March 2, 1943. G. WHEAT 2,312,613

MINER'S LAMP

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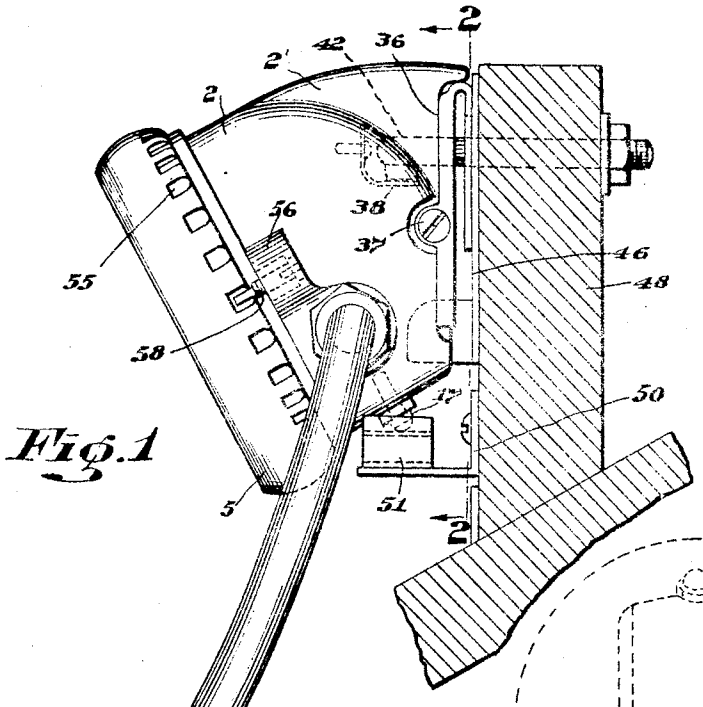


Fig. 1

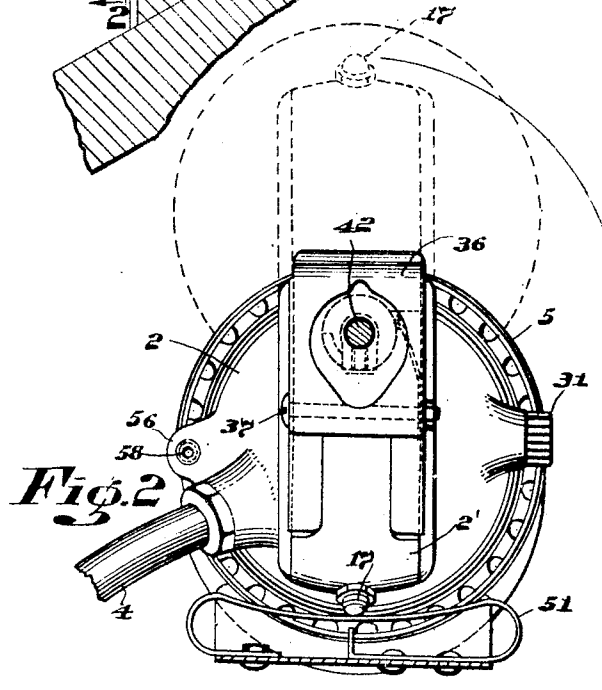
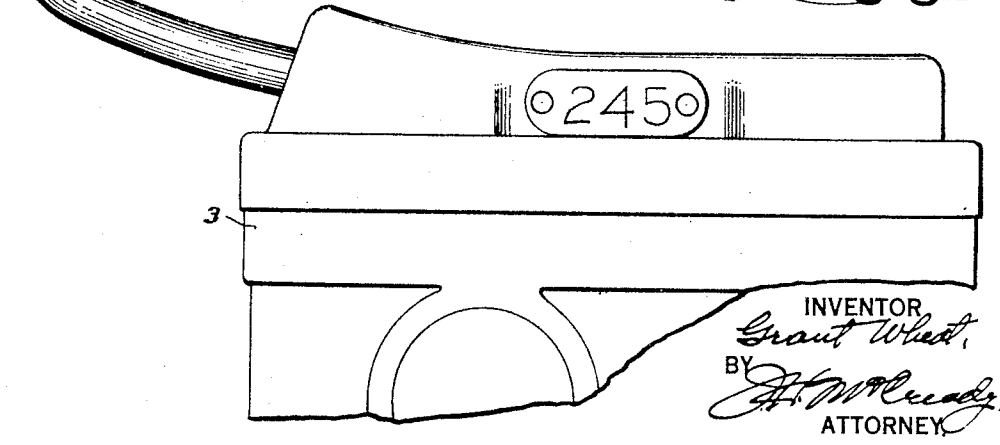


