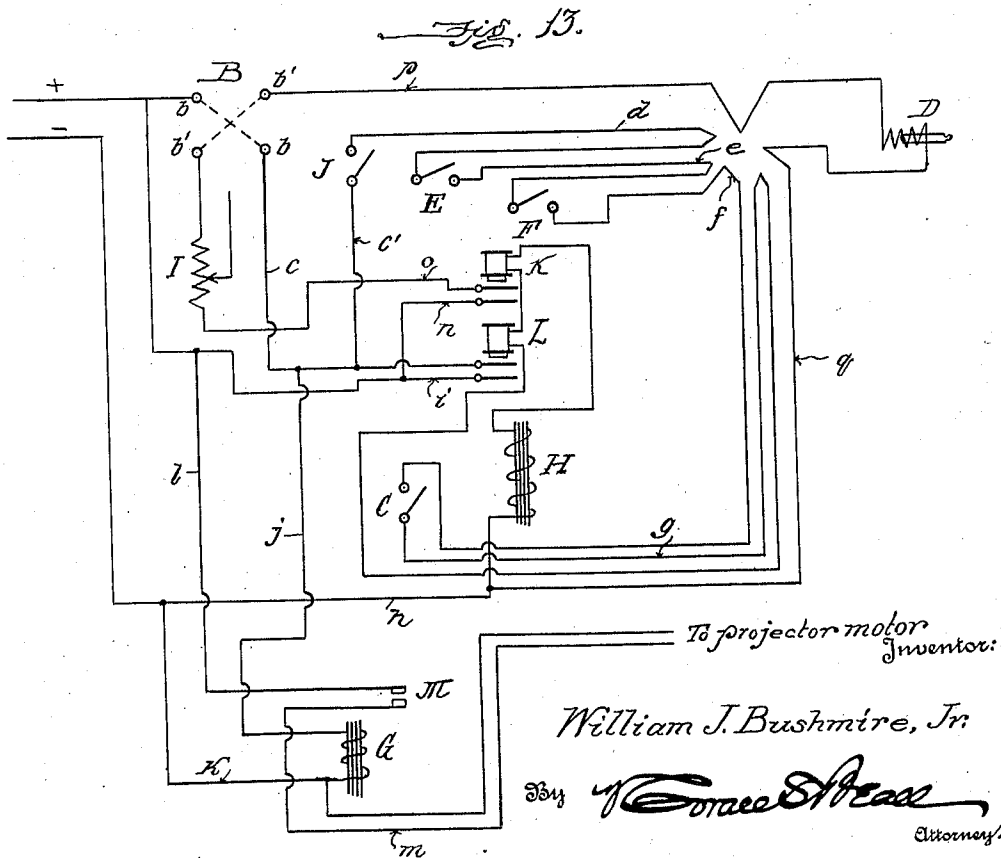
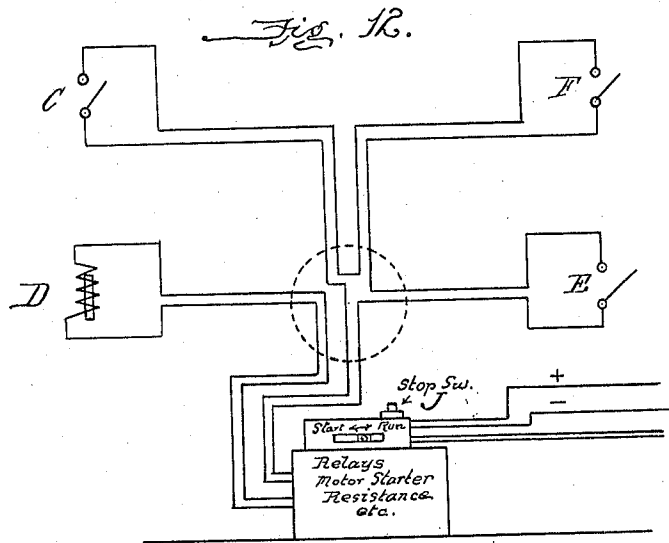
W. J. BUSHMIRE, JR

2,340,792

AUTOMATIC SAFETY CONTROL FOR MOVING-PICTURE MACHINES

Filed Aug. 15, 1941

4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,340,792

AUTOMATIC SAFETY CONTROL FOR
MOVING-PICTURE MACHINES

William J. Bushmire, Jr., Canonsburg, Pa.

