March 2, 1943. G. WHEAT 2,312,614

MINER'S LAMP

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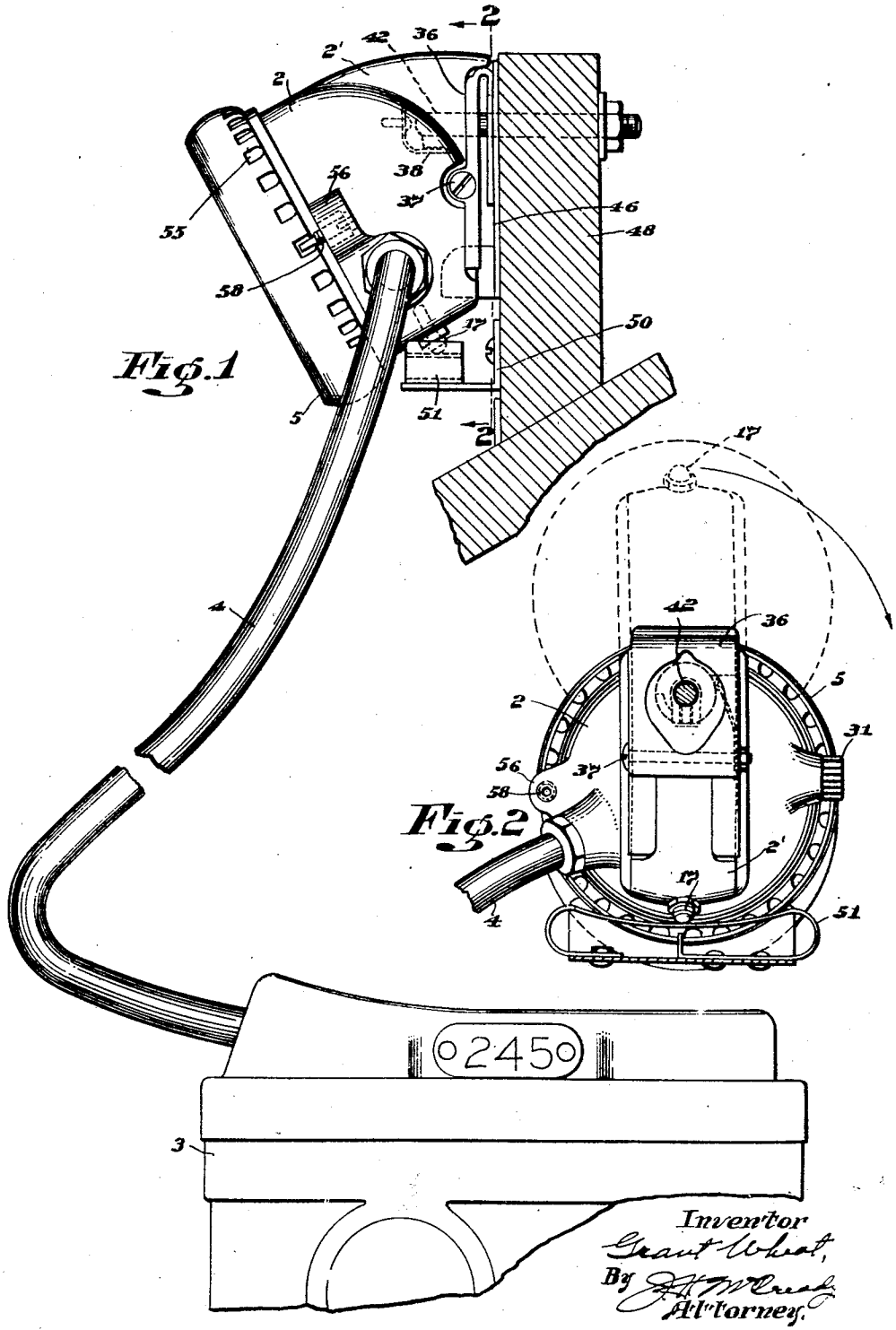


