June 12, 1951 A. O. ROBERTS 2,556,506

ACCUMULATOR LAMP AND CHARGING DEVICE THEREFOR HAVING A MAGNETICALLY OPERATED SWITCH TO OPEN THE LAMP CIRCUIT AND ESTABLISH THE CHARGING CIRCUIT

Filed Oct. 3, 1945 3 Sheets-Sheet 1

FIG. 1.

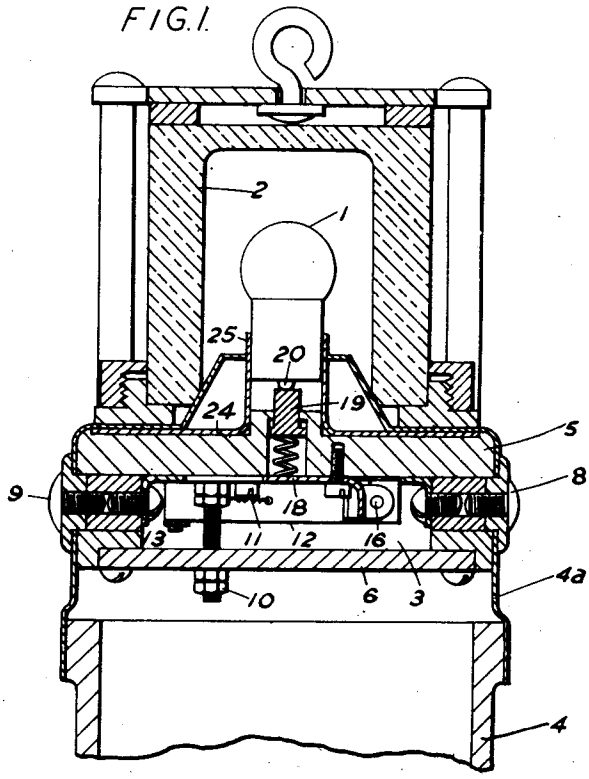
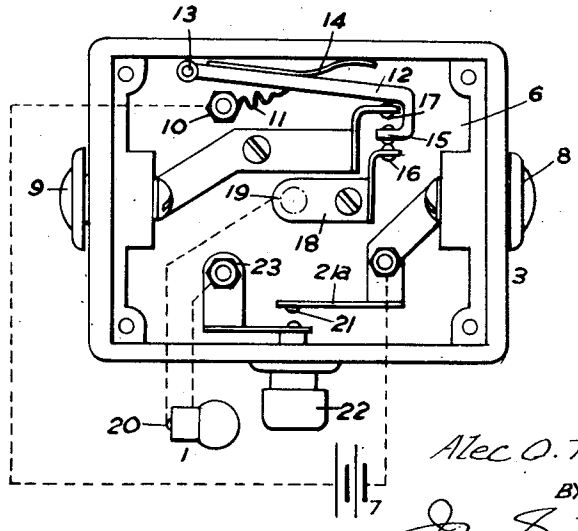


FIG. 2.



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Filed Oct. 3, 1945 3 Sheets-Sheet 2

