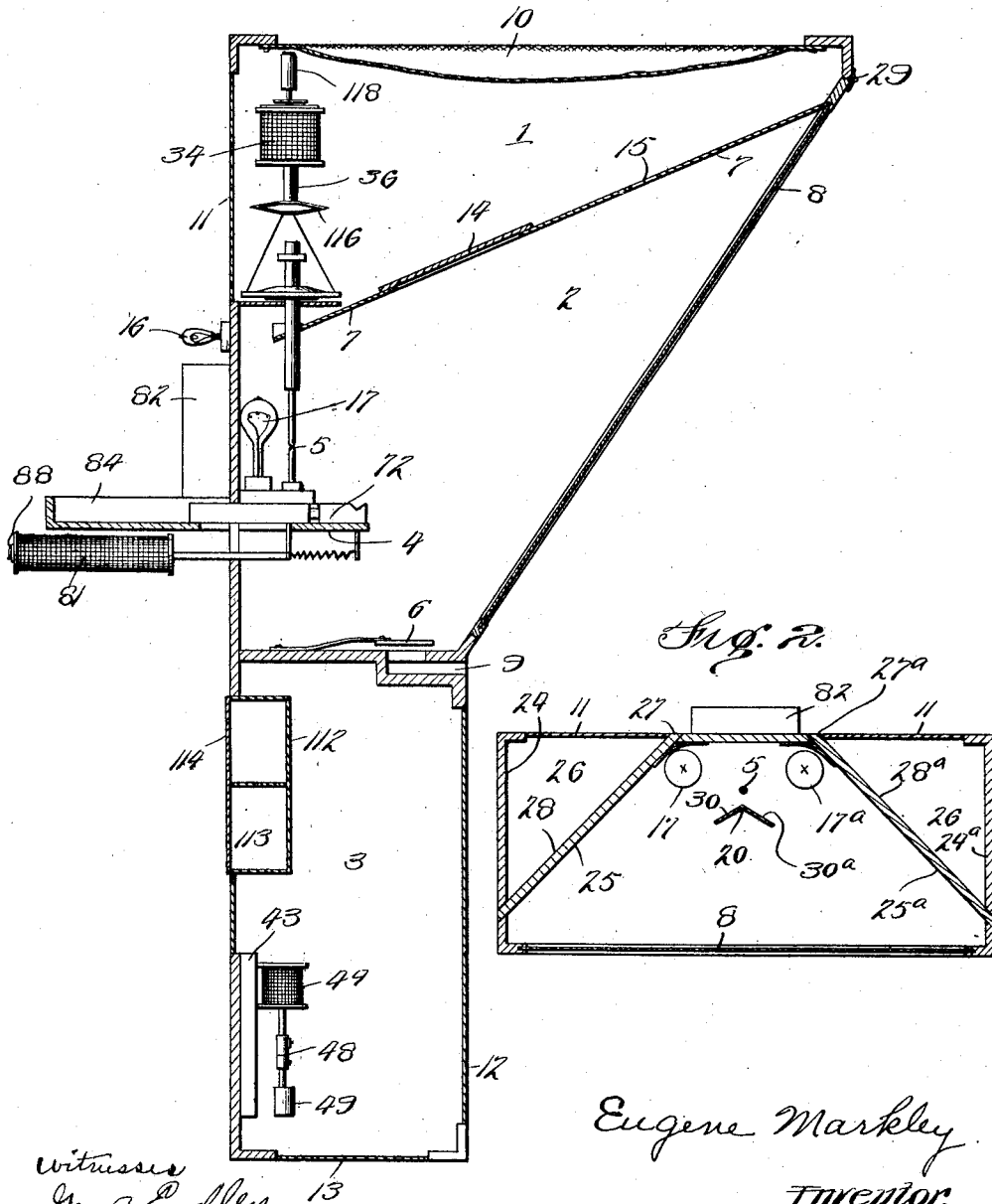


E. MARKLEY.
 PHOTOGRAPHIC APPARATUS.
 APPLICATION FILED AUG. 6, 1917.

1,295,342.

Patented Feb. 25, 1919.
 3 SHEETS—SHEET 1.

Fig. 1.