Fig. 1

Fig. 2

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Fig. 3

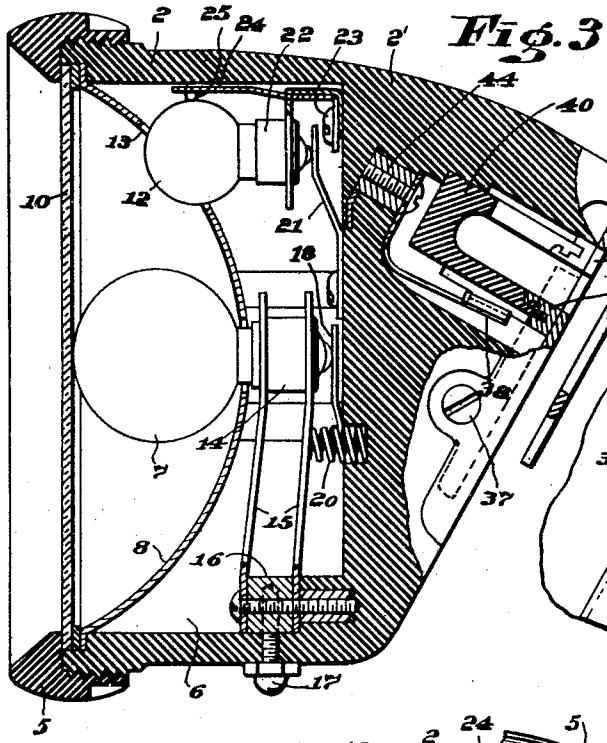


Fig. 4

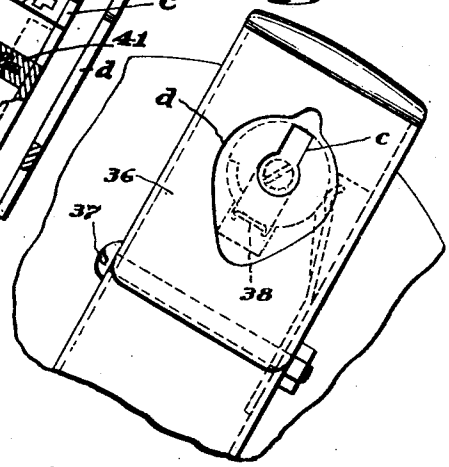
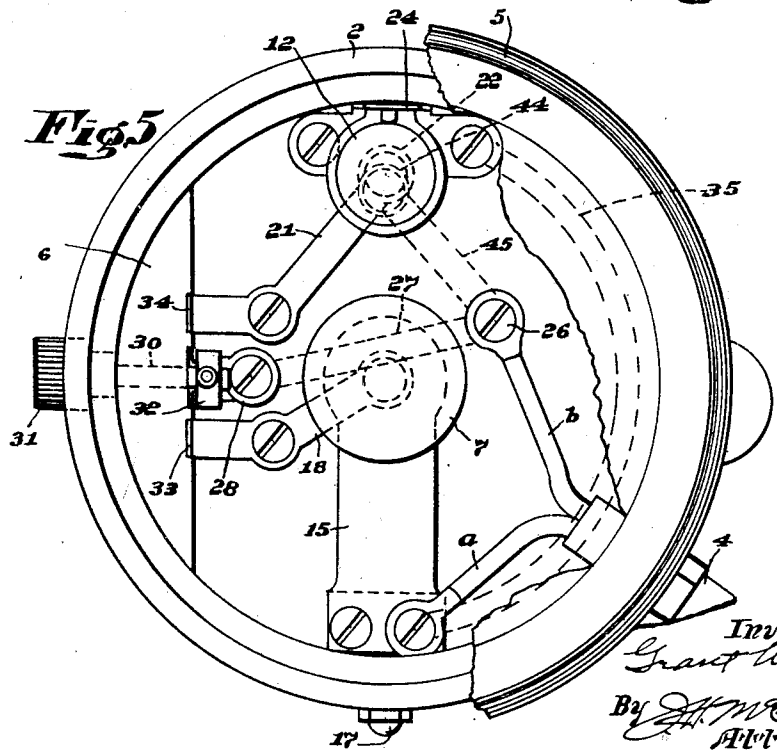


