

April 23, 1935.

K. R. BLAKE

1,999,079

PORTABLE ELECTRIC LIGHTING STRUCTURE

Filed Jan. 11, 1934

2 Sheets-Sheet 1

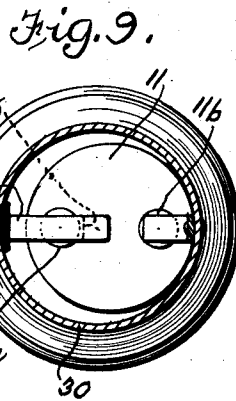
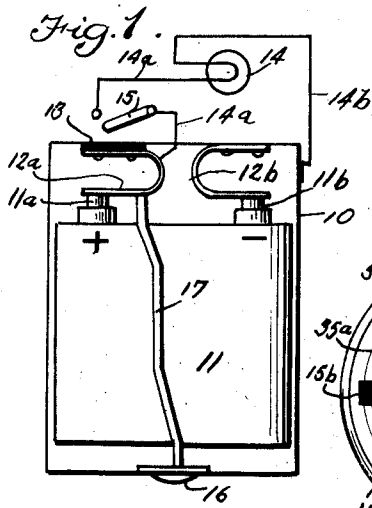


Fig. 8.

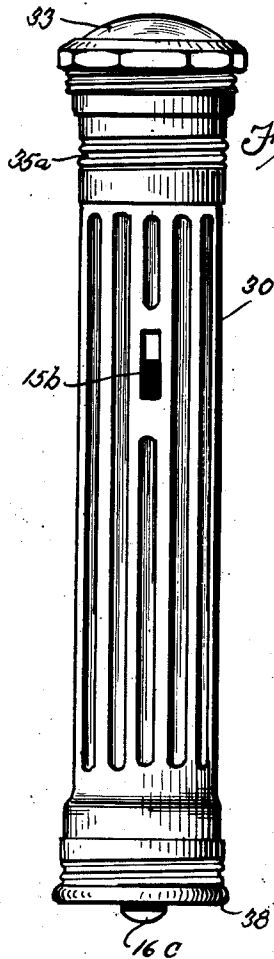
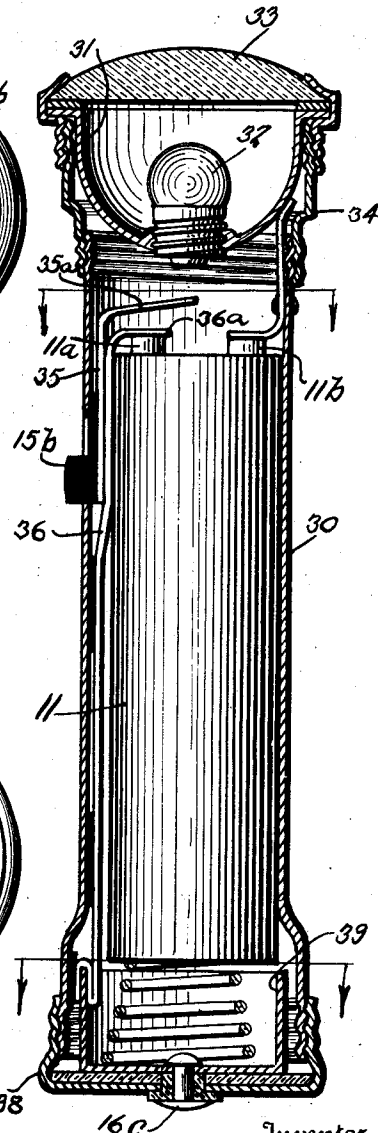
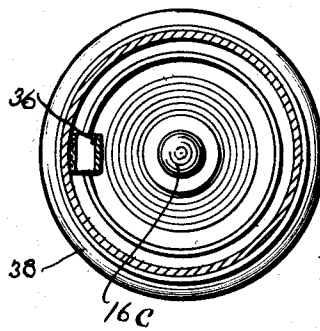


Fig. 10.



Inventor
Kenneth R. Blake
H. A. Emanuel

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Attorney

April 23, 1935.

K. R. BLAKE

1,999,079

PORTABLE ELECTRIC LIGHTING STRUCTURE

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2 Sheets-Sheet 2

Fig. 2.

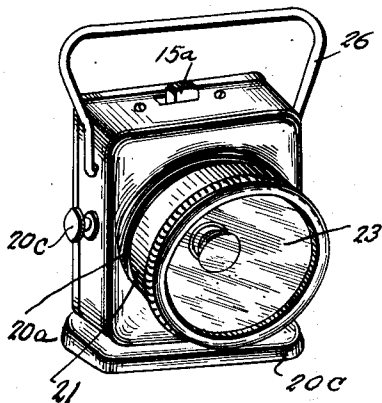


Fig. 3.