Fig. 2



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Fig. 3

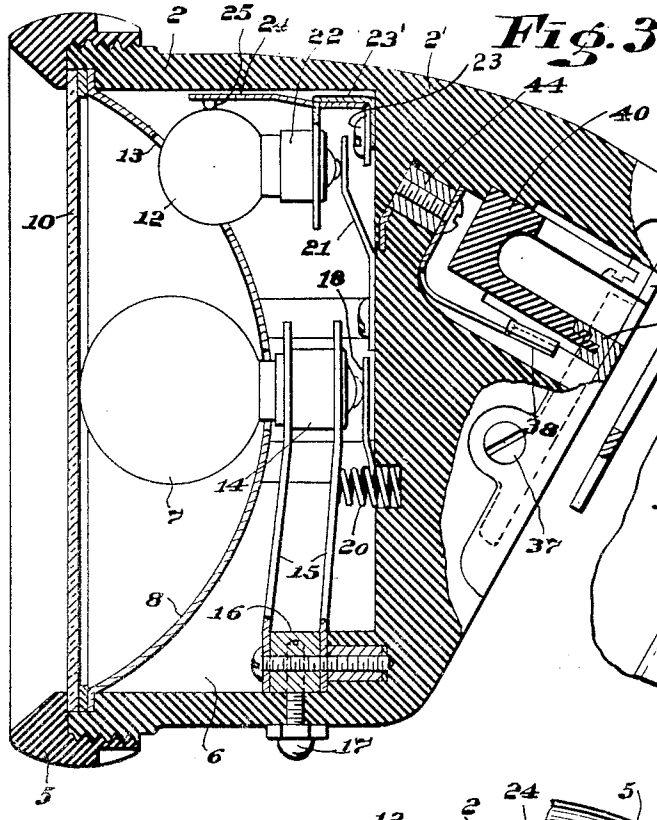


Fig. 4

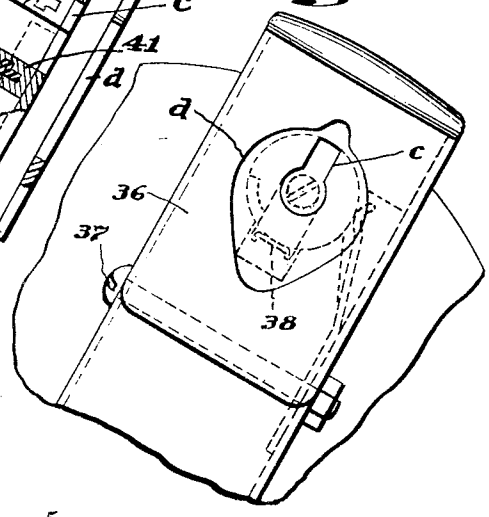
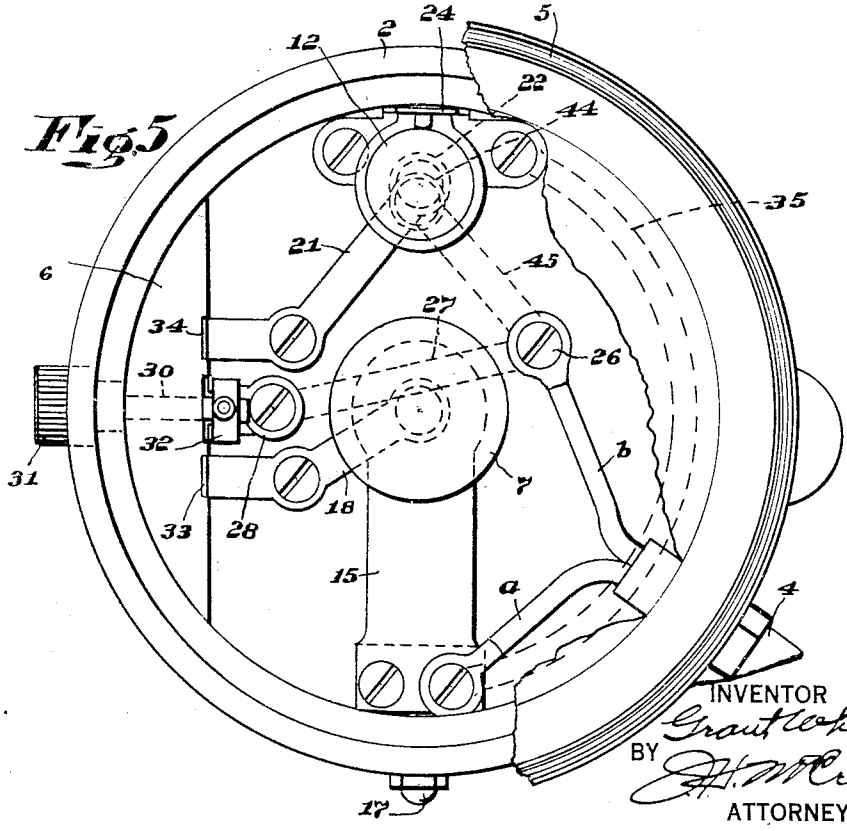