Fig. 5



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Fig. 6

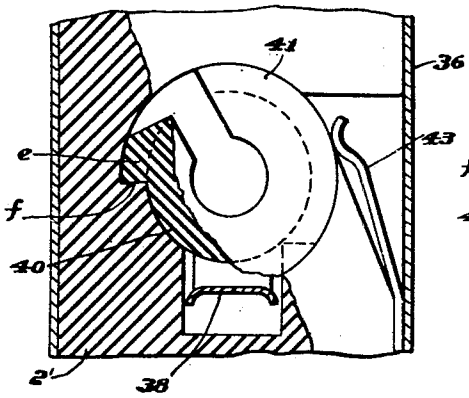


Fig. 7

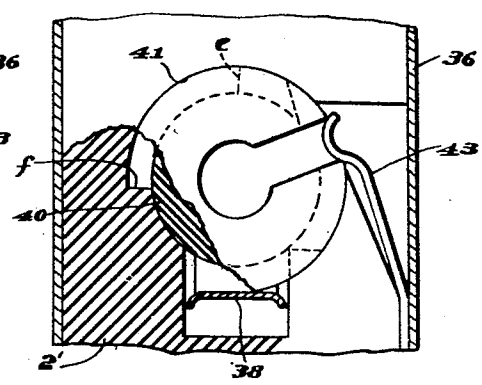


Fig. 8

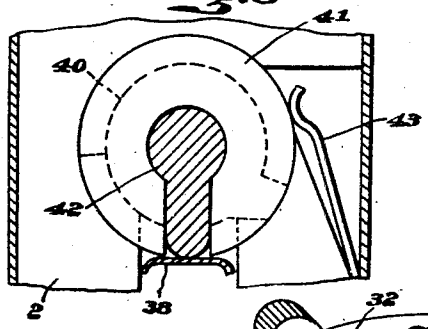


Fig. 9

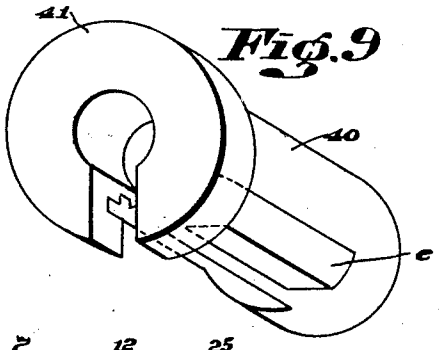
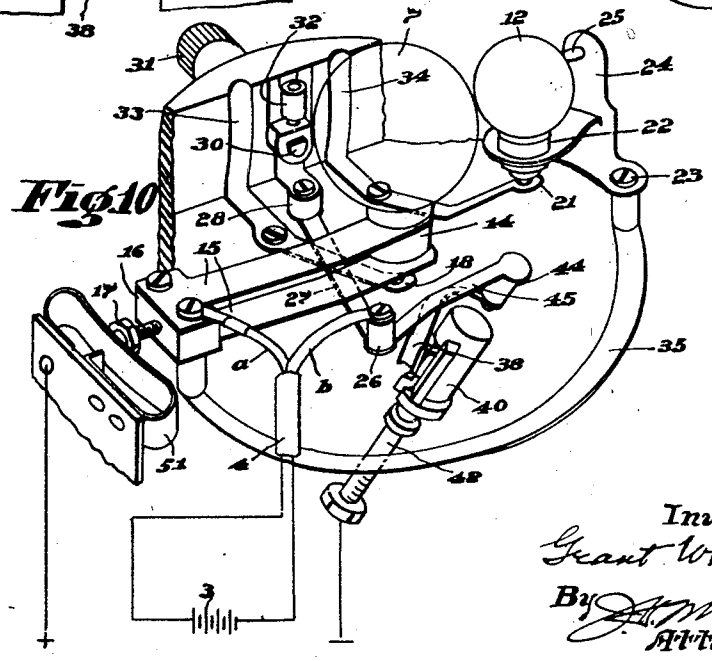