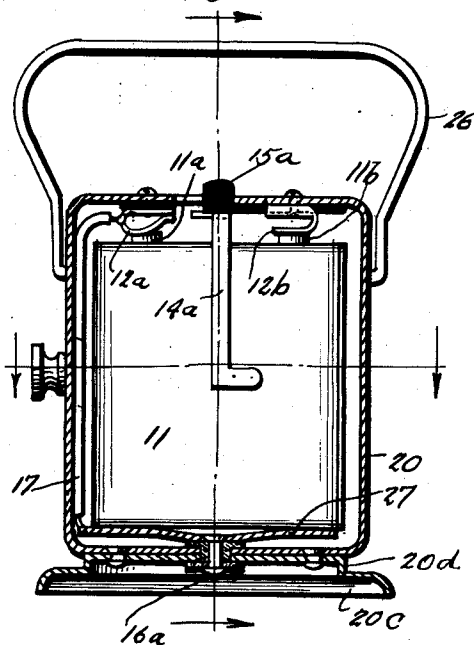


Fig. 4.

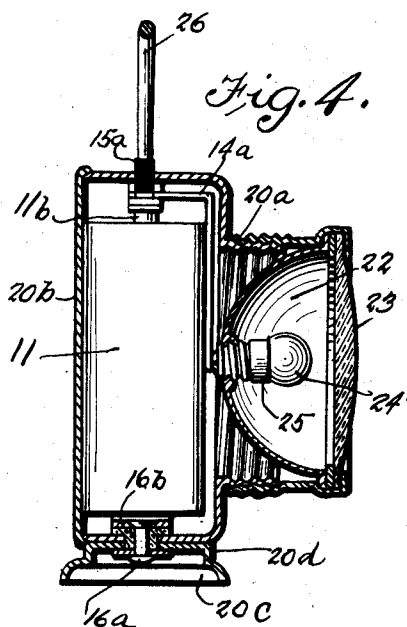


Fig. 5.

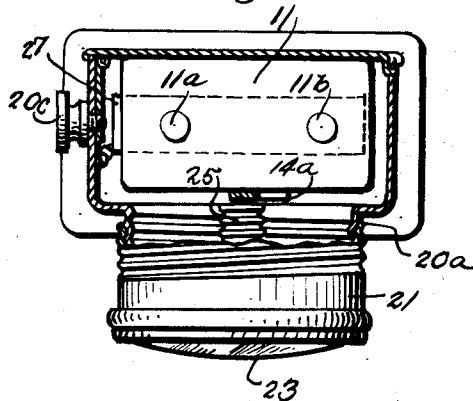
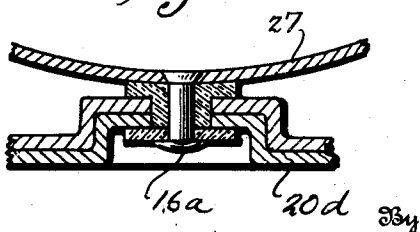


Fig. 6.



Inventor
Kenneth R. Blake
By Emanuel

Attorney

UNITED STATES PATENT OFFICE

1,999,079

PORTABLE ELECTRIC LIGHTING
STRUCTUREKenneth R. Blake, Anderson, Ind., assignor of
one-tenth to Benjamin D. Emanuel, Anderson,
Ind.

Application January 11, 1934, Serial No. 706,284

12 Claims. (Cl. 240—10.6)

This invention relates to improvements in portable electric lighting structures and more particularly structures in which the battery is carried by the lamp casing, illustrations of which are flash lights, trouble lamps, lanterns, etc.

Structures such as flash lights, etc., in which the lamp element is of miniature bulb type operated by a battery unit of small voltage, are well-known, the arrangement used being varied but generally including a casing which carries the bulb and reflector and having a space to receive one or more dry cells, the casing carrying the desired electrical connections including a contact with which a cell terminal is brought into engagement when the casing has been filled and closed, as well as the usual make and break control for flashing the lamp. These structures are generally small dimensionally, and hence the battery units are relatively small.

The most common form of such structures has the casing elongated with the lamp bulb at one end, the other end of the casing being closed by a removable cap to permit the ready insertion and removal of the cell or cells, the latter being in series arrangement where a plurality of cells are used. However, other forms of casings have been employed, such, for instance, as a casing for the battery with a side of the casing carrying the bulb and lens formation, this particular type permitting the use of a larger reflector and lens and thus enabling an increase of the candle power of the structure, although the unit is comparatively small and easily carried about.