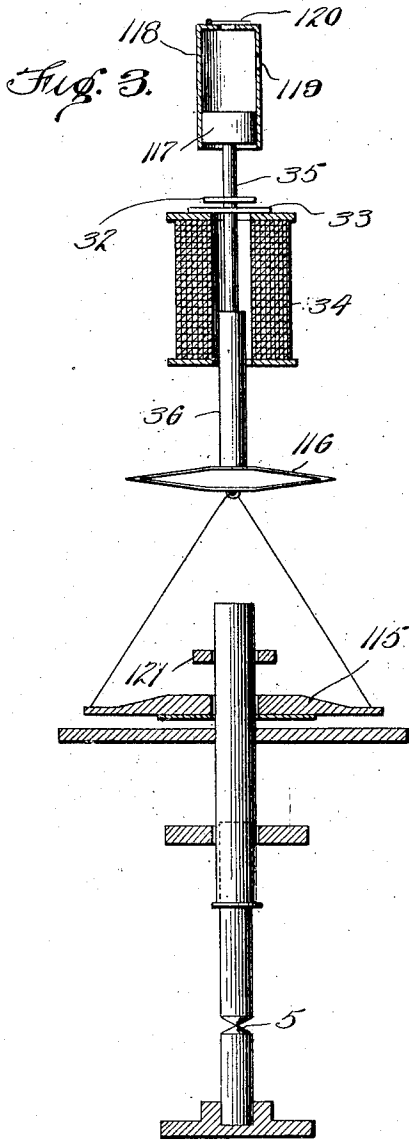
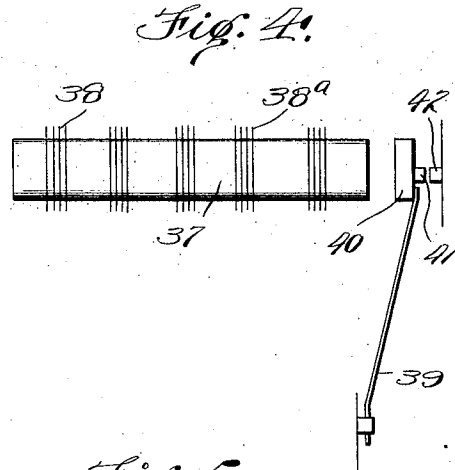
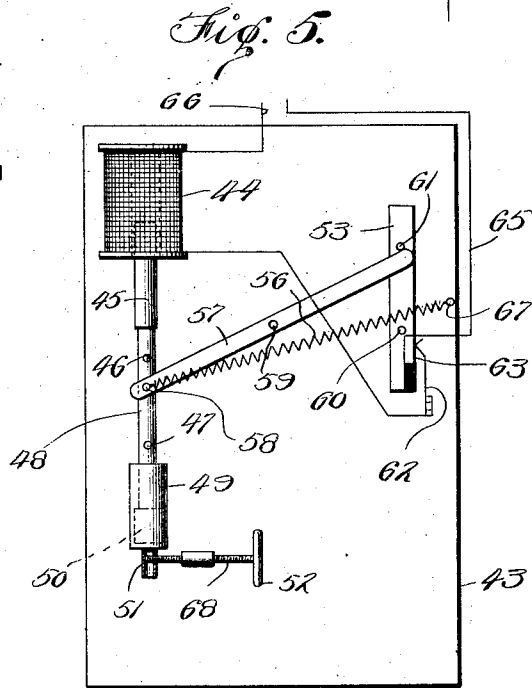
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3 SHEETS—SHEET 3.

Fig. 6.

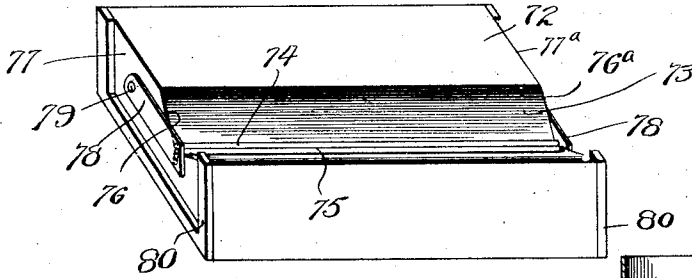


Fig. 7.

