July 10, 1934. S. H. MILLSPAUGH 1,965,664

ELECTRIC LAMP

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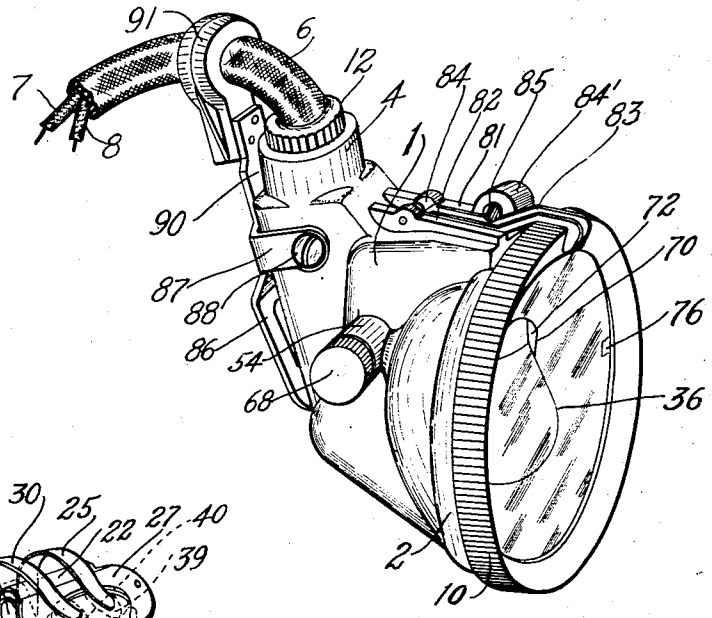