Fig. 10



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Fig. 11

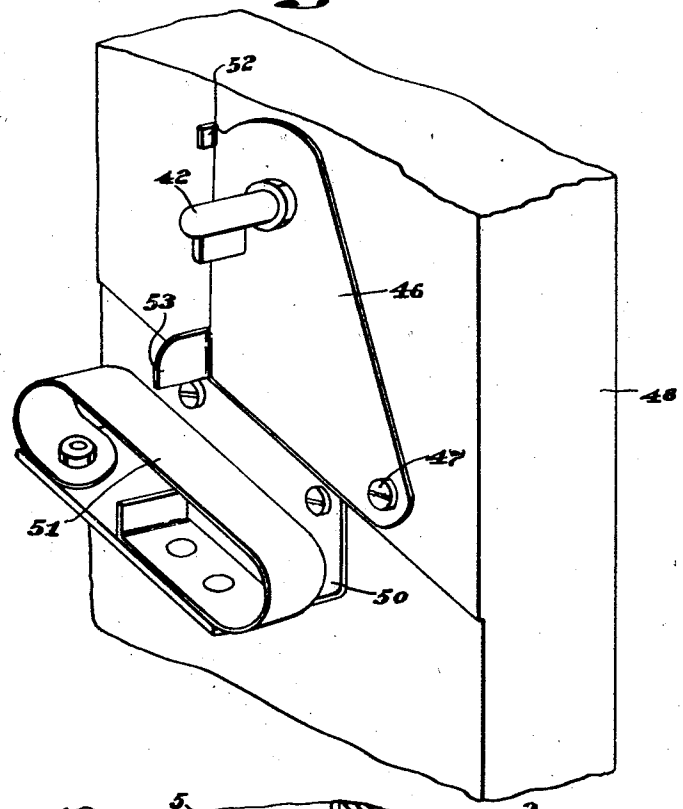


Fig. 12

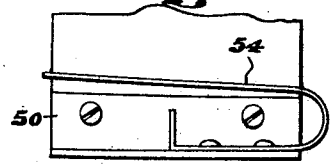
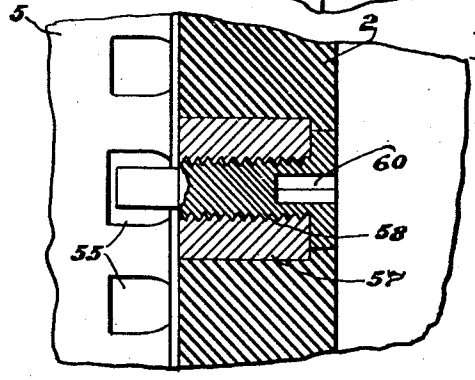


Fig. 13



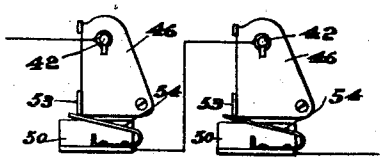


Fig. 14

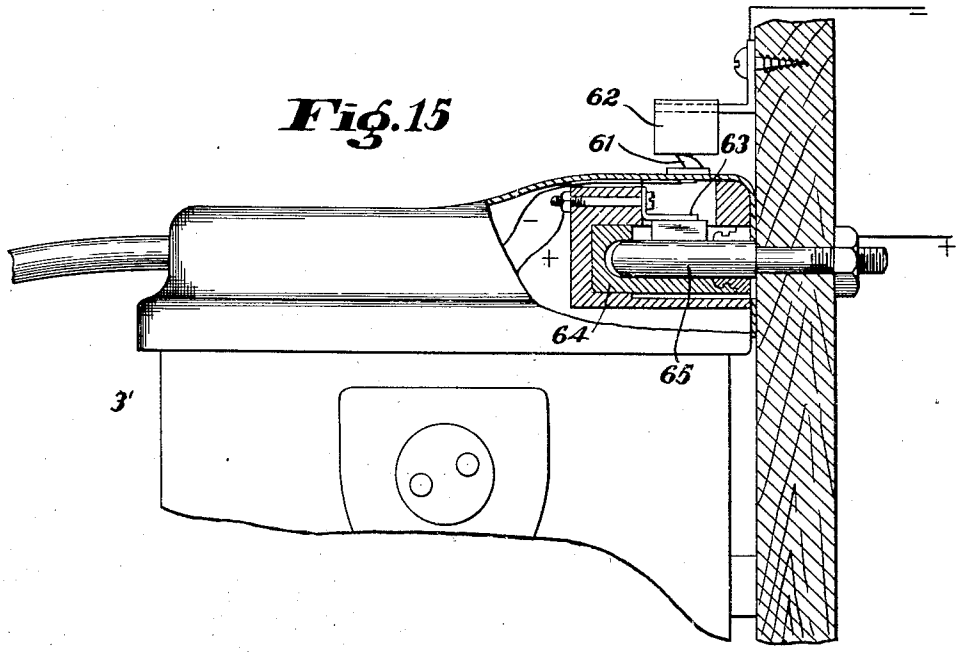
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MINER'S LAMP