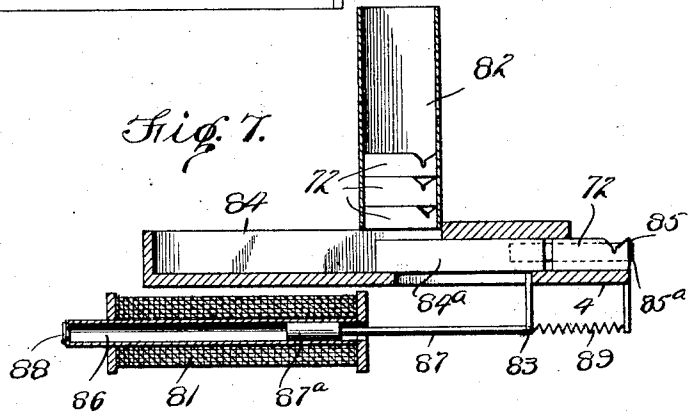
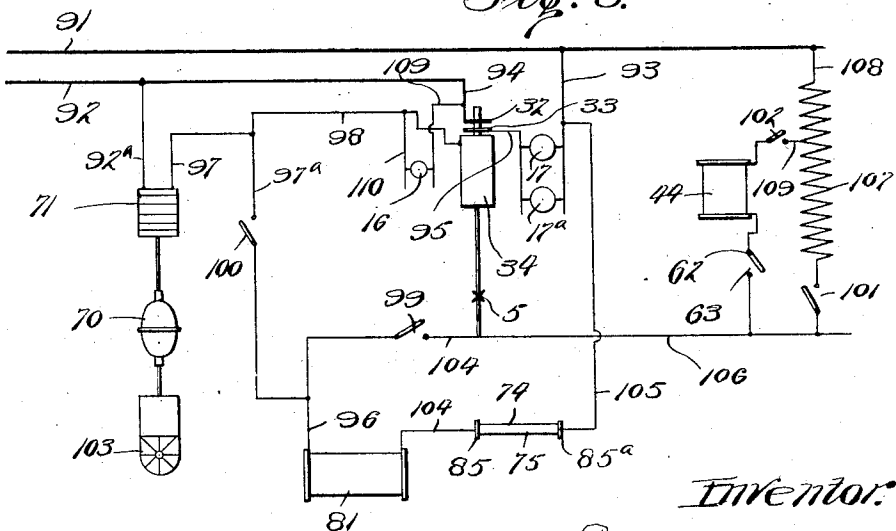


Fig. 8.



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UNITED STATES PATENT OFFICE.

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PHOTOGRAPHIC APPARATUS.

1,295,342.

Specification of Letters Patent.

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Application filed August 6, 1917. Serial No. 185,223.

To all whom it may concern:

Be it known that I, EUGENE MARKLEY, a citizen of the United States, residing in Middleburg, county of Snyder, and State of Pennsylvania, have invented new and useful Improvements in Photographic Apparatus, of which the following is a specification.

My invention relates to the art of photography and particularly to devices for the provision and control of artificial light. The invention resides in a means for utilizing the best advantages of flash powder and of electric light, either separately or in conjunction with each other.

Among the objects of my invention are the igniting of flash powder and the energizing of an electric arc either in conjunction or independently of each other and in synchrony with the actuating of a camera shutter, the provision of a simple switching device for deenergizing the incandescent focusing lamps during the period of illumination by the arc lamp, the provision of means whereby the chamber in which the flash powder is ignited is speedily and automatically ventilated and freed from the smoke of the burned flash powder.

A further object of my invention is the provision of a device for automatically bringing a new charge of flash powder into igniting position.

A further object of my invention is the provision of means whereby the electric circuit through the arc lamp can be automatically broken at a predetermined time and uniformly timed exposures be secured.

Another object of my invention is to provide means for reflecting and diffusing the light from the electric arc in such a manner that the diffusion and the incidence of the light from the arc are the same as that of the incandescent lamps.

A further object of my invention is to provide means for securing a photographic exposure with the electric arc with the least possible noise due to the vibration of the electric magnet arc regulating means of the arc lamp.

These and other objects will appear as the features of my invention shall be further described and claimed.

While I do not limit myself to the exact details shown and described, still, for the purpose of disclosure, reference is had to the accompanying drawings illustrating a prac-

tical embodiment of the invention and in which like characters designate the same parts in the several views and in which, Figure I is a sectional vertical side view of my photographic apparatus. Fig. II is a horizontal sectional view of the apparatus a little distance above the means for holding the flash pan in igniting position. Fig. III discloses the arc lamp mechanism in operative relation to the switching device for controlling the incandescent lamps. Fig. IV, discloses a modified form of a switching device for securing the same ends of the switching means disclosed by Fig. III, but operated by the rheostat controlling the electric current flowing to the arc lamp. Fig. V, discloses the automatic timing device for automatically opening a switch and breaking the circuit through the arc lamp at a predetermined time and automatically closing the switch again. Fig. VI, shows the flash pan or cartridge with means for engaging the electric igniting fuses. Fig. VII is a sectional view of the automatic loading device. Fig. VIII, is a diagram of the electrical connections and circuits through the different electrical devices and lamps of my apparatus.