Fig. 1

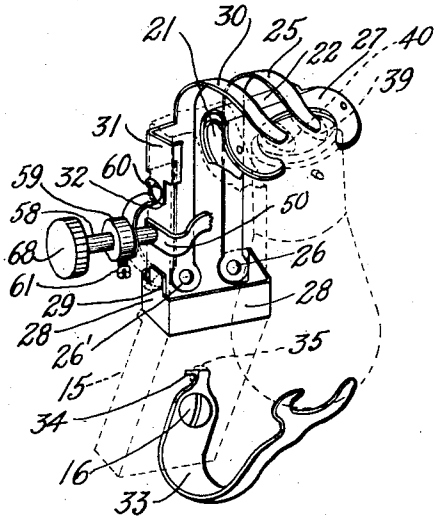


Fig. 4

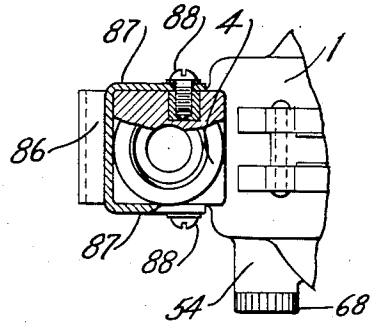


Fig. 5

INVENTOR
Stanley H. Millspaugh
BY
Henry Lanahan
ATTORNEY

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Fig. 2

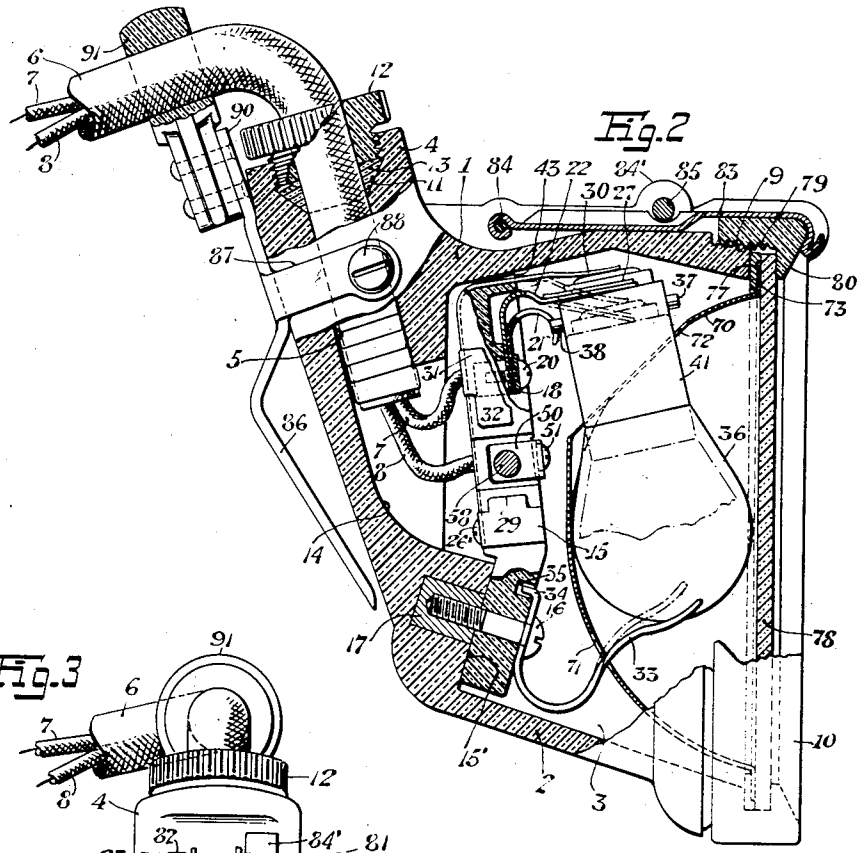


Fig. 3

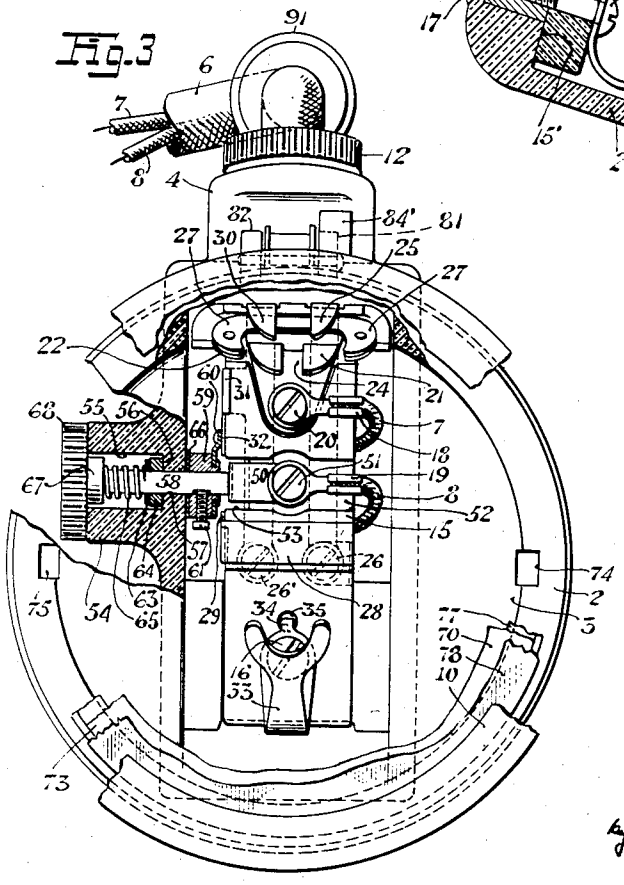
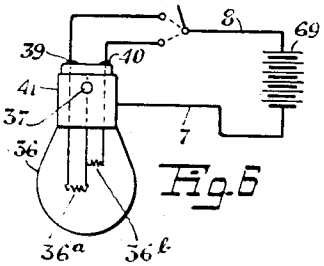


Fig. 6



INVENTOR
Stanley H. Millspaugh
by Henry Lanahan
ATTORNEY

Patented July 10, 1934 1,965,664

UNITED STATES PATENT OFFICE

1,965,664

ELECTRIC LAMP

Stanley H. Millspaugh, West Orange, N. J., assignor, by mesne assignments, to Thomas A. Edison, Incorporated, West Orange, N. J., a corporation of New Jersey

Application August 27, 1929, Serial No. 388,700

11 Claims. (Cl. 240—11.3)

The present invention relates to electric lamps, and more particularly to electric safety lamps of improved construction adapted especially for use in mines, powder magazines or other places where materials or fluids of a highly combustible or explosive nature are likely to be present.

It is of prime importance that a safety lamp of this character be so constructed as to prevent any explosive or combustible fluids or material from entering the inner chamber thereof and coming in intimate contact with the source of luminosity while in an incandescent state. It is of equal importance that the electric conductors be so arranged as to prevent any arcing or sparking occurring when the lamp is in use or has been suddenly rendered ineffective by the breakage of the bulb thereof. It is also important to prevent unauthorized opening of the lamp when in use under circumstances which would be dangerous. It is desirable to have the lamp of small weight and bulk, and adapted to be carried in such a manner as to least interfere with the physical activities of the user.