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Fig. 15



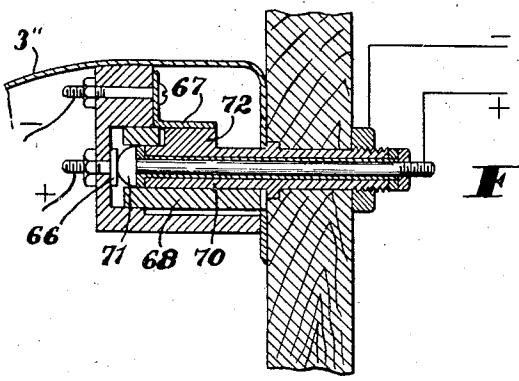
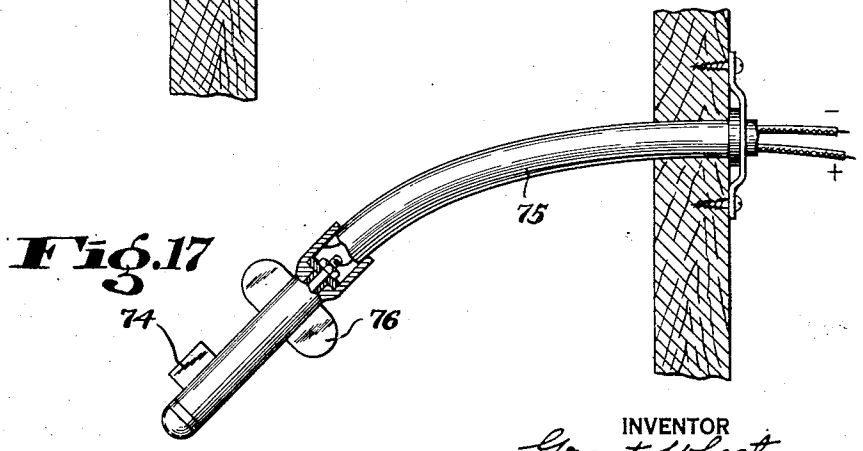


Fig. 16

Fig. 17



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Patented Mar. 2, 1943 2,312,614

UNITED STATES PATENT OFFICE

2,312,614

MINER'S LAMP

Grant Wheat, Marlboro, Mass., assignor to Koehler Manufacturing Company, Marlboro, Mass., a corporation of Massachusetts

Application January 27, 1941, Serial No. 376,097

13 Claims. (Cl. 173—356)

In my copending application Ser. No. 315,135, filed January 23, 1940 (of which the present application is a continuation in part) I have disclosed a lamp structure of the type commonly designated as a miner's lamp or cap lamp. Such a structure comprises three units: first, a headpiece in which one or more electric lamps are mounted, the head piece being equipped with means for fastening it to a hat, cap, or some other part of the clothing; second, a storage battery which customarily is slung from the miner's belt; and third, a flexible cord containing conductors for carrying current from the battery to the headpiece.

In the lamp structure described and claimed in said application, the charging terminals for the battery are mounted on the headpiece, and a locking mechanism is provided to protect one of said terminals from tampering, with the resultant liability of creating a short circuit or a spark which might ignite an explosive atmosphere. The present invention aims to devise an apparatus for use in charging batteries of mine lamps of this general character, which will be convenient to use with headpieces equipped with locking means for protecting one or more terminals of the miner's lamp and which preferably will be adapted for self-servicing.

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;

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;

Figs. 15 and 16 are fragmentary views, partly in side elevation and partly in vertical section, illustrating additional embodiments of the invention; and

Fig. 17 is a similar view showing another variation which the invention may take.