Application August 15, 1941, Serial No. 407,056

3 Claims. (Cl. 88—17)

My invention relates to the general class of cinematographs or moving-picture machines in which a series of pictures on a roll of film are projected on to a screen through the medium of an electric light or lamp, and has particular reference to means for controlling the operation of the door to the lamp-house for cutting off the beam of light under certain conditions which adversely affect the orderly running of the machine.

In the operation of moving-picture machines the film on which the pictures are photographically printed is moved rapidly and intermittently in front of the lamp-house, and as an electric lamp or other intense source of light is employed the heat directed against the Celluloid film from the concentrated rays presents the danger of the film becoming ignited, but the rapidity or speed of the film during the normal operation of the machine overcomes this hazard and has prompted the use of a governor for automatically closing the door of the lamp-house when the speed in the feeding of the film to the projector is reduced below the point of safety. In starting machines of a conventional type it is customary for the operator to manually open the lamp-house door when the desired running speed is attained and hold it open until automatically locked, a method of manipulation that presents the danger of the film becoming ignited should it break or bunch at any part thereof during the time the operator is holding the door in open position. Furthermore, during the operation of the machine various conditions arise in which the governor does not offer sufficient protection in respect to the automatic operation of the douser-door, or is not quick enough to prevent firing of the film, especially in those instances where the film breaks or becomes bunched causing interruption in the feeding of the film past the lamp-house or projector.

With these hazards in mind it is the main purpose of my invention to provide means for automatically controlling the operation of the douser-door with reference not only to the opening of the door when the desired speed of the film is attained but also to automatically close the door should any mishap occur in the regular feeding thereof, being accomplished in this instance by including in the electric circuit with the governor cooperating devices actuated by the breaking of the film or the bunching or jamming of any portion thereof while the pictures are being projected on to the screen.

My invention therefore contemplates the employment of a solenoid for operating the douser-door by an electric circuit including a governor-

operated switch responsive to the speed of the machine for opening said douser-door when a desired speed is attained, in combination with means for closing the douser-door under certain contingencies, such means comprising mechanism for automatically opening the circuit should the film become bunched or jammed, and mechanism under tension of the film to automatically open the circuit should the film become broken between the rolls, in each instance the devices operating quickly and efficiently to promptly close the douser-door in the emergency; all as hereinafter fully described and specifically set forth in the appended claims.

In the drawings:

Figure 1 is a side elevation showing the douser-door and casing in which the solenoid operated mechanism is enclosed.

Fig. 2 is a longitudinal sectional view through the mechanism for opening the electric circuit by the bunching or jamming of the film, the latter being indicated by dotted lines.

Fig. 3 is a detail side elevation of the mechanism for opening the circuit should the film become broken.

Fig. 4 is a detail view of the governor and associated switch for opening and closing the douser-door depending on the speed of the machine.

Figs. 5 and 6 are vertical sectional views illustrating the solenoid and mechanism operated thereby for opening and closing the douser-door, the sectional view in Fig. 6 being on the line 6—6 of Fig. 5.

Fig. 7 is a plan view of the device shown in Fig. 2.

Fig. 8 is an end view thereof.

Figs. 9 and 10 are elevational and end views of the device illustrated in Fig. 3.

Fig. 11 is a side elevation of the governor, and

Figs. 12 and 13 are diagrammatic views to illustrate the electric circuit in which the means for automatically preventing film fire are included.

As the improvements in accordance with my invention have reference to the automatic control of the douser-door of the lamp-house, and the operation thereof is responsive to the feeding of the film in projecting the pictures on to the screen, I have deemed it unnecessary to show other parts of a moving picture machine, it being understood that the improvements are applicable to any conventional type having a lamp-house and mechanism for running the film in respect thereto. In carrying out my invention, therefore, the douser-door is for cutting off the beam of light from the lamp-house (not shown).

is controlled by the mechanism hereinafter described, and, with the exception of the governor operable under the influence of the speed of the machine, comes into play through the medium of the film indicated in dotted lines, Fig. 2, and designated by the letter A.