Referring to Fig. I, a smoke receiving chamber 1 is formed above the flash chamber 2 by a partition 7 inclining upwardly from the rear of the apparatus. A valve or trap door 14, opening into chamber 1 is disposed in the partition 7 above and a little forward from the flash mechanism 4. This trap door is operated by the pressure caused by the liberation of gases from the exploded flash which lifts the trap door upward, thus permitting the greater part of the smoke to be carried into chamber 1, immediately after the explosion of the flash powder.

In the bottom of chamber 2 an inlet valve 6 and a vent 9 connecting with the outside are provided. This valve prevents the escape of gases and smoke to the outside and is closed by the pressure of the gases liberated from the exploding flash. The front 8 is preferably made of glass, as a glass front helps to muffle the sound of the exploding flash and forms an air-tight wall. The walls of the flash chamber being solid and non-porous, the products of the combustion are forced upward into the smoke chamber 1. A porous extensible wall 10 of material similar to cotton flannel forms the top to permit the sudden inrush of gases from the

flash chamber 2. Further means for ventilating the flash chamber 2 are provided by the openings 15 and 9. Opening 15 is relatively smaller than the opening caused by the actuating of the trap door 14. These openings 9 and 15 are provided to ventilate the nitrogen lamps 17, 17^a. The heated air rises from the lamps 17, 17^a and enters the chamber 1 through opening 15. Fresh air rushes through the opening 9 to take the place of the ascending air.

Thus it can easily be seen that the smoke remaining after the trap door 14 is closed, is soon carried into the smoke chamber by the ascending current of warm air.

The condensing chamber 3 is located under the flash chamber 2 and communicates with chamber 1 through openings 26, 26^a in the rear of the apparatus.

These openings are formed by the diagonal side walls 25, 25^a of the flash chamber which incline outwardly from the rear of the apparatus at 27, 27^a toward the front, and the straight sides 24, 24^a and the back 11 of the flash cabinet. The walls 25, 25^a are covered with insulating material 28, 28^a to prevent the descending air passing through 26, 26^a from being heated. After the heated air and smoke in chamber 1 have cooled they begin to descend into chamber 3 and the small particles of smoke gradually settle to the bottom of chamber 3.

Excepting the portion of the back of the apparatus that is formed by the back of the flash chamber 2 and such portions as need to be solid to support the several electrical and mechanical means, the back 11 is made of porous material to permit ventilation and to form a medium for screening the particles of smoke.

The front 12 and the bottom 13 of chamber 3 are also made of porous material. It will be seen that a large amount of screening surface is secured which permits the use of cloth which is comparatively thick and finely woven thus permitting perfect screening of particles of smoke and also serving to muffle the noise of the explosion of the flash.

The front 8 is hinged to the top at 29, thus making access easy to the inside of the flash chamber for purposes of renewing the carbons of the arc lamp and cleaning the lamps 17, 17^a which are not shielded from the action of the flash. Within the cabinet and located in the rear of chamber 3 is a double chamber consisting of compartments 112, 113 for receiving and holding the flash cartridges. One compartment can be used for loaded cartridges and the other for empty ones; a door 114 incloses the cartridge compartments.

A V shaped reflector 20 is placed before the arc 5 to diffuse the light. A large portion of the light from the arc is reflected

against the reflecting surfaces 25, 25^a, and 31 on the sides and back of the flash chamber by the reflecting sides 30, 30^a of the reflector 20. By limiting the size of the reflector 20, and adjusting the angles of the reflecting surface 25, 25^a and 30, 30^a practically the same incidence of the rays of light is secured from the arc 5 as from the incandescent lamps 17, 17^a.

Fig. III discloses the arc lamp mechanism which is especially designed for brief and noiseless periods of illumination and which is in operative relation to a switch consisting of members 32, 33 which are operated by the solenoid 34. The electrical contact member 32 is fastened to an extension 35 of the solenoid core 36 and normally rests on the contact 33, which also serves as a support of the core 36. When the magnet 34 is energized the core 36 lifts the member 32 from member 33, thus opening the switch. As the current through the incandescent lamps 17, 17^a flows through this switch it can readily be seen how they are deenergized simultaneously with the energizing of the arc and energized again by the release of the solenoid core.