Fig. 5



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Fig. 6

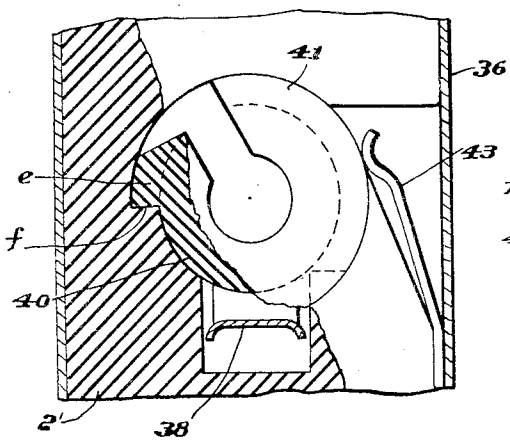


Fig. 7

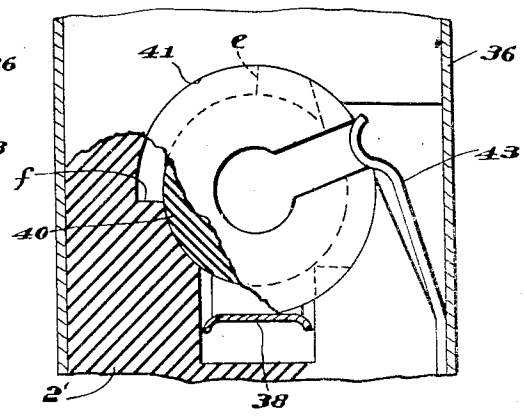


Fig. 8

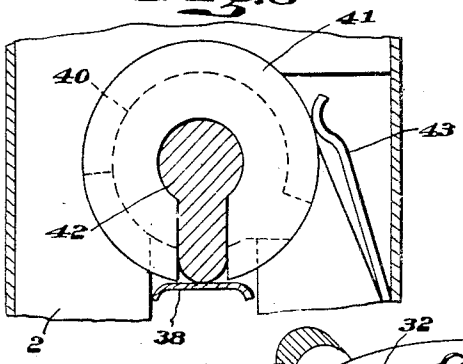


Fig. 9

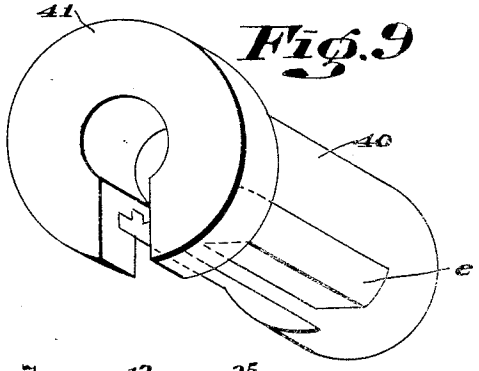
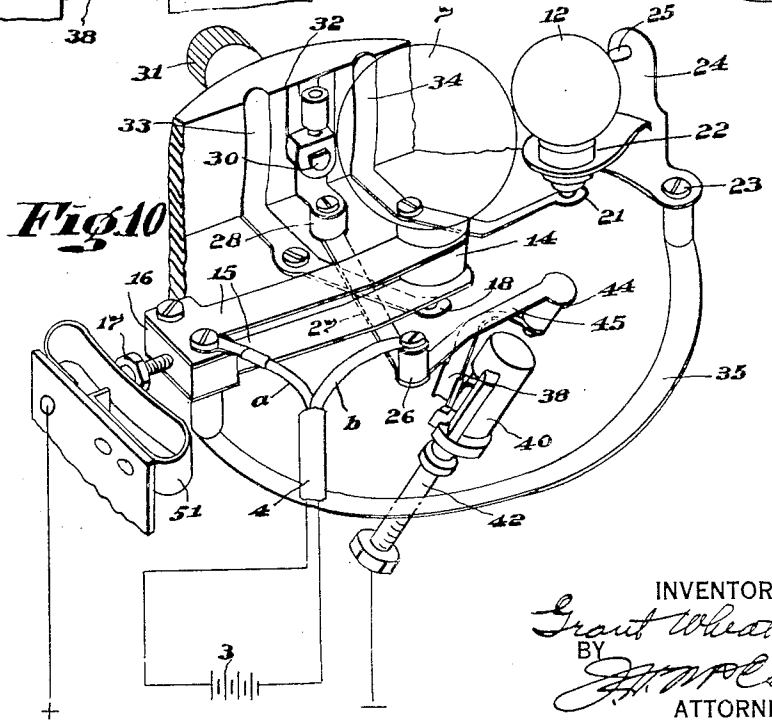