The means for operating the douser-door is controlled by an electric circuit and includes a solenoid 16, the core 17—working in coil 18—being pivotally connected by links 19 to an arm 20 fixed to a turnable shaft 21 by which the door is swung to open and closed positions, with the solenoid mounted in a casing 22 through which the shaft passes in a bushing 23. The douser-door is firmly connected to the shaft by means of a block 24 from which projects a rod 25 to the outer end of which the door is attached, and as the arrangement of parts is such that the douser-door will be opened by the solenoid when the latter is energized, the closing of the door is effected automatically by gravity, assisted by spring 26, when the solenoid is deenergized. The downward movement of the door is limited by stop-arm 27 secured to and projecting from the door supporting rod to strike against the casing, and for supporting the douser-door and its operating mechanism in association with the lamp-house spaced apart bracket arms 28 are secured to the casing to project outwardly therefrom. The solenoid is included in circuit with the governor and safety control devices hereinafter described, the governor being of that type having arms or links 29 pivotally connected together and at opposite ends to a collar 30 and disk 31, respectively, the collar being fixed to shaft 32 while the disk is slidable thereon, whereby centrifugal movement of the arms or links will shift the collar to operate lever 33 of an electric switch enclosed in box 34. The governor device is of ordinary construction and includes stop collars 35, 36 fixed to the shaft for limiting movement of the slidable disk, in connection with a helical spring 37 surrounding the shaft and interposed between collar 35 and disk 31 for counteracting the movement of the arms in the direction of the collar 35, and pins 38 projecting from the fixed collar 35 to prevent excessive centrifugal movement of the weighted arms. This governor device operates in usual manner; that is to say, switch 34 in circuit with the solenoid operating the douser-door is normally in open position, and when a predetermined speed of the moving-picture machine is attained the governor 33 will operate said switch to close the circuit which energizes the solenoid—switch B (Fig. 13) being closed between switch points *b'*—*b'*—for opening the douser-door at the proper time, thus effecting an automatic operation to obviate the manipulation of the door by the operator and remove the hazard attendant on such operation.

When the machine is in operation it sometimes happens that the film becomes bunched or jammed, halting the speed of that stretch which passes in front of the beam of light from the lamp, and the concentration of the intense rays of light is apt to set fire to that portion of the film with disastrous results. To provide for immediately dousing the lamp or cutting off the rays of light from the film in this emergency, I provide means in the electric circuit for promptly deenergizing the solenoid and thus permit the douser-door to fall and close off the rays of light, said means being located at the film loop beyond the point where it passes between the guide rollers 39, 40 mounted in the rectangular box 41 hav-

ing the usual shield 42. For this purpose I provide a horizontal plate or pan 43 above the loop portion *a* of film A in association with an operating-rod 44 below said loop, with means operated by either the pan or trip rod for opening an electric switch 45, which latter may be of a conventional type, as for instance the well known Micro switch commonly sold on the market. To the accomplishment of this end the plate or pan 43 is secured to an arm 46 extending from a rocking shaft 47 supported at the front end of the box 41 and having an angular bent portion 47a to engage and operate the push-rod 48 of the switch, the connection of the arm to the shaft being by means of a collar 49 fixed on the shaft with the arm passing through a slot 50 in the front wall of the box, and the movement of the plate or pan limited by stop-pin 51. It will be apparent that should anything happen to the running of the film which may cause it to buckle up or jam the loop portion *a* will exert an upward push on the plate or pan causing it to turn the shaft to which it is connected and thus operate the Micro switch to open the circuit for closing the douser-door by the solenoid becoming deenergized. The trip mechanism which is associated with the pan for opening the circuit through the medium of the Micro switch 45 includes the operating member or rod 44, extending transversely below the loop *a* of the film from one end of a rocking lever 52 pivoted intermediate its ends to a bracket plate 53 depending from the box 41 at one side thereof, the other end of said lever carrying a vertically disposed trip-rod 54 the upper end of which is guided by a bracket 55 and terminates immediately below the plate or pan 43 so as to operate the Micro switch by engagement of the film with either the pan or trip mechanism, the weight of the trip rod being counterbalanced by means of a light spring 56. As will be understood the trip mechanism—including the pan above the film loop and operating rod below the same—are in normal position, as illustrated in the drawings, when the film is running smoothly and the douser-door is open in the operation of the moving-picture machine, but in the event of accident causing the film to buckle, jam, or otherwise become disarranged, the loop portion thereof will operate either one of the movable elements of this trip mechanism to open the electric switch and provide for an automatic closing of the douser-door by the solenoid, thus preventing the film from being fired by the beam of light from the lamp.