Electric safety lamps designed to obtain some of the above, as well as other results, have heretofore been produced. Upon employing them in practice, however, certain objectionable features in their construction have become apparent, such as the inaccessibility of vital parts of the lamps requiring repair or replacement, and the lack of a positive exclusion of explosive fluids from the interior of the casings or housings thereof.

The present invention is concerned with overcoming the difficulties experienced with lamps of this character heretofore produced, and at the same time with the production of a conveniently sized, inexpensive safety lamp.

One of the objects of the invention is to provide an improved electric safety lamp of a simplified construction with all parts readily accessible.

Another object of the invention is to provide a lamp having two independent sources of illumination adapted to be used alternately when so desired, both of the sources preferably being located within a single bulb and in substantially the proper focal relation to the reflector of the lamp. The advantage of having two independent sources of illumination within one bulb is obvious. This not only results in a better distribution of the light but also conserves space, which is highly important. Moreover a two-filament bulb is less expensive than two single-filament bulbs.

A further object of my invention is to provide a safety lamp having a housing that is fluid tight and also having provision for preventing arcing or sparking within the housing when the bulb is broken.

Other and further objects of the invention will be obvious upon an understanding of the embodiment thereof about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

For a clearer understanding of my invention attention is directed to the drawings accompanying and forming part of this specification, wherein:

Fig. 1 is a perspective view of a preferred form of my improved electric safety lamp;

Fig. 2 is a view of the lamp, in side elevation, partly in section;

Fig. 3 is a view of the lamp in front elevation, partly broken away and partly in section;

Fig. 4 is a perspective view, partly broken away, of the mounting for the two-filament bulb of the lamp;

Fig. 5 is a fragmentary top plan view, partly in section, of the small end portion of the lamp casing showing the mounting of the cap hook bracket; and

Fig. 6 is a diagrammatic view of the lighting circuits of the lamp.

Referring particularly to the drawings, numeral 1 represents the casing or housing of the lamp which is preferably molded in one piece of light non-conductive material. The large end portion 2 of the casing is hollow and flares out to form the chamber 3, the larger end of the flared portion being circular in cross-section and exteriorly threaded as at 9 to cooperate with threads on the bezel 10. The small end portion 4 of the casing has an opening 5 extending longitudinally therethrough and communicating with the chamber 3. The opening 5 is preferably circular in cross-section and of substantially the same diameter as the cable 6 containing the insulated wires 7 and 8, except at its outer end portion where the diameter is abruptly increased and internal threads are provided to form the stuffing box chamber 11 for the reception of the gland nut 12 and suitable packing 13, preferably of soft rubber. Upon tightening the nut 12 the packing 13 is forced against the inner end of chamber 11 and against cable 6, compressing the latter, to thereby provide a fluid tight connection between the cable and the housing and also to maintain the cable in fixed position with respect to the housing.

The opening 5 and chamber 3 are in communication through an auxiliary chamber 14, which provides ample space for those portions of the insulated wires 7 and 8 extending from the inner end of the cable 6 to a point about to be described. The inner part of chamber 3 adjacent the auxiliary chamber 14 is so formed as to provide a seat 15; which is preferably a substantially plane surface, for the non-conductive block 15, said block being maintained in fixed position in the chamber 3 and against said seat by a screw 16 which is threaded into a bushing 17 secured in the housing 1. The block 15 extends vertically across the auxiliary chamber and within the chamber 3, and is angular or offset in form as shown in Fig. 2, space being provided for the wires 7 and 8 to pass from the auxiliary chamber 14 between a lateral surface of said block and the inner surface of chamber 3, for attachment to the outer face of the block in a manner and for purposes hereinafter to be explained, and substantially as shown in Figs. 2 and 3 of the drawings. By reason of the angular form of the block and the construction just described, ample space may be provided within the chamber 3 for the reflector 70, the bulb 36, the spring 33 and other elements hereinafter described, all without substantially increasing the size or weight of the lamp beyond that usual or allowable in such cases.