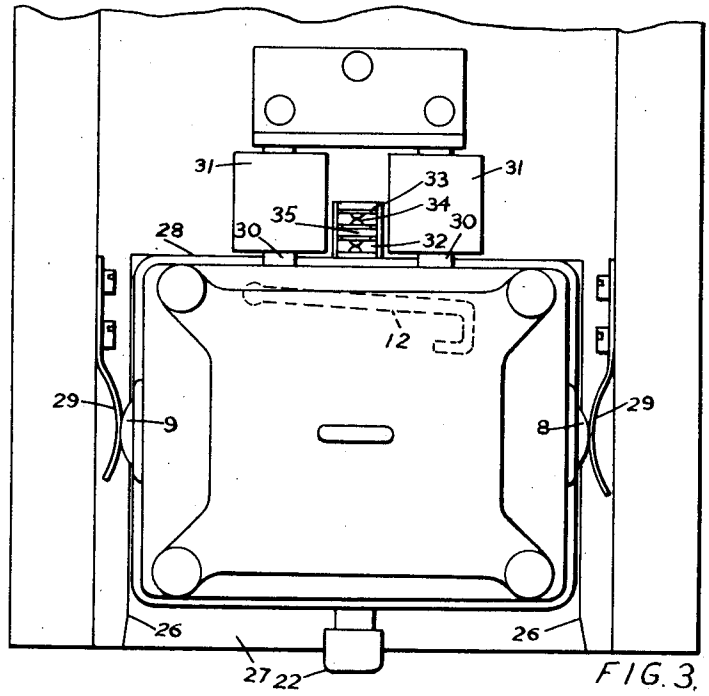
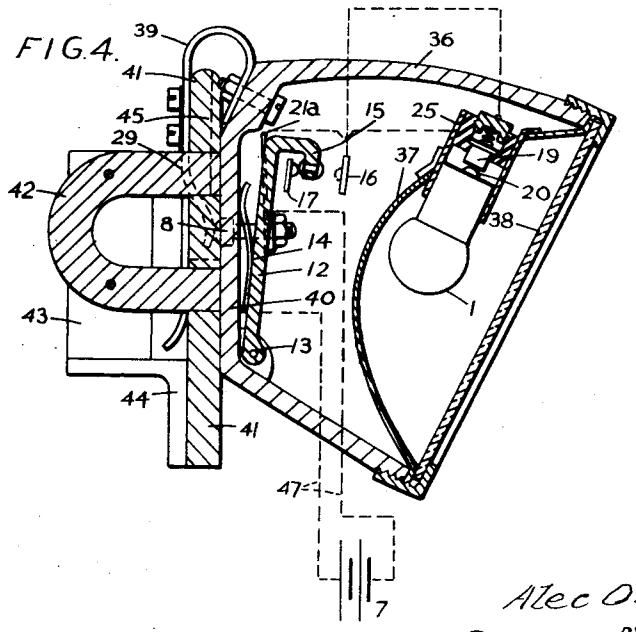


FIG. 3.

FIG. 4.



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Filed Oct. 3, 1945 3 Sheets-Sheet 3

FIG. 5.

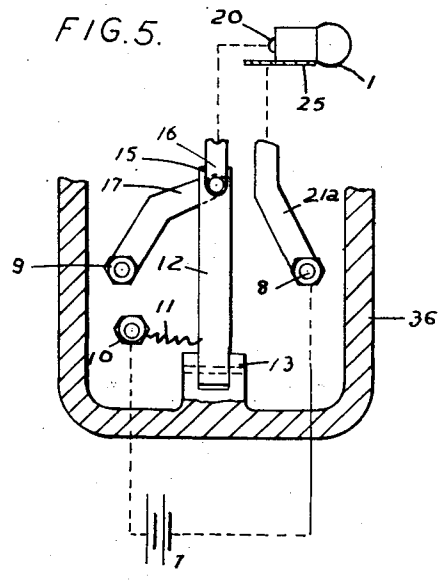
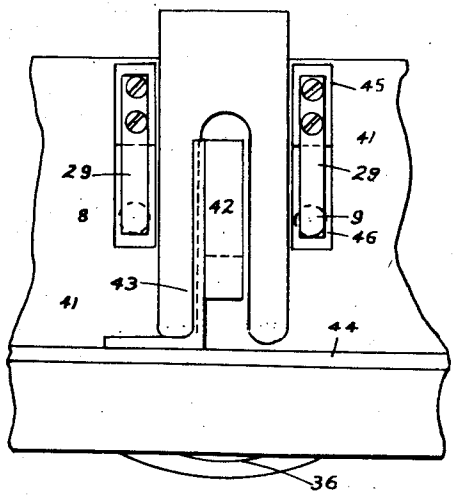


FIG. 6.



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2,556,506

ACCUMULATOR LAMP AND CHARGING DEVICE THEREFOR HAVING A MAGNETICALLY OPERATED SWITCH TO OPEN THE LAMP CIRCUIT AND ESTABLISH THE CHARGING CIRCUIT

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8 Claims. (Cl. 240—11.3)

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This invention relates to accumulator lamps and charging devices therefor, such as are used by miners.