As an additional protection against the film catching fire from the rays of light from the lamp by automatic operation of the douser-door, I provide means for opening the electric circuit when the film becomes broken or when it runs out, the means cooperating with the trip mechanism and being adapted to maintain the electric circuit closed by tension of the running film, and automatically opening the circuit when relieved of the tension. For this purpose I employ an idle roller 57 rotatable on one end of a crank-shaft 58 the other end of which is mounted in a bracket 59 and carries a roller 60 having a switch operating member 61 projecting therefrom, with a spring 62 to assist in the operation of the crank shaft when the film breaks. The operating member is in the form of a set screw to serve also as the means for securing the collar to the crank rod, and the torsion spring is interposed between one of the bracket arms and col-

lar. This idle roller and its crank shaft operate a rod 63 fixed to and projecting from a collar 64 fixed to one end of a shaft 65 the other end of which is bent at an angle and terminates in a head 66 for engagement with the push-rod 67 of an ordinary electric switch 68, preferably a Micro switch, for opening and closing the circuit through the medium of the film and idle roller engaged thereby. Rod 63 operated by the member 61 on the crank shaft carrying the idle roller is guided and limited in movement by a bracket 69 mounted on a supporting plate 70 carrying this mechanism, and the rocking shaft which operates the switch is supported to have a rocking movement in the bracket 71, being held against longitudinal movement by stop-collars 72 bearing against the projecting ends of the bracket. Furthermore, the Micro switch, its operating shaft and bracket supporting the latter are enclosed in a casing 73 attached to the supporting plate 70, and in the application of this safety control mechanism to a moving-picture machine it is secured to the bottom of the sound head (not shown) above the take-up magazine (not shown) so that only the idler and shaft carrying the same are within the sound head. The wire connections for the electric circuit are extended into the Micro switch through a nipple 74, and as before stated the switch is normally closed during the orderly running of the film, so as to effect operation of the douser-door should the film become broken and thereby release the spring-actuated crank rod having the idle roller which responds to the breaking of the film. The idle roller engages the film loop *a*, and the operation of this device for closing the douser-door should the film become broken cooperates with the device illustrated in Fig. 2 for closing the douser-door should the film bunch or jam in the operation of the machine—both devices being in circuit with the governor responsive to the speed of the machine.

In the diagrammatic views I have shown the system of wiring to include the safety control devices of my invention in circuit with a source of electric supply, Fig. 12 being a simple diagram to include only the cooperating devices hereinbefore described, while the diagram in Fig. 13 shows the inclusion of other electric devices associated therewith in the operation of a moving-picture machine.

By reference to Fig. 12 it will be noted that the douser-door operating device, referred to generally by the letter D, is in a separate circuit from that including the governor device C, film loop circuit breaker F, and take-up circuit breaker E, and that these circuits are controlled by the electrical devices illustrated in Fig. 13 to automatically open the douser-door through the medium of the governor when the desired speed of the machine is reached, and include the circuit through the devices E and F for automatically closing the douser door by an interruption in the running of the film.