Fig. 10



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Fig. 11

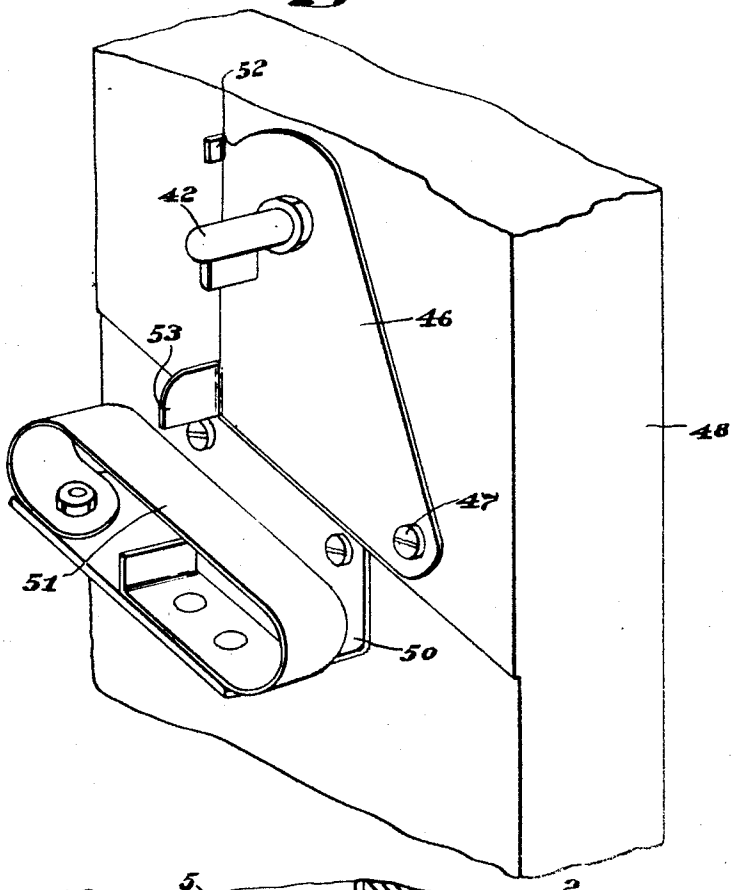


Fig. 12

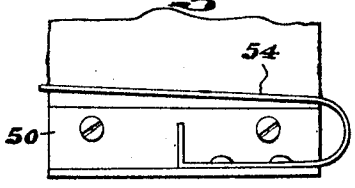
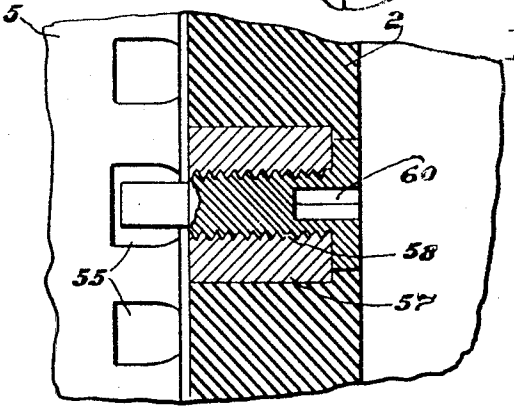


Fig. 13



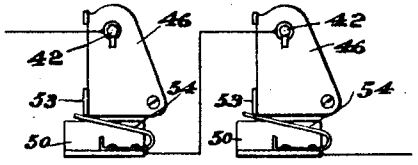


Fig. 14

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Patented Mar. 2, 1943 2,312,613

UNITED STATES PATENT OFFICE

2,312,613

MINER'S LAMP

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Application January 23, 1940, Serial No. 315,135

8 Claims. (Cl. 240—11.3)

This invention relates to lamp structures of the type commonly designated as miner's lamps or cap lamps. Such a structure comprises a headpiece in which one or more electric lamps are mounted, the headpiece being equipped with means for fastening it to a hat, cap, or some other part of the clothing, a storage battery which customarily is slung from the miner's belt, and a flexible cord containing conductors for carrying current from the battery to the lamp. While such devices were originally designed especially for use by miners, they are also used to a very substantial extent by firemen, artisans, and others.