As indicated, these structures are generally operated with dry cells, the latter having been developed to such an extent as to make a comparatively low-cost unit. The difficulty with such units, however, lies in the relatively short life of the battery cells, the small dimensions of the battery necessitated by the unit dimensions limiting the space for battery ingredients with the result that, assuming careful usage, the maximum life of the battery is generally less than twelve hours, and of this period only the early portion gives the maximum power conditions, the service curve showing a decrease after a few hours use.

Various efforts have been made to remedy this condition by the use of larger batteries carried separately and connected to the lamp, such structures having been mainly utilized in connection with miners lamp structures. Since the battery is separate from the lamp casing, it would be possible to utilize a rechargeable battery as the power source, the battery being readily disconnected from the lamp casing and thus easily locatable in

a suitable battery charging system. And these efforts have extended to the point where the battery has been carried in the casing itself but removable therefrom for the purpose of charging, the batteries being small but of sufficient capacity to permit of use for the limited time desired; this particular development has been designed especially for the use of miners having a relatively short period of duty, the lamps being turned in at the end of this duty and the batteries recharged; because of the number of individual lamps being used in the particular mining service, a special charging assemblage is employed to provide collective charging, so that the operation cost per lamp is reduced to a point capable of competing with the older forms of such lamps. But, as indicated, the assemblage is such that the battery is removed from the casing for charging purposes, so that, in effect, the action is similar to that of the earlier form in which the battery was a separate unit; the latter, permitting a larger dimension—being carried by the body instead of the cap—enables a longer service period, but requires the connections to the lamp, so that the installation becomes more or less cumbersome in service; on the other hand, the battery within the lamp casing has less capacity, being usable because of the usually short period of the individual mining service.

The use of a rechargeable battery as the power source is advantageous due to the fact that after the initial assembly the battery cost is limited to the cost of recharging over an extended period which may reach many months, during which a comparatively large number of dry cell replacements would have been required, but, under the practice above indicated—the removal of batteries for the purpose of charging—provides a condition by which the cost is materially increased so that the cost advantage over the dry cell type is lost; its use in the miners lamp service, because of its special advantages over the old type lamp, is advantageous; but in the ordinary field in which it is necessary to compete with the dry cell type in cost conditions, such arrangement becomes impracticable because of cost conditions as well as the necessity for special handling of the structures during the recharging operation.

It is in the latter field of general service conditions that the present invention is located—a field in which the dry-cell battery is practically supreme through its ability to utilize a casing in which the battery remains until it becomes unserviceable and which permits replacement. The invention retains the conditions but utilizes the

rechargeable battery, the general distinction being that it is recharged without removal from the casing. The advantage of this lies in the fact that the unit itself is simply placed within the charging instrumentality and is recharged during a period when the lamp is not in use; in other words, the normal non-use position of the unit is in its charging location. This permits a charging operation of very slow development—for instance, the time length of charging a two-volt battery may be extended to include as much as 72 hours, a condition which practically overcomes the possibility of overcharging. With the normal non-use position of the unit in its charging relation, it is readily understood that since ordinary usage does not deplete the battery to its maximum, it is possible that during non-use of the unit the charging operation is in effect, more or less a replenishing character, that of the charging simply compensating for the loss set up by the single use condition. Hence, the cost of operation of the unit is small and enables the unit to successfully compete in the commercial field now dominated by the dry-cell type.

Since the battery is recharged without removal, it is evident that provision must be made for reaching the battery with the recharging current while the battery is enclosed within the casing; because of battery conditions it would not be practicable to expose the battery and its charging terminals permanently, and since these are within the casing, the unit must be arranged in such manner as to permit access of the charging current to the battery through the casing itself. This can be done in various ways, several of which are illustrated herein to indicate the general characteristics of the invention, so that the complete unit practically substitutes the rechargeable battery for the dry-cell batteries for this general service use, with the unit arrangement unchanged whether in use or being charged.

In addition, however, this development reaches beyond this particular field. For instance, it has been found that the fundamental idea permits the invention to be utilized as the basis of a structure designed as a substitute for the usual kerosene lantern. The ability to charge the battery while the latter is encased, enables the kerosene burner to be substituted by a bulb operated from the battery—the kerosene receptacle receiving the battery—with the non-use location of the lantern arranged to provide the charging activities referred to. Experiments have shown that the cost of lantern service has been greatly reduced in this way with the added advantage of the use of the electric lamp bulb as the source of light.

To these and other ends, therefore, the character of which are more fully set forth herein—after, my invention consists in the improved construction and combination of parts hereinafter more particularly described, illustrated in the accompanying drawings, and more particularly pointed out in the appended claims.