In operation the control switch B is closed between the contact points *b, b* which closes the contacts M through the medium of the starter coil G and projector motor, and when the desired operating speed is attained and switch J is closed to include the make and break devices E, F, and C the current will operate the relay L completing the circuits, at which time the control switch is then closed between the contact points *b', b'*, and this connection will not interrupt the relay in closed position, including relay

K; the resistance coil I being in circuit with the solenoid operating the douser-door. When the control switch is closed between the points *b, b* the current flows by wire *c, c'*, through closed switch J, by wire *d* through make and break device E, by wire *e* through make and break device F, and to the governor C by wire *f*, from which latter the current passes to the relay coil H by wire *g*, and the relay coil connected to return wire *h* of the electric supply, relay L being included in the circuit by wires *c* and *i* to maintain the circuits when the control switch is shifted from *b, b* to *b', b'*—the circuit for starting the projector being established through starter coil G by wires *j* and *k* and the motor contacts M are included by wires *l* and *m*. Now when the control switch is operated to close contacts *b', b'* the resistance coil I and relay K are included in circuit with the solenoid of the douser-door operating device D, by way of wires *n, o*, and *p*.

From the above it will be seen that the system of wiring provides for opening the douser-door when the running speed of the machine operates the governor-controlled switch in circuit with the main switch, whereby the circuit for the starting of the motor is closed by one position of the main switch and the circuit to include the solenoid operating the douser-door is closed by the other position of said switch, and when thrown to this latter position the douser-door will not open unless the desired speed has been obtained. When the switch is thrown on to connect contact points *b', b'* and the film is running smoothly the douser-door will open automatically and remain open as long as the film continues to run uninterrupted to the end of the film, any interruption causing either one of the devices C, E, or F to automatically open the circuit to deenergize the solenoid and allow the douser-door to close automatically.

I claim:

1. In a moving-picture machine, the combination with the picture-film and douser-door of the lamp-house, of an electric device and circuit in which the device is included for opening the douser-door and maintaining it open on a closed circuit and automatically closing said door when the circuit is open; together with means included in the circuit for opening the same by engagement of the film therewith to automatically close the douser-door and cut off the rays of light from the lamp-house, said means cooperating with the film loop and comprising a switch in circuit with the aforementioned electric device, a plate or pan located above the film loop, a rocking shaft for operating the switch and to which said plate or pan is connected for opening the switch by engagement of the film with the plate or pan, in association with a rocking lever below the film loop, an operating rod at one end thereof extending transversely below the film loop and adapted to be engaged thereby, and a trip rod rising from the other end of the lever to engage the plate or pan.

2. In a moving-picture machine, the combination with the picture-film and douser-door of the lamp-house, of a solenoid and means operated thereby for opening and closing the douser-door, an electric circuit in which the solenoid is included to operate the latter for opening the door and maintaining it open when the circuit is closed; together with means included in the circuit for opening the same by engagement of the film therewith to automatically close the douser-door and cut off the rays of light from

the lamp-house, said means cooperating with the film loop and comprising a switch in circuit with the aforementioned electric device, a plate or pan located above the film loop, a rocking shaft for operating the switch and to which said plate or pan is connected for opening the switch by engagement of the film with the plate or pan, in association with a rocking lever below the film loop, an operating rod at one end thereof extending transversely below the film loop and adapted to be engaged thereby, and a trip rod rising from the other end of the lever to engage the plate or pan.

3. In a moving-picture machine, the combination with the picture film, governor and douser-door of the lamp-house, of a solenoid and means operated thereby for opening and closing the douser-door, an electric circuit in which the solenoid is included to operate the latter for opening the door and maintaining it open when the circuit is closed, and a governor-operated switch in

circuit with the solenoid, said governor being operated by a driven shaft of the moving-picture machine; together with means included in the circuit for opening the same by engagement of the film therewith to automatically close the douser-door and cut off the rays of light from the lamp-house, said means cooperating with the film loop and comprising a switch in circuit with the aforementioned electric device, a plate or pan located above the film loop, a rocking shaft for operating the switch and to which said plate or pan is connected for opening the switch by engagement of the film with the plate or pan, in association with a rocking lever below the film loop, an operating rod at one end thereof extending transversely below the film loop and adapted to be engaged thereby, and a trip rod rising from the other end of the lever to engage the plate or pan.

WILLIAM J. BUSHMIRE, JR.