I prefer to use in my improved safety lamp, an electric bulb 36 having two filaments 36*a* and 36*b* respectively, altho, if desired, a bulb having but one filament may be used. In its preferred form, as shown, the bulb has a low resistance and a high resistance filament adapted to afford different degrees of luminosity, altho both filaments may be of the same resistance and afford the same degree of luminosity if so desired. The internal circuits of the bulb are of conventional arrangement, the two filaments of the bulb each having one terminal respectively connected to independent contacts 39 and 40 on the base of the bulb and the other terminal connected to a common contact consisting of the metallic casing 41 of the base of the bulb. The casing 41 has two transversely extending lugs 37 and 38 either of which is adapted to cooperate with a slot or notch 24 in resilient conducting member 21 to position the bulb in the lamp with its contacts 39 and 40 properly located.

A terminal 18 secured to the inner end of wire 7, is rigidly attached to that face of the block 15 which is remote from the auxiliary chamber 14 by means of the screw 20, which screw also serves to secure two conductive members 21 and 22 to the block and in electrical connection with each other. The member 22 is of thin resilient conductive material, is mounted on the block 15 beneath the member 21 and extends longitudinally of the block to a point just beneath the overhanging top 43 of the block, from which point it curves away from the block and then continues in the form of a straight but slightly downwardly inclined extension. This inclined extension of member 22 is bifurcated to form two arms, the inner edges of which form a major segment of a circle having a diameter slightly less than the outer diameter of the metallic casing 41 of the base of bulb 36 but a slightly greater than the diameter of said base. Accordingly if the base of bulb 36 is disposed between the two arms of the member 22, the contacts 39 and 40 will project above said arms and the metallic casing 41 will bear against these arms.

The member 21 is made of thin resilient conducting material, is mounted on the block 15 over the member 22 and extends in the same direction as member 22, curving away from the latter at a point slightly beneath the bifurcated portion thereof. The curved portion of member 21 has a downwardly extending end provided with a notch 24 which is adapted to be engaged by one of the lugs 37 or 38 when the base of bulb 36 is disposed between the two arms of the bifurcated portion of member 22.

A conductor 25 formed of thin resilient material, is attached at 26, as by means of a screw, to the rear face of the block 15, and extends longitudinally of the block to the upper end thereof where it is curved over the top of the block and extends to a point between the two arms of the bifurcated member 22 to form a contact adapted to engage one of the contacts on the base of the bulb 36. The conductor 25 is prevented from directly engaging member 22 by means of thin insulating material 27 mounted on the latter. A conductor 28 made of thin resilient material, is formed to extend transversely around and closely conform to the block 15 and is provided with an integral upwardly extending portion forming a contact 29, said conductor 28 being connected to the block and to the conductor 25 by the same screw which serves to secure the latter at the point 26, to the block. A conductor 30 formed of thin resilient material is attached at 26', as by means of a screw, to the rear face of the block 15, extends longitudinally of the block and substantially parallel to conductor 25, to the upper end of the block where it is curved over the top of the block and extends to a point between the bifurcations of the member 22 to form a contact adapted to engage the other one of the contacts on the base of the bulb 36. The conductor 30 is also prevented from directly engaging member 22 by the insulating material 27. Integral with the conductor 30 is a transversely extending arm 31 which conforms closely to the block 15 and is provided with a lateral projection to form the contact 32. The various conducting members mounted on the block 15 preferably have those portions thereof which conform to and engage the block countersunk in shallow recesses formed in the block. This is not essential but is desirable to eliminate any likelihood of the conductors shifting about their points of connection with the block and causing short circuits. The same result could, of course, be accomplished in other ways.

A spring 33 is held in fixed position on the block 15 by the screw 16 and by a lip 34 formed on one end of the spring which engages a recess 35 in the block. This spring extends away from the block in substantially the shape of a U, one end of the U being attached to the block and the other outwardly extending end being shaped to receive the tip or glass end of the electric bulb 36.

From the foregoing description it will be seen that when the bulb 36 is positioned within the chamber 3 with the upper annular end of the metallic casing 41 on the base thereof engaging the under surfaces of the arms of the bifurcated member 22 with either one of the lugs 37 or 38 engaging the notch 24 in member 21, the base of the bulb carrying the two contacts 39 and 40 will project through the space between the said arms of member 22 and the said contacts 39 and 40 will be so positioned as to respectively engage the resilient contact end portions of the conductors 25 and 30, as is clearly shown in Figs. 2 and 4. It will also be seen that if the outer free