Miners' lamps comprise hand lamps, consisting of an accumulator with lamp as a single unit, or cap lamps representing a combined unit and consisting of a lamp adapted to be fitted to the head and connected to an accumulator by a flexible conductor. An essential feature of both types of lamp is that the miner should not be able, either accidentally or intentionally, to complete a circuit including the accumulator outside the lamp or accumulator case. For convenience in charging the accumulators, the lamps or accumulator cases have been provided with two terminals adapted for connection to terminals of a charging circuit at the charging station. In this case, one at least of the terminals must be disconnected from the accumulator inside the lamp or accumulator case while the lamp is in the hands of the miner. The accumulator then has to be connected to the charging circuit by an operative at the charging station who is provided with a key or other means, by which the two terminals are made live, or connected with the accumulator.

The object of the invention is an accumulator lamp and a charging device at which the miners themselves can directly place the accumulator lamps, on a charging circuit, and from which they can themselves directly remove the lamp for use in the mine.

In accordance with the present invention a miner's accumulator lamp and charging station therefor comprises in combination a pair of exposed terminals on the lamp of which one is connected to one pole of the accumulator while the other is normally dead, a magnetic switch in the lamps adapted when operated to connect the normally dead terminal to the other pole of the accumulator, supporting means at the charging station adapted to support the lamp in a predetermined position, a pair of terminals at the charging station connected in the charging supply circuit adapted to make contact with the pair of exposed terminals when the lamp is placed in the predetermined position, a magnet at the charging station adapted to operate the magnetic switch when the lamp is placed in the predetermined position, whereby the act of placing the lamp in the predetermined position at the charging station connects the pair of exposed terminals to the charging supply and completes connection to the accumulator.

The magnetic switch may be a two-way switch adapted in normal position to connect a pole of

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the accumulator to the bulb and in the operated position to connect it to the normally dead terminal and disconnect it from the bulb.

The magnet at the charging station may be an electromagnet and characterised by contacts in the circuit of the magnet which are normally open and are closed by the lamp when in the predetermined position.

Further a pair of contacts may be arranged in the charging supply circuit, which are normally open and are closed by the lamp when in the predetermined position.

In order that the invention may be more clearly understood reference will now be made to the accompanying drawings which show by way of example two embodiments thereof.

In the drawings:

Figure 1 is a central sectional elevation of a miner's lamp comprising a magnetic switch and exposed terminals according to the invention, and Figure 2 is a plan view from below with the cover removed of the switch box containing the magnetic switch and carrying the exposed terminals, the base element of which is removed for sake of clarity;

Figure 3 is a plan view of a charging station and a lamp of the kind shown in Figure 1, also shown in plan view, in a position at the charging station so that the accumulator can be charged from the supply circuit of the station.

Figure 4 shows a miner's cap lamp in sectional elevation with a magnetic switch and exposed terminals according to the invention, the lamp being shown supported at a charging station for charging the accumulator connected with the cap lamp; and

Figure 5 is a fragmentary elevation showing the armature and circuits, and

Figure 6 is a rear elevation more clearly showing the manner of supporting the lamp in predetermined position at the charging station.

Referring now to the drawings. In Figures 1 and 2 is shown a miner's hand lamp of known general construction, with bulb 1 within a glass cover 2, supported on a switch box 3 which in turn is supported in the metal top 4a of the accumulator case 4. The switch box has a base 5 with side walls of insulating material, on which all the parts are mounted. A cover 6 protects the parts in the box from fumes from the accumulator. In Figure 2, dotted lines indicate diagrammatically connections to the accumulator 7 and the bulb 1.

Two terminals 8 and 9 on the outside of the box pass through the sides of the box. Terminal 8 is connected to one terminal of the ac-

cumulator; the other terminal of the accumulator is connected to a post 10 from which a flexible connection 11 is made to the armature 12 of the magnetic switch. The armature 12 is a hinged element being pivoted at 13 and a spring 14 keeps it in the normal position shown, when the switch is not operated. The magnetic switch is a two-way switch and the armature 12 carries a contact member 15 which, in normal position, makes contact with a contact 16 and, in operated position with a contact 17. The contact 17 is connected to the terminal 9 and consequently when the armature is in operated position, the two terminals of the accumulator 7 are connected with the terminals 8 and 9; terminal 9, however, is dead except when the switch is operated.