The construction of the means for separating the carbons for forming an electric arc differ from the conventional mechanism used for that purpose in that the spring 116 is made sufficiently resilient to prevent the pulling of the carbons apart too suddenly to break the electric circuit. In this way an arc can be formed more quickly with less liability of breaking the current than by retarding the upward movement of the solenoid core with the familiar dash pot device. The spring retards only the first movement of the upper carbon and prevents too sudden separation. Thus the carbon points are heated sufficiently to allow the rest of the length of the arc to be made more quickly. By using the dash pot for retarding the upward movements of the solenoid core the variation of the speed of separating the carbons is reversed as during the first part of the movement of the plunger the compression is comparatively small, but is increased during the movement of the plunger, hence the first part of the movement is more rapid than the rest of the movement. While by the use of a spring having the proper degree of resiliency the first portion only of the movement of the arc separating mechanism is retarded. The check or stop 121 regulates the length of the arc. A retarding device consisting of a pneumatic cylinder 118 and plunger 117 is used in conjunction with the spring 116 but a valve allows the plunger to move upward unretarded. The rapid upward motion of the core and plunger permitted by the resiliency of the spring carries the core above the point where it is permitted to remain by

the stop 121 and normally held by the magnetism of the coil 34 during the period of illumination. The return of the plunger is retarded by the closing of valve 120. In fact for a brief period the weight of the core and arc regulating mechanism is wholly suspended upon the atmospheric pressure caused by the vacuum in the cylinder. As the core has been raised approximately to the center of the coil and there being no weight suspended upon the magnetism of the coil the vibration of the solenoid is entirely eliminated. The vibration due to the upward pull of the magnet is also reduced to the minimum by the quick movement of the core which is permitted by the resilient spring and unretarded upward movement of the plunger. Thus practically all of the vibration and noise of the solenoid magnet 34 is eliminated during the photographic exposure. A vent 119 is placed in the cylinder 118 which allows the plunger to drop quickly after the magnet is deenergized and the core has passed below the point necessary to suspend the carbon for forming the arc. In this way the return of the core is prevented from being unduly prolonged and the incandescent lamps are permitted to be quickly reenergized by the contact of members 32, 33.

Fig. 4 discloses another form of a switching device which may be used instead of switch 32, 33. 37 is the core and 38, 38^a are the sectional windings of a rheostat for controlling the current which flows through the arc 5. When the arc is energized magnetism is developed at the poles of core 37 and in operative relation to this magnetism an armature 40 is fastened to a spring 39 in juxtaposition to one of the poles of core 37. An electrical contact member 41 is attached to the back of armature 40 which rests against an electrical contact 42. It can be seen how that when the current to the arc flows through the rheostat the armature 40 is attracted thus breaking the contact between members 41 and 42 and breaking the circuit through the incandescent lamps. When the arc is deenergized the circuit is again closed by the return of the armature 40 to its normal position by the force of spring 39.

An automatic timing mechanism, disclosed by Fig. V is placed in series with the arc lamp. A switch consisting of a conducting plate 63 in sliding relation to a spring contact member 62 is mounted upon a movable bar 53. The bar is actuated by the motion of a lever 57 against pins 60 and 61. Lever 57 is mounted on a pinion 59 and is actuated by a solenoid magnet 44. The switch 62, 63 is normally closed. When the solenoid 44 is energized the bar 48, which is attached to the core 45, is drawn toward the solenoid. During the motion of the bar 48 the lever

57 is actuated by a pin 47. As soon as the end 58 of lever 57 to which the spring 56 is attached passes above a point beyond a horizontal plane extending from between points 59 and 67 the tension of the spring 56 pulls the lever quickly against pin 60 in the bar 53 and moves the conducting plate 63 out of contact with member 62. In this way a quick break is secured in the electrical circuit through contacts 62 and 63, even though the motion of operating bar is retarded. The electrical circuit being broken the deenergized core drops back by gravity and during the return motion of bar 48 pin 46 engages lever 57 and moves it back again below the horizontal point as described, and the tension of the spring reverses the motion of the bar 53 and moves the conducting plate into contact again with member 62. The time required for the bar 48 to move the distance necessary is determined by the retarding of the pneumatic plunger 50 in cylinder 49. A threaded pin 68 with a tapered point extending transversely through the air vent 51, controls the amount of suction and compression due to the motion of the plunger thus controlling the speed of the actuating bar 48. The electric current flows through conductor 66 thence through magnet 44, conductor 64, switching members 62, 63 and completing the circuit through 65. It is understood that the operator, when using the timing device immediately releases the bulb 70 after the arc is deenergized thus the switch 71 is opened before the switch 62, 63 is closed again by the return of the bar 48 to its normal position.