This invention aims to improve organizations of the general character just referred to with a view to simplifying their construction, improving their efficiency, protecting the internal structure of the headpiece from outside tampering and facilitating the operation of recharging the battery. It is also an object of the invention to devise a simple and efficient form of charging apparatus to be used in connection with miner's lamps of the general character here disclosed.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Figure 1 is a side elevation of a miner's lamp constructed in accordance with this invention, certain parts being broken away and the headpiece being shown in charging position on a rack embodying features of this invention;

Fig. 2 is a sectional view approximately on the line 2—2, Fig. 1;

Fig. 3 is a vertical, sectional view of a headpiece of a preferred form;

Fig. 4 is a rear view of a part of the headpiece showing particularly the attaching clip and parts immediately associated with it;

Fig. 5 is a front elevation of the headpiece with the reflector removed and most of the lens and bezel broken away;

Figs. 6, 7 and 8 are fragmentary views, partly in section and partly in rear elevation, showing the locking means for protecting the internal charging terminal of the headpiece;

Fig. 9 is a perspective view of the barrel of the lock;

Fig. 10 is a schematic angular view, largely diagrammatic in character, showing the current carrying parts of the apparatus;

Fig. 11 is a perspective view of one unit of a charging rack;

Fig. 12 is a front elevation of a spring contact which is used to replace that shown in Fig. 11 in series charging;

Fig. 13 is a sectional view through a portion of the headpiece showing the means for sealing it; and

Fig. 14 is a diagrammatic view of a portion of a series charging circuit in which parts similar to those shown in Figs. 11 and 12 are used.

Referring first to Figs. 1 and 3, the lamp structure there shown comprises a headpiece 2, a storage battery 3, and a flexible cord 4 operatively connecting the battery with the headpiece. The headpiece includes a main body supporting the lamps and the conductors cooperating with them, and a bezel 5, both of which parts may conveniently be made of some molded insulating material, such as Bakelite, vulcanite, or some of the newer moldable plastic materials. It is provided with a lamp chamber 6 in which a main electric lamp 7 is mounted in a centered relationship to a reflector 8, the front of this chamber being closed by a lens or glass plate 10 held in position by the screw threaded bezel 5. At the upper side of the lamp chamber a small auxiliary or emergency lamp 12 is mounted, the bulb of this lamp projecting more or less through an aperture 13 in the reflector 8.

The circuit connections for supplying current to the lamps 7 and 12 are best shown in Figs. 3, 5 and 10. In all of these devices it is important to so mount the lamps that if any lamp bulb is broken the flow of current through it will be instantly and automatically cut off. Novel mountings for the lamps 7 and 12 designed to accomplish this object are provided. Referring more especially to Fig. 3, it will be seen that the base of the lamp 7 is supported in a holder or sleeve 14 which, in turn, is mounted on the outer ends of two parallel leaf springs 15—15 both secured to a metal block 16 fastened to one wall of the lamp chamber by means of a screw 17. The shell of the base forms one terminal of the lamp while the other terminal is located at the middle of the lower end of the base and rests on a relatively stationary contact 18. The springs 15—15 are either so biased or so acted upon by a coiled spring 20, Fig. 3, that they tend to force the lamp 7 outwardly far enough to interrupt the engagement of the center lamp terminal with the contact 18. Normally the lamp is supported against this action by the engagement of the bulb 7 with the glass plate 10. If, however, either the plate

10 or bulb 7 breaks, then the spring arms 15—15 or the spring 20, or both, when both are used, force the holder 14 outwardly and instantly cut off the flow of current through the lamp filament.

It will be observed that this arrangement supports the lamp with its axis substantially coincident with the axis of the reflector, and that the spring arms 15—15 form, in effect, the elements of a parallel motion device which maintains the lamp in this axis. At the same time it accommodates any differences in position due to minor variations in dimensions of the lamps themselves, or the position of the plate 10, without disturbing the relationship just mentioned.

A novel mounting for the auxiliary lamp 12 also is provided, comprising a relatively stationary contact 21 to engage the center terminal on the lamp base and a socket or holder 22, the spring element 23' of which is curved in the form of the letter U or C but is anchored to the headpiece by a screw 23. Also secured in position by the screw 23 is a stop including an arm 24 and a short pin or lug 25 projecting therefrom. The spring holder for the lamp is so biased that it tends to hold the lamp in an inclined position but is normally held in the position shown by the engagement of the lamp bulb with the stop 25. If, however, the bulb is broken, the spring 23' expands, thus tilting the lamp upwardly and laterally toward the stop and instantly breaking the engagement between the contact 21 and the center terminal of the lamp.