Contact 16 is connected through the tag 18 and spring pressed plunger 19 with the center tip contact 20 of the bulb 1. Terminal 8 is connected to one contact 21 of a press-button switch 22, of which the other contact is connected to a contact stud 23, which makes contact with the flange 24 of the bulb holder 25 and therefore with the other terminal of the bulb. The switch 22 is of the type which can be locked in "on" position.

With the armature 12 of the magnetic switch in normal position shown, current from the accumulator 7 passes through arm 21*a* to the contact 21 and, assuming switch 22 closed, to contact stud 23, bulb holder 25, through the bulb to contact 20, through plunger 19, tag 18, contacts 16 and 15, armature 12, connection 11 to post 10 and to the other side of the accumulator. When the magnetic switch is operated, this circuit is broken at contacts 15 and 16 and the accumulator is connected to the terminals 8 and 9.

In Figure 3 is shown the lamp in position at the charging station, the operated position of the armature 12 being shown in chain lines. The charging station has a recess with two side walls 26 and a base 27, into which the lamp is slid until it comes into predetermined position against a back wall 28. Two spring contact members 29, fixed on the side walls make contact with the two terminals 8 and 9 when the lamp is slid into its predetermined position. The contact members 29 are connected to the charging supply, and therefore the terminals 8 and 9 are connected to the charging supply by the action of sliding the lamp into place.

A magnet with poles 30 is fixed on the back wall 28, so that the poles 30 come against the back wall of the switch box, and opposite the armature 12. Thus the action of sliding the lamp into predetermined position brings the armature 12 into position to be operated by the magnet and close contacts 15 and 17 to connect terminal 9 with the accumulator. The accumulator then is connected with the charging supply, while the bulb circuit being broken, the higher voltage of the supply is not applied to the lamp.

The poles 30 may be poles of a permanent magnet, or they may be poles of the electromagnet shown, with coils 31. In the latter case the circuit of the magnet coils may be through a pair of contacts 32 fixed in a recess 33 in the back wall 28. These contacts are normally open, but are closed by the back wall of the lamp when this is slid in place. Thereby the magnet is energized only when the lamp is in place.

If it be desired that the contact members be not both live, when the lamp is not in place, a second pair of contacts 34 may be provided in the charging supply circuit. These may be closed also when the lamp is slid into place through the contact members of the contacts 32 and the insulating

distance piece 35. The weight of the lamp with its accumulator is sufficient to keep it upright against the spring pressure of the contact members. By such construction of lamp and charging station when the lamp or accumulator is removed from the charging station, the fact that the lamp is alight (or, when a hand switch is included in the circuit, can be lit by closing the switch), is an indication that the exposed terminal is dead. This prevents use of the lamp should the exposed terminal remain alive as a result of the magnetic switch failing to return to normal position. Also if the lamp is alight when the accumulator is put on charge, the fact that it goes out is an indication that the accumulator is properly in place.

When the invention is applied to a cap lamp with separate accumulator, the magnetic switch may be contained in the accumulator case and the exposed terminals on the case. Alternatively the magnetic switch may be in the case of the lamp and the exposed terminals on the back plate of the case, connected, with the switch interposed, to the accumulator through the flexible cable. Cap lamps are customarily provided with a spring clip attached to the back plate, whereby they can be clipped on to a bar at the charging station. The bar is then provided with charging terminals which are brought into contact with the exposed terminals of the lamp by the action of clipping the lamp on the bar. At the same time the magnetic switch is operated by a magnet fixed on or below the bar.

Figures 4, 5 and 6 show the invention applied to a miner's cap lamp, of which 36 is the casing, 37 the reflector and 38 the front glass. The lamp is provided with a spring clip 39, and a magnet armature 12, is pivoted at 13 to the casing, so as to be close to the back wall 40 of the casing and is normally urged against contact 16 by spring 14. The two external contacts 8 and 9, pass through the back wall 40.