The flash pan, or cartridge Fig. VI, consists of a block 72 of suitable non-inflammable and insulating material like porcelain with a longitudinal groove 73 for receiving the flash powder. One or more electrical fuses 74, 75 preferably thin iron wires extend through the entire length of the groove. When the electric circuit passes through the wires they are heated to the igniting point throughout the entire length, thus simultaneously igniting the whole charge of powder at every point along the whole length of the charge. This method of ignition permits the charge of powder to be spread out a considerable distance without sacrificing speed. A broader flame and less noise is also made possible than with powder in a more concentrated position. At the ends of the groove or gutter are slots 76, 76^a in conducting plates 77, 77^a to permit the ends of the fuse wires to extend beyond the groove. For the purpose of engaging and making electrical contact with the fuses a spring 78 is mounted at each end on a pinion 79. This spring can be pulled upward to allow the ends of the burned fuses to drop out of the slot 76, 76^a.

New fuses are easily dropped into the slots when the contact springs are again pressed over the slots and brought into sliding contact with the ends of the fuse wires. By this method plain pieces of wire without loops or knots at the ends can be inserted and perfect electrical contact be secured. The sliding motion of the contact spring over the fuses insures a clean conducting surface and prevents insulation due to the particles of magnesium oxid settling upon the contact members. A plurality of fuses is used because more current can be utilized for operating the arc lamp and the solenoid 81 with which the fuses are connected in series and quicker firing of the flash powder be secured than by using a single fuse carrying the same amount of current. One iron fuse wire of about 6 inches in length requiring 30 amperes to be fused when connected in series with the arc lamp and the automatic magnet would require a longer time to be burned than two fuse wires each being burned by 15 amperes of current. Thus the use of one fuse of sufficient capacity to allow an electric current to pass through to produce sufficient actinic light from the arc and sufficient magnetism to operate the automatic loading magnet would prolong the duration of the arc illumination and the time required for the firing of the flash powder too much to secure a "snap shot" exposure. By using a plurality of fine fuse wires, a quick powerful flash from the arc lamp as well as speedy ignition of flash powder can be secured. The flash pan is provided with a conducting edge 80 at the bottom and sides of each end to prevent contact of the springs 78 with the sides of the magazine 82 and drawer 83 of the loading device and to form electrical contact with members 85, 85^a at the points designated by 80.

Fig. VII is a sectional view of the automatic loading device and consists of a magazine 82 for receiving a plurality of flash cartridges, a plunger or expeller block 84^a, a drawer 84 communicating from the magazine to the inside of the flash chamber and springs 85, 85^a located at the end of the drawer 84 in juxtaposition with the opposite ends of the cartridge 72 for engaging and making electrical contact therewith. A solenoid magnet consisting of coil 81 and core 87 is in operative relation to the expeller block by an arm 83. The inside of the solenoid forms a pneumatic cylinder 86. A valve 88 is placed at the end of the cylinder to permit the rapid egress of air when the plunger is drawn into the cylinder and to prevent the rapid ingress of air when the core is pulled back to its normal position by the spring 89. When the magnet 81 is energized the core 87 quickly pulls the expeller block 84^a back beyond the magazine

82, allowing a new cartridge to drop into the drawer. As the magnet is connected in series with the igniting fuse the burning of the fuse deenergizes the magnet, thus allowing the tension of the spring 89 to pull the core and expeller block into normal position again. A new cartridge is pushed into igniting position by the return of the expeller block and the old cartridge is expelled by the new cartridge and dropped into a receiving arm 19. The return of the expeller block is retarded by the vacuum created in the cylinder 86 by the action of valve 88 and plunger 87, thus time is allowed for a new cartridge to drop into the drawer and the spilling of powder due to the untimed movement of the loaded cartridge is prevented.

When it is desired to operate the expeller block by hand an arm or handle 90 is provided which slides through a slot in the top of the drawer.