It should be observed that this stop engages the side of the lamp bulb directly opposite the filament and that it is interposed between the bulb and the wall of the lamp chamber so that any shadow of the stop is thrown against an opaque part of the headpiece and does not reduce the useful illumination of the lamp. The same construction can be used to support the main lamp 7, the pin 25, however, being made longer and extending radially and laterally with reference to the lamp filament in substantially the same relationship as the part 25 bears to the lamp 12 so that its shadow would be directed lengthwise of itself. It is not as desirable as the arrangement shown for the main lamp, however, because it would obstruct some of the rays coming from the reflector 8.

Referring more particularly to Figs. 5 and 10, it will be seen that the two conductors *a* and *b* in the cord 4 are separated after they enter the headpiece, the former being secured to the block 16 or to one of the leaf springs 15 secured to it, while the other is secured to a binding post 26 embedded in the material of the headpiece. From this post a conductor 27, also embedded in the back of the headpiece, runs to a middle terminal 28 of a selector switch which includes a shaft 30 extending through a thickened portion of the headpiece and equipped with a knob 31, Figs. 2 and 5, at the outside thereof. A revolving contact 32 is secured to the inner end of the shaft 30 and is adapted to engage either of two relatively stationary contacts 33 and 34. These two contacts are portions of metal strips other portions of which form the contacts 18 and 21, respectively, for the middle terminals of the two lamps 7 and 12. Another metal strip 35 connects the block 16 with the socket 22 for the auxiliary lamp 12.

It will be clear from an inspection of Fig. 10 that current from the battery 3 flows through the conductor *a*, springs 15, and socket 14 to the filament of the lamp 7, thence through the center terminal of said lamp to the contacts 18 and 33 and, assuming the switch blade 32 to be in engagement with the latter, the current then flows back through the elements 28, 27, 26 and the conductor *b* to the other side of the battery. If the switch is turned into engagement with the contact 34 to light the auxiliary lamp 12, then the current flows through the conductor *a*, metal strip 35, socket 22, filament of the lamp 12, the contacts 21, 34 and 32 to the switch terminal 28, and thence through the metal strip 27, post 26 and conductor *b*, back to the other side of the battery.

As best shown in Figs. 1, 2 and 3, the headpiece is equipped with a U-shaped spring clip 36, similar to those heretofore used, adapted to be hooked over a lamp holder of the conventional type with which a miner's hat or cap is customarily provided. This clip includes flanges overlapping the opposite edges of a relatively thin rearward extension 2' of the headpiece, and it is secured thereto by a bolt 37 projecting horizontally through said extension from one side to the other.

The circuit connections above described are of such a nature and are so positioned that any danger of them becoming accidentally short-circuited is negligible. It is desirable, however, to have contacts either exposed on the headpiece or readily accessible from outside of it for engaging the terminals of a charging rack or other apparatus by means of which the battery can be charged through the cord 4 without removing or dismantling any part of the entire lamp assembly. For this purpose the head of the bolt 17, Figs. 3, 5 and 10, by means of which the metal block 16 is secured in its operative position, is placed in an exposed location on the outside of the headpiece where it can be utilized as a charging terminal. The other terminal, however, must be located in a position where it will be inaccessible to the miner or to others who might tamper with the apparatus and create a short circuit with the resulting danger of initiating an explosion. According to the present invention this second charging terminal, indicated at 38 in Figs. 1 and 3, is located in that portion of the headpiece between the lamp chamber and the rearward surface covered by the clip 36, and a lock is provided to protect this contact. In the particular arrangement shown the lock comprises a barrel 40 composed chiefly of insulating material but provided with a metal flange or head 41 at its outer end. This barrel fits snugly into a socket provided for it in the back of the headpiece so that it can rotate around its own axis, and it is slotted to receive a key of the form shown at 42 in Fig. 11. The barrel is held in place by the inner plate of the clip 36, this plate bearing against the head 41 of the barrel and being slotted as shown at *c*, Fig. 4, to afford access to the slot in the barrel. A larger slot *d* in the outer flange of the clip affords access to the inner slot. Rotative movement of the barrel is limited in one direction by the engagement of a stop lug *e*, Figs. 6 and 7, formed on the barrel, with a stop or shoulder *f* on the material of the headpiece, and such movement in the opposite direction normally is prevented by a spring stop 43 located in a recess immediately in front of the clip 36 where it can drop into the end of the key slot in the barrel in the event that the barrel is rotated in a clockwise direction, Fig. 7, without the key being in it. If, however, the key is inserted in this slot, then it

projects to, or slightly beyond, the periphery of the flange 41 so that it moves this stop out of the way and permits the rotation of the barrel to continue. This arrangement thus affords very effective protection for the inside charging terminal and the lock is so disposed that it will not attract the attention of the average miner. In any event it can readily be made of such dimensions that the ordinary key would not operate it, and even such operation would not, of and by itself, create any trouble. The word "key" is herein used in its common or ordinary sense.