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 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 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 supporting the holder 22 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 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, Fig. 10, 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. This key is of a common form and includes a shaft or stem with a lug or blade extending laterally therefrom. 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. Rota-

tive 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.

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 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 gauges the initial position of the headpiece, while another lug 53 on the same plate gauges its final position. Thus the key is first inserted in the lock and then the headpiece, instead of the key, is rotated around the shaft of the key to operate the lock and to bring the blade or laterally extending 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 and 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.

In some cases it may be preferable to mount the charging contacts on one of the other units of the miner's lamp, and Fig. 15 shows an arrangement in which these contacts and the lock protecting one of them is mounted on the battery. Here one of the charging contacts 61 is exposed at the ouetr surface of the battery where it may conveniently engage a spring terminal 62 of the charging apparatus. The other charging contact 63 is protected by the rotary insulating barrel 64 of the lock mechanism in essentially the same manner as in the construction above described. The charging apparatus includes a key terminal 65 essentially like the terminals 42 of Figs. 11 and 14, and these two terminals 62 and 65 are connected in the charging circuit in any usual or convenient manner. The battery is placed in its charging position by initially presenting it thereto in approximately an inverted position and then swinging the battery down into an upright position, as shown in Fig. 15, this motion resulting in revolving the barrel and bringing the contact 63 into engagement with the lub or nib of the key. During the removal of the battery from the charging apparatus at the completion of the charging operation, the battery is rotated into its initial position and then withdrawn from the key, and this operation revolves the barrel 64 into its normal or locked position where it protects the contact 63 from outside tampering, in essentially the same manner as in the construction above described.

Also, if desired, both charging contacts may be mounted internally of the unit which carries them, and the key of the charging circuit may be constructed to engage both of these internal contacts. Such a construction is shown in Fig. 16, the two charging terminals being illustrated at 66 and 67, respectively, the insulating barrel of the lock being shown at 68, and the key at 70. This key is provided with two contacts numbered 71 and 72 which are adapted to engage the respective contacts 66 and 67 in the unit 3''. This unit is placed on and removed from the charging key in the same manner as is the headpiece shown in Fig. 1.

For some purposes it may be preferable to mount the key terminal of the charging circuit so that it can be moved around through a considerable range, and such a construction is shown in Fig. 17. Here the key is of the double contact type including terminals 73 and 74, respectively, and it is mounted on the free end of a flexible cable 75 provided with independent conductors running to the two elements 73 and 74. These conductors are, of course, connected into a charging circuit. Preferably, also, the key is equipped with a handle or thumb pieces 76 to facilitate the use of it in operating a lock and engaging its ter-

minals with the charging contacts of the battery or other unit of the miner's lamp structure.

While I have herein shown and described preferred embodiments of my invention, it will be understood that the invention is not limited to embodiment in the particular forms shown.

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

1. A charging apparatus for miners' lamps of the type comprising units consisting of a lamp structure, a storage battery, conductors electrically connecting said units, and a charging contact in one of said units protected by a lock, said apparatus including a charging terminal in the form of a key adapted to fit into a key-hole slot provided in the last mentioned unit and to operate said lock, another charging terminal positioned adjacent to said key for engagement with a second charging contact on said lamp structure, a charging circuit in which said key and said terminal are connected, and means supporting said key and said terminal in cooperative relationship to each other on said apparatus and a charging circuit into which said key is connected.

2. A charging apparatus for miners' lamps of the type including a headpiece, a storage battery and conductors connecting said headpiece and said battery, said apparatus including a charging terminal in the form of a key adapted to fit into a key-hole provided in a unit of one of said miners' lamps and to operate a lock mounted therein through relative movement of said unit and said terminal to connect said charging terminal electrically with a charging contact in said unit, and gauging means on said apparatus cooperating with said unit to determine the position of said unit in said apparatus for the charging operation.

3. A charging apparatus for miners' lamps of the type including a headpiece, a storage battery and conductors connecting said headpiece and said battery, said apparatus including a charging terminal in the form of a key adapted to fit into a key-hole provided in a unit of one of said miners' lamps and to operate a lock mounted therein through movement of said unit relatively to said terminal to connect said charging terminal electrically with a charging contact in said unit, gauging elements on said apparatus determining both the initial position of the unit on which it must be positioned relatively to said terminal and also its final or charging position relatively thereto.