The plan of electrical connections is disclosed by diagram Fig. VIII. 91 and 92 are the main conductors. The current to the focusing lamps 17, 17^a passes through conductors 93, 94 and switch contact members 32, 33 and thence through conductor 95 to the focusing lamps. The focusing lamps are not energized by the closing of the operating switch but must be previously energized by the current from the main conductors. When it is desired to operate the electric arc in synchrony with the flash and the automatic loading device, switch 99 is previously closed and switches 100, 101, 102 are previously opened. When the bulb 70 is compressed the shutter 103 is actuated, the switch 71 is closed and a circuit passes through conductors 92^a, 97, 98, the solenoid 34 and the arc 5, switch 99, conductor 96, magnet 81, conductor 104, contact 85, fuses 74, 75, contact 85^a, conductors 105, 93, and completing the circuit with 91. In this way the arc lamp is energized for a brief period, the flash powder is ignited, the automatic loading device is actuated in synchrony with the opening of the camera shutter.

When it is desired to operate the arc lamp alone and without the automatic device, switch 101 is previously closed, switches 100, 99, 102 are previously opened. Thus when the switch 71 is closed a circuit is formed through conductors 97, 98, arc lamp 5, conductor 106, switch 101, reactance 107 completing the circuit 91 through conductor 108. If it is desired to use the timing device, switch 102 is closed and switches 100, 99, and 101 are previously opened when a circuit is formed same as for arc alone excepting that the current is shunted through magnet 44 and automatic switch 62, 63. As the reactance of the current through the arc lamp is increased by the magnet 44 it becomes necessary to decrease the reactance of

the rheostat 107 by shunting the current around a portion of the rheostat as illustrated by 109, thus equal brilliancy is produced by the arc either by bulb or timed exposures.

When it is desired to ignite the flash powder without actuating the arc, switch 100 is previously closed and switches 99, 101, 102 are previously opened, thus a circuit is formed through conductor 97, 97^a, switch 100, magnet 81, conductor 104, ignition means 85, 74, 75, 85^a completing the circuit through 105, 93, to 91. It is obvious that every time switch 71 is actuated by the bulb 70 the camera shutter 103 is actuated in synchrony.

A small incandescent lamp 16 is placed on outside of the back of the cabinet for determining whether or not the electric contacts are made through the various switches and electrical connections. This lamp is connected by conductors 109 and 94 to 92, and conductors 110, 98 and 97^a connect it in series with the various combinations of arc alone, or arc and flash ignition means to conductor 91. Thus before a circuit can be made through the lamp from the main conductor 91 the current has to flow through the various connections and conductors as predetermined by the arrangement of the switches described for operating the lighting apparatus.

The current through a 25 watt lamp is too small to affect the fuses or magnets through which it must pass and the resistance of the various magnets and the lighting means is not sufficient to materially reduce the intensity of the lamp; hence the lamp serves the purpose perfectly of determining the electrical contact of all the photographic exposure lighting means except the switch 71.

Having thus described my invention what I claim is:

1. A photographic apparatus comprising a compartment with means for igniting flash powder, one or more electric incandescent lamps within said compartment, means for providing ventilation for the incandescent lamps consisting of an opening at the bottom of the compartment and an opening at the top of the compartment, a compartment for receiving the products of combustion from the ignited flash powder and the ascending heated air from the incandescent lamps, a porous wall associated with the said receiving compartment to permit egress for the air which is displaced by the ascending air and smoke from the incandescent lamps and the ignited flash powder and filter the particles of smoke from the air which is displaced.

2. A photographic apparatus comprising one or more electric incandescent lamps, an electric arc lamp, means for igniting flash powder in synchrony with the opening of

a camera shutter, means for deenergizing the incandescent lamps and energizing the arc lamp in synchrony with the opening of the camera shutter, means for reenergizing the incandescent lamps and deenergizing the arc lamp in synchrony with the closing of the camera shutter.

3. A photographic apparatus comprising one or more electric incandescent lamps for focusing prior to the photographic exposure, an electric arc lamp, means for energizing the arc lamp in synchrony with the actuating of a camera shutter during the photographic exposure, means for preventing the suspension of the weight of the electrode regulating means of the arc lamp upon the magnetism of the regulating magnet after the separating of the electrodes of the arc and during the remainder of the photographic exposure.