With the armature in the position shown current from the accumulator 7 passes through terminal 8 to the bulb holder 25, through the bulb to contact 20, through plunger 19 to contact 16, armature 12 (flexible connection 11 and post 10 not shown) to the other side of the accumulator. When the magnetic switch is operated this circuit is broken, the armature engages contact 17 which is connected to other terminal 9 (not shown) of the accumulator, thus the two terminals of the accumulator 7 are connected with the terminals 8 and 9.

The lamp is shown in place at the charging station, where it is adapted to be clipped over a bar 41 of insulating material. A magnet 42, shown as a permanent magnet is supported on bracket 43 and angle piece 44, and its pole pieces pass through holes in the bar 41 so that they abut against the back wall 40 of the casing, in position to attract the armature 12. Slots 45 in the bar 41 receive the protruding terminals 8 and 9 to allow the back wall 40 to lie close against the bar and to the magnet pole pieces. Spring contact pieces 29 connected to the charging supply are suitably fixed to the bar 41 and their ends pass through holes 46 in the bar so that the terminals 8 and 9 make contact with them when the lamp is in place on the bar. Simultaneously the armature 12 is attracted to connect the terminal 9 to the accumulator, and thus connect the accumulator to the charging suply, as in the case of the lamp of Figures 1, 2 and 3. In the case of a cap lamp, the accumulator 7 is connected to the lamp

by a flexible conductor 47 as shown diagrammatically in Figure 4.

Alternatively, in the case of a cap lamp, the magnetic switch and the exposed terminals may be in the accumulator casing. In this case the magnetic switch and exposed terminals may be arranged in the casing as shown in Figures 1, 2 and 3, the lamp being connected by flexible conductor to contact pieces 18 and 23 instead of being mounted on the accumulator casing.

The present invention comprises also the switch box constructed and operating as herein described for employment in either a hand lamp or a cap lamp.

By devising a charging station and miner's lamps in accordance with the present invention it is possible for a miner to himself put his lamp on charge in predetermined position at a charging station and can himself remove it for use in the mine.

Moreover a miner's lamp constructed as herein described has the advantage that no holes or external moving parts, which can get blocked up with coal dust, are required for the charging device.

I claim:

1. In a miner's electric accumulator lamp unit and charging station therefor, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals on said casing in fixed relation thereto and to each other, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, a pair of charging contacts at said charging station located in fixed relation thereto so as to be engageable by said exposed terminals on the lamp unit, a magnet at said charging station located in fixed relation with respect to said charging contacts so as to be located in co-operative positional relation to said magnetic member to attract said member against the action of its retaining means to automatically break the lighting circuit and complete the charging circuit when the lamp unit is placed in charging position with the exposed terminals in contact with said charging contacts, and means for locating the lamp unit in said charging position.

2. In a miner's electric accumulator lamp unit and charging station therefor, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals on said casing in fixed relation thereto and to each other, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, a pair of resilient charging contacts at said charging station located in fixed relation thereto so as to be engageable by said exposed terminals on the lamp unit by a bodily sliding movement of the lamp unit relative to the charging station, a magnet at said charging station located in fixed relation with respect to said charging contacts so as to be located in co-operative positional relation to said magnetic member to attract said member against the action of its retaining means to automatically break the lighting circuit and complete the charging circuit when the lamp unit is slid into charging position with the exposed terminals in contact with said charging contacts, and means for guiding the lamp unit into and locating it in said charging position.

3. In a miner's electric accumulator lamp unit and charging station therefor, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals on said casing in fixed relation thereto and to each other, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, side walls and a rear wall at said charging station forming lamp unit guiding and locating means, a pair of resilient charging contacts fixed to said side walls so as to be engaged by said exposed terminals on the lamp unit when the lamp unit is slid bodily into charging position between said side walls, a magnet behind said rear wall and fixed relative thereto so as to be located in co-operative positional relation to said magnetic member to attract said member against the action of its retaining means to automatically break the lighting circuit and complete the charging circuit when the lamp unit is slid into said charging position.