As above stated, the exposed charging terminal 17 is connected directly to the block 16 and thus to the conductor *a*, Fig. 10. The inside charging terminal 38 is secured to a knurled nut 44, Figs. 3 and 10, embedded in the headpiece, and a metal strip 45 connects this nut with the binding post 26 to which the other conductor *b* is secured. These connections are never disturbed in the normal use of the apparatus. Consequently, in order to charge the battery 3 it is merely necessary to connect a suitable source of charging potential to the two contacts 17 and 38.

Charging apparatus designed for this purpose is shown in Figs. 1 and 11. It includes a plate 46 secured by the key terminal or stud 42 and by a screw 47 to the face of a suitable support 48. Mounted immediately below this plate is a metal bracket 50 on the shelf of which a bowed spring 51 is secured. These two plates 50 and 46 are connected into a charging circuit, either in parallel or in series, depending upon the nature of that circuit.

In mounting the headpiece on this charging apparatus, the headpiece is inverted, as shown in dotted lines in Fig. 2, and is placed on the stationary key 42 in this position, after which it is swung in a clockwise direction, Fig. 2, until it is brought into its upright position. A lug 52, Fig. 11, on the plate 46 gages the initial position of the headpiece, while another lug 53 on the same plate gages its final position. Thus the key is first inserted in the lock and then the headpiece, instead of the key, is rotated around the shank of the key to operate the lock and bring the blade or lug of the key into engagement with the internal charging contact 38, as shown in Fig. 8. After the charging operation has been completed the headpiece may be removed by a reversal of the movements just described.

It will be understood by those skilled in this art that a charging rack is provided with a horizontal row of pairs of charging elements, such as those shown in Fig. 11, arranged in the same way, and usually in cooperative relationship to a shelf for supporting the batteries 3, so that a multiplicity of these miner's lamps may be charged simultaneously.

The arrangement shown in Fig. 11 is designed for the connection of the headpieces in parallel into the charging circuit. When a series circuit is used, the spring 51 is replaced by the form of spring shown in Figs. 12 and 14 at 54. This spring is so biased that when no headpiece is in engagement with it, it bears against the lug 53 of the plate 46 and thus short circuits this particular charging unit. When, however, a headpiece is placed in charging position, it depresses the spring 54, thus moving it away from the lug 53 and causing the current to pass through the charging circuit connections in the headpiece.

The parallel connected system lends itself readily to use in the so-called "self-service installations" in which the miner always keeps the same lamp and is charged with the duty of placing it in the charging rack properly when he leaves the mine and removing it therefrom when he goes to work again.

It is necessary to seal the bezel 5 against removal, and the present invention provides a novel means for accomplishing this object. As best shown in Figs. 1, 2 and 13, the bezel has a series of equally spaced sockets or depressions 55 molded into that portion of its peripheral surface adjacent to the main body of the headpiece. A lug 56, Figs. 1 and 2, is formed on the headpiece and a metal bushing 57, best shown in Fig. 13, is molded into this lug and is internally drilled and threaded to receive a locking screw 58. The end of this screw is adapted to extend into any one of the depressions 55 where it will positively lock the bezel against any material rotative movement relatively to the headpiece, and it is provided with a socket 60 at its opposite end adapted to receive the small end of a tool similar in nature to a screw driver but having an end portion of square, triangular, half round, or other cross-sectional form of an unusual shape. Also, the head of the screw is embedded in the material of the headpiece when it is in its locking position so that it is practically impossible for anyone not equipped with the proper tool to unlock the bezel.

The charging apparatus herein disclosed is not claimed specifically in this application but is so claimed in a continuation-in-part application, Serial No. 376,097, filed January 27, 1941.