end portion of spring 33 is then depressed that end of the bulb 36 remote from the base thereof may be slipped over it, and that upon then releasing the spring 33 the latter will engage the bulb and force it upwardly against the arms of the resilient bifurcated member 22 and the resilient conductors 25 and 30. Engagement, under a substantially constant pressure, is thus maintained between the member 22 and the metallic casing 41 of the bulb and between the two resilient conductors 25 and 30 and the two contacts 39 and 40 on the base of the bulb. From the foregoing it is obvious that the bulb 36 when mounted as described and as shown in Fig. 2, is firmly held by the pressure of the resilient arm 22 and of the conductors 25 and 30 acting against the pressure of the spring 33 so that it is in a sense maintained floating between the spring 33 and the resilient members 22, 25 and 30. The purpose of this is two fold: In the first place it reduces the likelihood of external vibrations being transmitted to the bulb and the filaments thereof, thus materially reducing the danger of breaking the latter; and in the second place, should the glass of the bulb be broken, the conductors 25 and 30 and the resilient member 22, being no longer opposed by the action of spring 33, will instantaneously act to eject or move the bulb 36 from its normal operative position and thereby move the contacts 39 and 40 from engagement with the conductors 25 and 30 and the metallic casing 41 of the base of the bulb from engagement with the resilient arm 22. The filaments of the bulb are thus immediately rendered non-incandescent and all arcing and sparking between the ends of the filaments, in the event that they are broken, are also prevented.

The terminal 19 of the wire 8 is connected by a screw 51 to the block 15 and to a spring 50, the latter being disposed in a shallow, transverse recess 52 extending across the face of the block 15 at a point slightly below that where the terminal 7 is secured to the block. A similar but deeper recess 53 is formed in one side of block 15 and substantially midway between the ends of the two contacts 29 and 32, with the edges thereof respectively intersecting the corresponding edges of the recess 52. The spring 50 extends, from its point of connection with the terminal 19, across the face of the block 15 within the recess 52 to the recess 53, and has an angular end portion which is disposed in but is spaced from the bottom of the latter recess.

The casing 1 has an integral and substantially cylindrical portion 54 extending therefrom, the longitudinal axis of said cylindrical portion being substantially normal to the sides of the block 15 at a point which is substantially central of the recess 53. This cylindrical extension 54 has a comparatively large longitudinal opening or aperture 55 extending therethrough and almost to the inner surface of the casing 1, at which point the said opening is abruptly restricted to form a shoulder 56 and a small concentric opening 57 which extends from said shoulder through the casing 1 to the inner chamber 3. Reference character 58 represents a cylindrical rod or shaft which is rotatably mounted in and extends through the openings 55 and 57 from the outer end of the extension 54 nearly to the bottom of the recess 53 so as to engage and depress the spring 50. A collar 59, having a resilient contact arm 60 affixed thereto, is secured to the rod 58 by a set screw 61, the arrangement being such that in the rotation of the rod the contact arm will at certain points respectively engage the contacts 29 and 32 and at intermediate points will be free from such engagement while the inner end of the said rod will at all times be maintained in engagement with the spring 50. A washer 66 is preferably disposed between the collar 59 and the inner surface of the casing 1 to prevent wear of the latter at this point by the collar in its turning movements. A suitable packing ring 64 is disposed tightly about the rod 58 and is pressed against the shoulder 56 by a spring 65 which is held in a compressed condition on the said rod between the washer 63 and a collar 67 which is secured to the rod adjacent its outer end. To enable the rod 58 and contact arm to be readily turned, a serrated knob 68 of insulating material is secured to the outer end of the rod in a position closely adjacent the outer end of the extension 54.

From the foregoing description it is apparent that a fluid tight seal is formed by the packing 64 substantially at the point where the shaft 58 enters the chamber 3, as is clearly shown in Fig. 3. It will also be seen that if the two wires 7 and 8 are connected to a battery or other suitable source of energy 69, the two terminals 18 and 19, spring contact 50, rod 58 and contact arm 60 will be energized. It is then necessary merely to turn rod 58 and contact arm 60 to energize at will either of the contacts 29 and 32 to thereby effect the energization of either of the conductors 25 and 30 which respectively engage or are adapted to engage the terminals 39 and 40 of bulb 36. It is, of course, obvious that if the contact arm 60 is in neutral position, i. e. out of engagement with both of the contacts 29 and 32, neither of the conductors 25 and 30 will be energized. As heretofore explained when the terminal 18 is energized the members 21 and 22, which engage or are adapted to engage the metallic casing 41 of bulb 36, will be energized. Accordingly when the preferred type of bulb 36 is properly positioned in the lamp, as shown in Figs. 1 and 4, the same may be rendered ineffective by turning the contact arm 60 to neutral position, or either filament may be rendered incandescent as desired, by turning the contact arm 60 to the proper position.