4. In a miner's electric accumulator lamp unit and charging station therefor, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals on said casing in fixed relation thereto and to each other, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, a pair of charging contacts at said charging station located in fixed relation thereto so as to be engageable by said exposed terminals on the lamp unit, an electro-magnet at said charging station located in fixed relation with respect to said charging contacts so as to be located in co-operative positional relation to said magnetic member to attract said member against the action of its retaining means to automatically break the lighting circuit and complete the charging circuit when the lamp unit is placed in charging position with the exposed terminals in contact with said charging contacts, means for locating the lamp unit in said charging position, an energising circuit for said electro-magnet, and con-

tacts, in said energising circuit said last mentioned contacts being normally open and arranged to be closed by the lamp unit when in said charging position.

5. In a miner's electric accumulator lamp unit and charging station therefor, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals on said casing in fixed relation thereto and to each other, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, a pair of resilient charging contacts at said charging station located in fixed relation thereto so as to be engageable by said exposed terminals on the lamp unit by a bodily sliding movement of the lamp unit relative to the charging station, an electro-magnet at said charging station located in fixed relation with respect to said charging contacts so as to be located in co-operative positional relation to said magnetic member to attract said member against the action of its retaining means to automatically break the lighting circuit and complete the charging circuit when the lamp unit is slid into charging position with the exposed terminals in contact with said charging contacts, means for guiding the lamp unit into and locating it in said charging position, an energising circuit for said electro-magnet, and contacts in said energising circuit, said last mentioned contacts being normally open and arranged to be closed by the lamp unit when in said charging position.

6. In a miner's electric accumulator lamp unit and charging station therefor, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals on said casing in fixed relation thereto and to each other, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, side walls and a rear wall at said charging station forming lamp unit guiding and locating means, a pair of resilient charging contacts fixed to said side walls so as to be engaged by said exposed terminals on the lamp unit when the lamp unit is slid bodily into charging position between said side walls, an electro-magnet behind said rear wall and fixed relative thereto so as to be located in co-operative positional relation with said magnetic member to attract said member against the action of its retaining means to automatically break the lighting circuit and complete the charging circuit when the lamp unit is slid into said charging position, an energising circuit for said electro-magnet, and contacts in said energising circuit, said last mentioned contacts being normally open and arranged to be closed by the lamp unit when in said charging position.

7. In a miner's electric accumulator lamp unit and charging station therefor, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals on said casing in fixed relation thereto and to each other, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, side walls and a rear wall at said charging station forming lamp unit guiding and locating means, a pair of resilient charging contacts fixed to said side walls so as to be engaged by said exposed terminals on the lamp unit when the lamp unit is slid bodily into charging position between said side walls, an electro-magnet behind said rear wall and fixed relative thereto so as to be located in cooperative positional relation to said magnetic member to attract said member against the action of its retaining means to automatically break the lighting circuit and complete the charging circuit when the lamp unit is slid into said charging position, an energising circuit for said electro-magnet and make and break contacts in said energising circuit, an energising circuit for said charging contacts and make and break contacts in said second mentioned energising circuit, said make and break contacts being normally open and arranged to be closed by the lamp unit when in said charging position.

8. In a miner's electric accumulator lamp unit, a completely enclosed casing forming part of said lamp unit, an internal lighting circuit in said lamp unit, an accumulator charging circuit for the lamp unit including a pair of exposed terminals fixed to the casing, a contact in said casing for completing said lighting circuit, a second contact in said casing for completing said charging circuit and spaced from said first contact, a magnetic member in said casing pivotally movable between said contacts, means in said casing for normally retaining said magnetic member in electrical engagement with said first contact for automatically completing the lighting circuit and breaking the charging circuit, said exposed contacts projecting from opposite side walls of the casing and so shaped that they can be slidingly engaged by correspondingly positioned contacts at a charging station, and said magnetic member being positioned adjacent the rear wall of the casing and so arranged as to be attractable by a magnet acting through said rear wall.

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