4. A charging apparatus for miners' lamps of the type including a headpiece, a storage battery, and conductors connecting said headpiece and said storage battery, said apparatus including a charging terminal in the form of a key adapted to fit into a key-hole slot provided in a unit of one of said miners' lamps said key having a body portion and a blade, a leaf spring charging terminal mounted adjacent to said key for engagement with a charging contact on said unit while said key terminal is positioned in said key-hole slot, and a charging circuit in which said key and said leaf spring terminal are connected.

5. A charging apparatus according to preceding claim 1, including means for supporting said keyshaped terminal in a fixed position, said second charging terminal being mounted for yielding engagement with the charging contact on the lamp structure with which it cooperates when said unit is in charging position.

6. A charging apparatus for miners' lamps of the type including a headpiece, a storage battery and conductors connecting said headpiece and said battery, said apparatus including two charging terminals adapted to engage charging contacts on a unit of a miner's lamp, a charging circuit in which said terminals are connected, one of said terminals being in the form of a key adapted to fit into a key-hole in said unit, and a lug separate from but electrically connected with said key, the other of said charging terminals comprising a leaf spring normally engaging said lug but arranged to be moved out of contact with the lug by said unit when the latter is placed in charging relationship to said key.

7. A charging apparatus for miners' lamps of the type including a headpiece, a storage battery and conductors connecting said headpiece and said battery, said apparatus including two charging terminals adapted to engage charging contacts on a unit of a miner's lamp, a charging circuit in which said terminals are connected, one of said terminals being in the form of a key adapted to fit into a key-hole in said unit, and the other being in the form of a leaf spring, means operatively supporting said terminals in cooperative relationship to each other, and gauging means for positioning said unit in charging relationship to both of said terminals.

8. A charging apparatus for miners' lamps of the type including a headpiece, a storage battery and conductors connecting said headpiece and said battery, said apparatus including two charging terminals adapted to engage charging contacts on a unit of a miner's lamp, in which one of said contacts is protected by a lock, a charging circuit in which said terminals are connected, one of said terminals being in the form of a key adapted to operate said lock, said key being mounted on a flexible cable affording a substantial range of movement of the key and containing a wire for conducting current to the key.

9. A charging apparatus for miners' lamps of the type including a headpiece, a storage battery and conductors connecting said headpiece and said battery, said apparatus including two charging terminals adapted to engage charging contacts on a unit of a miner's lamp, in which one of said contacts is protected by a lock, a charging circuit in which said terminals are connected, one of said terminals being in the form of a key adapted to operate said lock, said key including the two aforesaid terminals insulated from each other and adapted to engage said respective contacts of said unit when the lock has been operated.

10. The combination with a miner's lamp structure of the type including a storage battery, charging contacts connected to said battery and mounted on said lamp structure, and a lock protecting one of said contacts, of a charging apparatus therefor comprising two charging terminals adapted to engage the charging contacts on said lamp structure, one of said terminals being in the form of a key adapted to operate said lock, and a charging circuit in which said charging terminals are connected.

11. 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 in said headpiece, and a lock mounted in said headpiece and protecting said terminal from outside tampering, in combination with a charging

apparatus including a key for operating said lock.

12. 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 in said headpiece, and a lock mounted in said headpiece and protecting said terminal from outside tampering, in combination with a charging apparatus including a key for operating said lock, said key forming a part of the charging circuit.

13. 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 in said headpiece, and a lock mounted in said headpiece and protecting said terminal from outside tampering, in combination with a charging apparatus including a key for operating said lock, said key forming one terminal of the charging apparatus, and a spring contact forming another terminal of said charging apparatus and adapted to engage a terminal exposed on the headpiece.

GRANT WHEAT.

CERTIFICATE OF CORRECTION.

Patent No. 2,312,614. March 2, 1943.

GRANT WHEAT.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, lines 23 and 24, strike out "and a charging circuit into which said key is connected"; page 5, first column, line 1, after the word "lock" and before the period insert --and a charging circuit into which said key is connected--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 13th day of April, A. D. 1943.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)

CERTIFICATE OF CORRECTION.

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