A suitable reflector 70, of substantially parabolic form, as shown in Figs. 1 and 2 of the drawings, is positioned within chamber 3 of the lamp. The large or outer end portion of this reflector is circular in cross-section and is provided with an annular outstanding flange 73 which extends over the annular face of the large end portion 2 of the casing 1, the diameter of the outer periphery of the flange 73 being slightly less than the larger diameter of the said annular face. The reflector has two openings 71 and 72 through which the spring 33 and the base of bulb 36, when the lamp is properly assembled, respectively extend. Two shallow recesses 74 and 75 are formed in the annular face of the large end portion 2 of the casing and cooperate with corresponding deformations or lugs 76 provided on the flange 73 of the reflector 70, so as to position the latter with the openings 71 and 72 thereof in proper relationship with the spring 33 and the base of the bulb 36 respectively. An annular sealing gasket 77 is disposed between the annular face of the large end portion 2 of the casing 1, and the flange 73 of the reflector, as shown in Fig. 2. The diameter of the outer edge of the gasket is slightly greater than the outer di-

ameter of the flange 73 and slightly less than the diameter of the outer edge of the annular face of the said end portion 2, and the outer edge portion of this gasket is turned over so that it overlaps the edge of the flange 73 and extends outwardly slightly beyond the latter. A suitable transparent glass closure or window 78 for the open front end of the casing 1 is positioned with its inner surface engaging the outwardly extending edge portion of the gasket 77. The bezel 10, which is connected to the casing 1 at its large front end by the coacting screw threads 9 and 79, is turned up tightly with the result that the flange 80 of the bezel engages the window 78 and forces it against the sealing gasket 77, the latter thus being compressed and distorted to form a fluid tight seal between the window and the casing.

The upper exterior portion of the casing 1, as viewed in Figs. 1 and 2, has two spaced ribs 81 and 82 extending rearwardly from points adjacent the front end of the casing. A locking member 83 is pivotally mounted between these two ribs, as at 84, and is of such form as to be adapted to hook over and engage the bezel 10 and thus prevent the removal of the latter from the lamp casing. A lug 84', formed on the rib 81 and an adjacent portion of the casing 1 is provided with an opening in which a suitable seal 85 is secured. This seal, when the lamp is completely assembled, as shown in Figs. 1 and 2, projects from the lug 84' so as to overlie the member 83 and maintain the same in operative locking engagement with the bezel 10. This construction renders it impossible for an unauthorized person to gain access to the interior of the lamp casing by removing the bezel and window 78, without destroying the seal 85.

A hook 86 adapted to fasten the lamp to any article desired, such as a miner's cap, is off-set from the rear face of the small end portion of the casing 1 and is secured to the latter by means of arms 87 provided thereon and screws 88. The shank 90 of the hook extends upwardly to a point slightly above the small end portion of the casing 1 and constitutes a support on which is mounted a member or eye 91 serving a guide and support for the cable 6.

The construction above described embodies all of the essential features of an effective and highly satisfactory electric safety lamp. An important feature of my invention lies in the manner of mounting the bulb and all of the conductors on an insulating block so as to provide an assembly which can be readily removed as a unit for examination, replacement, or repair of the parts. It will also be observed that when the insulating block is removed, the switching device for controlling the lighting of either filament at will, is exposed and open for inspection, so that it is a simple matter to trace and repair any defect in the said device or in those portions of the conductors 7 and 8 which are disposed within the lamp casing. Attention is also directed to the feature of employing a two-filament bulb instead of two independent bulbs which, as heretofore explained, permits a better distribution of light and conserves space. The employment of such a bulb having both a bright and a dim lighting filament should also result in the saving of electrical energy, as there are many times when a bright light is not required and it is a simple procedure for the user to switch from bright to dim and vice versa.

As various changes may be made in the form, construction and arrangement of the parts in the preferred embodiment herein described, without departing from the scope and spirit of the invention, all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having now described my invention, what I claim is:

1. In a mine lamp, the combination of a hollow casing, conductors entering said casing, a block of insulating material removably mounted within said casing, resilient conductive members mounted on said block, a spring mounted on said block, and a two-filament electric bulb having electrical terminals at one end only and maintained in electrical connection with said members by said spring.