While I have herein shown and described a preferred embodiment of my invention, it will be evident that various features of the invention may be embodied in other forms without departing from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

1. In a miner's lamp, the combination of a headpiece, a reflector in said headpiece, an electric lamp mounted in said headpiece in a centered position with reference to said reflector, said lamp including a bulb, circuit elements for supplying current to said bulb including a relatively stationary contact engaging one terminal of the bulb, and a spring actuated support for said bulb including substantially parallel leaf spring arms lying at approximately right angles to the axis of said lamp and forming a parallel motion device, a sleeve joining the upper ends of the arms and forming a support for the bulb, the spring actuated support being so biased as to urge said lamp outward axially to break the engagement between said contact and said terminal, and means engaging the lamp bulb and supporting it against movement due to said spring action, whereby upon breakage of the bulb, the engagement of the terminal with the contact will automatically be broken.

2. In a miner's lamp structure, the combination with a headpiece, an electric lamp mounted in said headpiece, a storage battery, and flexible conductors for leading current from said battery to said headpiece to supply said lamp, of means whereby said battery may be charged through said conductors, including a charging terminal inside said headpiece, a lock rotatably mounted in the rear portion of said headpiece for protecting said terminal from outside tampering, said lock having a key-hole exposed at the rear side of the headpiece, and key means

for rotating said lock to a position where the key contacts with said terminal.

3. In a miner's lamp structure, the combination with a headpiece, an electric lamp mounted in said headpiece, a storage battery, and flexible conductors for leading current from said battery to said headpiece to supply said lamp, of means whereby said battery may be charged through said conductors, including a charging terminal mounted in an exposed position on said headpiece and another charging terminal inside said headpiece, a lock rotatably mounted in the rear portion of said headpiece for protecting said terminal from outside tampering and having its outer end exposed at the rear surface of the headpiece, and key means for rotating said lock to a position where the key contacts with said terminal.

4. In a miner's lamp structure, the combination with a headpiece, an electric lamp mounted in said headpiece, a storage battery, and flexible conductors for leading current from said battery to said headpiece to supply said lamp, of means whereby said battery may be charged through said conductors, including a charging terminal inside said headpiece, and a lock mounted in said headpiece and protecting said terminal from outside tampering, said lock including a barrel mounted in said headpiece for rotative movement, said barrel being slotted to receive a key and being so related to said charging terminal as to hold the key out of engagement with said terminal during a part of its rotative movement but permitting such contact during another part of said movement.

5. In a miner's lamp structure, the combination with a headpiece, an electric lamp mounted in said headpiece, a storage battery, and flexible conductors for leading current from said battery to said headpiece to supply said lamp, of means whereby said battery may be charged through said conductors, including a charging terminal inside said headpiece, and a lock mounted in said headpiece and protecting said terminal from outside tampering, said lock including a barrel mounted in said headpiece for rotative movement, said barrel being slotted to receive a key and said terminal being mounted at one side of said barrel where it is normally protected thereby but is adapted to be engaged by the blade of a key fitted into said barrel.

6. In a miner's lamp structure, the combination with a headpiece, an electric lamp mounted in said headpiece, a storage battery, and flexible conductors for leading current from said battery to said headpiece to supply said lamp, of means whereby said battery may be charged through said conductors, including a charging terminal inside said headpiece, and a lock mounted in said headpiece and protecting said terminal from outside tampering, said lock including a barrel mounted in said headpiece for rotative movement, said barrel being slotted to receive a key and said terminal being mounted at one side of said barrel where it is normally protected thereby but is adapted to be engaged by the blade of a key fitted into said barrel, and stops limiting the rotative movement of said barrel in both directions, one of said stops being positioned for release by said key.

7. In a miner's lamp structure, the combination with a headpiece, an electric lamp mounted in said headpiece, a storage battery, and flexible conductors for leading current from said battery to said headpiece to supply said lamp, of means whereby said battery may be charged through said conductors, including a charging terminal inside said headpiece, and a lock mounted in said headpiece and protecting said terminal from outside tampering, said lock including a barrel mounted in said headpiece for rotative movement, said barrel having a key slot opening at the back of the headpiece, a clip rigid with said headpiece and positioned at the back thereof and adapted to fasten said headpiece to a cap, or the like, said clip partially covering the end of said barrel and being provided with an aperture through which said key can be inserted in said slot.

8. In a miner's lamp structure, the combination with a headpiece, an electric lamp mounted in said headpiece, a storage battery, and flexible conductors for leading current from said battery to said headpiece to supply said lamp, of means whereby said battery may be charged through said conductors, including a charging terminal inside said headpiece, and an insulating lock rotatably mounted in said headpiece for protecting the charging terminal from outside tampering, said lock being slotted to removably receive a metallic key having a shank and a blade and to support said key for rotation in the headpiece, the charging terminal being located adjacent to the lock in position to be contacted by the key blade during the relative rotation of the key in the headpiece to connect said charging terminal into a circuit.

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