4. A photographic apparatus comprising means for igniting flash powder, one or more incandescent lamps for focusing prior to the photographic exposure, a camera shutter, an arc lamp, a switch for energizing the arc lamp, means for actuating the camera shutter and the switch in synchrony with the actuating of the means for igniting flash powder, means for automatically deenergizing the arc lamp after the igniting of the flash powder.

5. A photographic apparatus comprising one or more incandescent lamps, an arc lamp, a lamp for electrically igniting flash powder, conductors for connecting said lamps to the same source of electrical energy, a switch in operative relation to the arc lamp and the flash lamp, means for actuating the switch in synchrony with the actuating of a camera shutter.

6. A photographic apparatus comprising an arc lamp, one or more incandescent lamps, conductors connecting said lamps to the same source of electrical energy, a switch normally open in operative relation to the arc lamp, means for actuating said switch in synchrony with the actuating of a camera shutter, a switch normally closed in operative relation to the incandescent lamps, means associated with the arc lamp for automatically opening said switch in operative relation to the incandescent lamps during the period of the actuation of the arc lamp switch and the camera shutter.

7. A photographic apparatus comprising an arc lamp, an electric switch for actuating the arc lamp, means for actuating the switch in synchrony with the actuating of a camera shutter, means for automatically deenergizing the arc lamp at a predetermined time.

8. A photographic apparatus comprising two electric incandescent lamps, an electric arc disposed between the incandescent lamps, a reflector disposed behind the incandescent lamps and the electric arc, a reflector rela-

tively smaller than said reflector disposed in front of the arc and between the incandescent lamps.

9. A photographic apparatus comprising
5 two electric incandescent lamps for focusing prior to making a photographic exposure, two electrodes disposed between the incandescent lamps, means for energizing the electrodes and forming an electric arc
10 during the photographic exposure, a reflector on one side of the incandescent lamps and the electrodes, a reflector relatively smaller than said reflector and having sides converging toward the junction of the electrodes disposed on the opposite side of the
15 electrodes.

10. A photographic apparatus comprising an electric arc, a reflector disposed behind the arc with sides inclining outwardly from the arc, a V shaped reflector disposed in
20 front of the arc with sides converging toward the arc and relatively smaller than the sides inclining outwardly from the arc.

11. A photographic apparatus comprising
25 a magazine for receiving a plurality of flash powder cartridges each containing an electric fuse wire, means for automatically feeding a new cartridge from the magazine into igniting position after the ignition of the cartridge previously in igniting position, a
30 spring in operative relation to said feeding means, means for retarding the movement of the spring, electromagnetic means for actuating the spring.

35 12. A photographic apparatus comprising means for electrically igniting a charge of flash powder by closing a circuit through a fuse, electromagnetic means for bringing a new charge into igniting position, said
40 magnetic means being connected in series relation with the fuse and actuated by the current which flows through the fuse prior to being burned.

13. A photographic apparatus comprising
45 a pan adapted to contain flash powder and having slotted ends, one or more fuse wires

extending longitudinally through the groove of the pan and projecting through the slots in the ends, movable members disposed on the outside of the slotted ends for slidingly
50 engaging the projecting ends on the inside of the movable members.

14. A photographic apparatus comprising one or more fuse wires for igniting flash powder, an electric arc in series relation to the current which passes through the fuses,
55 electromagnetic means for automatically loading a new charge of flash powder in series relation to the current which passes through the fuses.

15. A photographic apparatus comprising a chamber for the prevention of the products of combustion of burned flash powder escaping to the outside, means for igniting the flash powder by electrically burning a
65 fuse wire, one or more incandescent lamps in juxtaposition with said means and electrically connected in multiple relation with said means, an incandescent lamp disposed on the outside of the chamber and electrically connected in series with the fuse wire,
70 a switch for shunting the electric current around the incandescent lamp on the outside of the chamber and burning the fuse, means for actuating the switch in synchrony
75 with the actuating of a camera shutter.

16. A photographic apparatus comprising an arc lamp, a fuse wire for igniting flash powder electrically connected in series relation with the arc lamp, an electric incandescent lamp connected in series relation with the arc lamp, means for shunting the electric circuit around the incandescent lamp and the fuse for energizing the arc lamp,
80 means for shunting the current around the incandescent lamp and simultaneously burning the fuse and energizing the arc lamp, means for shunting the current around the incandescent lamp and the arc lamp and
85 burning the fuse.

EUGENE MARKLEY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."