2. In a mine lamp, the combination of a hollow casing, conductors entering said casing, a block of insulating material removably mounted within said casing, resilient conductive members mounted on said block, a spring mounted on said block, a two-filament electric bulb having contacts at one end only and maintained in electrical connection with said members by said spring, and means for instantaneously moving said bulb from electrical connection with said members when the glass of said bulb is shattered.

3. In a mine lamp, the combination of a hollow casing having a plurality of apertures therein, conductors entering said casing thru one of said apertures, means for sealing all of said apertures to prevent ingress of fluid into said casing, a block of insulating material removably mounted within said casing, resilient conductive members mounted on said block and in electrical connection with said conductors, a spring, and a two-filament electric bulb having contacts at one end only and maintained in contact with said resilient members by said spring, said resilient members operating to instantly eject said bulb from its mounting when the glass of said bulb is broken.

4. In a mine lamp, the combination of a block, an electric bulb having contact terminals and two filaments adapted to become incandescent, resilient means for mounting said bulb on said block, said means including a spring member adapted to engage said bulb and resilient conductors adapted to contact said terminals, and means for alternately causing either of said filaments to become incandescent, said block and conductors being removable from the lamp as a unit.

5. In a mine lamp, the combination of a housing, a block removably mounted in fixed position within said housing, resilient conductive members on said block, a spring on said block, and an electric bulb having contacts at one end only and provided with two filaments, said bulb being maintained with contacts thereof in engagement with said members and in a floating relation to said block by and between said spring and said resilient members.

6. In a mine lamp, in combination, a hollow casing, an electric bulb disposed within said casing and having a plurality of elements adapted to be rendered luminous, the base of said bulb having a plurality of contact terminals to which said elements are respectively connected, a block of insulating material removably mounted within said casing, a plurality of resilient conductors mounted on said block respectively adapted to engage said contact terminals and thereby connect said elements in a plurality of electric circuits respectively, a resilient member associated with said block and engaging said bulb to yieldingly maintain the same in a position in which said contact

terminals engage said conductors, and means operable to open or close any of said circuits at will.

7. In a mine lamp, in combination, a hollow casing provided with a chamber and a passageway communicating with said chamber and adapted to receive electric wires, an insulating block mounted in said chamber, said block having a longitudinal portion extending angularly therefrom, a seat formed on the inner surface of said casing and adapted to cooperate with said longitudinal portion for so positioning said block in respect to said passageway as to provide space for said wires to enter said chamber, means securing said block to said seat and in such position, resilient electric conductors applied to said block, means for electrically connecting said wires with said conductors, an electric bulb provided with contact terminals and adapted to be positioned with said terminals electrically connected with said conductors, and means for resiliently maintaining said bulb so positioned.

8. In a mine lamp, in combination, a hollow casing, leads for electric energy entering said casing, an electric bulb having at least two filaments and comprising a base having at least three contact terminals, and a plurality of conductors adapted to be maintained in electrical connection with said leads and with said contact terminals, said conductors constituting a seat for the base of said bulb and comprising a resilient element adapted to position said base so that said contact terminals will be respectively in alignment with said conductors, and means for supporting said bulb in such position.

9. In a mine lamp, in combination, a hollow casing, a two-filament electric bulb within said casing, said bulb comprising a base and at least three contact terminals, and a plurality of electric conductors mounted within said casing, said conductors being adapted to constitute a seat for said base and one of said conductors comprising a resilient element adapted to cooperate with said base to so position said bulb in respect to said seat that said contact terminals will respectively be in alignment with said conductors.

10. In a mine lamp, in combination, a hollow casing, means adapted to prevent the ingress of explosive fluids into said casing, electric conductors entering said casing, an electric bulb comprising at least two filaments and at least three contact members, and a mounting for said bulb within said casing, said mounting comprising conductors in electrical connection with said first named conductors and a resilient element associated with said mounting conductors adapted to cooperate with said bulb to position said bulb in said mounting so that said mounting conductors are respectively in alignment with said contact members.

11. In a mine lamp, in combination, a hollow casing, electric conductors entering said casing and a mounting within said casing adapted to receive the base of a two-filament bulb, said mounting comprising conducting arms in electrical connection with said first named conductors and a yieldable element adapted to cooperate with a lug on said base to position said base in respect to said conducting arms.

STANLEY H. MILLSPAUGH.