In the accompanying drawings, in which similar reference characters indicate similar parts in each of the views;

Figure 1 is a diagrammatic view illustrating generally the fundamental characteristics of the present invention;

Figure 2 is a perspective view showing one form of lighting structure employing the present invention;

Figure 3 is a vertical sectional view of the same taken on line 3—3 of Figure 4;

Figures 4 and 5 are sectional views of the same

taken on lines 4—4 and 5—5 of Figure 3, the battery not being in section;

Figure 6 is a detail fragmentary sectional view of a bottom portion of the casing;

Figure 7 is a side elevation of a different type of lighting structure employing the principles of the invention;

Figure 8 is a central longitudinal sectional view of the same;

Figures 9 and 10 are sectional views taken on lines 9—9 and 10—10 of Figure 8.

The invention, designed more particularly for use in the field of lighting structures of small dimensions, of which the ordinary commercial flash light is an example, utilizing small wattage and low voltage conditions, can be utilized in many different forms and types, thus making it possible to provide individuality as to form and type to meet various conditions. Structures of this character inherently present problems arising through the space restrictions present in units of such small dimensional characteristics, and because of this the substitution of a rechargeable battery for batteries of the dry-cell type present certain difficulties. Aside from the battery structure per se, the dimensions of the latter required are such that the operative connections required must be arranged in such form as to be capable of location within the free space, and where these connections must include features which serve as portions of a charging circuit, these space limitations provide complications of a serious nature.

While the invention is applicable for use with units of large dimensions, thus avoiding somewhat the space limitations, such structures generally involve the use of larger wattage conditions and higher voltages and thus set up these as additional problems which must be met. For instance, to meet the space limitations, the present invention utilizes casing portions as parts of circuit connections—this being possible because of the low voltage conditions; with the higher voltages such use of the casing may prove detrimental in some instances. While the larger dimensional units could be utilized with the low voltage conditions, the larger dimensions of the unit casing, with no greater power results would present the unit in a disadvantageous light commercially as a substitute for the dry cell type.

The invention is therefore designed more particularly for use in the field of lighting structures of small dimensional characteristic, although not limited to its application in this specific field, its main usefulness however being in this particular field of lighting activities.

In illustrating the invention, therefore, the general characteristics are presented through a diagrammatic representation, together with one form of each of two types, these illustrating somewhat ways in which the fundamentals can be applied to specific types. Obviously, the particular form in which the type can be exemplified can be varied to a considerable extent to meet individual needs or desires. And the same is true of the types themselves. Manufacturing conditions may cause selection of particular features in form varied from those disclosed, as may individual taste, the present disclosure being simply to illustrate one of the many forms in which the type may be employed. As will be understood, each of the forms utilizes the characteristics presented in the diagrammatic showing of Figure 1 which is now described.

In Fig. 1, the casing, indicated at 10, is as-

sumed to be metal, and is designed to receive a rechargeable battery 11 having battery terminals 11a and 11b; the specific form of the battery construction is not disclosed in detail, since the same forms the subjects-matter of other applications, the arrangement, however, being such that if the terminals 11a and 11b be connected to the charging line, the battery will become charged, the time length required being dependent upon the charging rate being employed for this particular service. The top of the casing carries two contacts in the form of spring elements 12a and 12b, the former being insulated from the casing by suitable insulation 13, the contact 12b being secured directly to the casing. The positions of the two contacts are such that when the battery is in position the contacts will engage the respective battery terminals.

The bulb is indicated at 14 and is operatively connected with contact 12a by lead 14a, the opposite bulb terminal being connected with the casing by lead 14b; the switch 15 for making and breaking the lamp circuit is located in lead 14a. As will be understood, leads 14a and 14b thus provide a circuit characteristic with the battery through the respective contacts and terminals, with the activity of the circuit dependent on the position of switch 15, so that when battery current is available the lamp can be made operative or inoperative by the usual switch control as in structures of this type, in which the bulb is generally of small wattage and the battery of low voltage.

To illustrate the charging characteristics, the bottom of the casing is shown as provided with an exposed contact 16, insulated from the casing and to which a lead 17 is connected, the latter being connected in suitable manner with the contact 12a. Obviously, if the contact 16 be operatively connected to one side of the charging line with the casing 10 operatively connected to the opposite side of such line, a charging circuit will be completed through the battery, in which the casing forms an element of the current path, enabling the battery to be charged while in position within the casing, it being understood that during the charging period the switch 15 is in open position to break the circuit through the bulb; with the battery being charged at a relatively slow rate, it will be obvious that if the switch 15 were closed during the charging period the charging current would be diverted more or less to the lamp circuit and thus prevent material charging of the battery.

It will thus be seen that the contacts 12a and 12b are both active as a part of both battery-charging and lamp-circuit lines, while both of these circuit lines are subject to make and break action external of the casing—the lamp circuit by switch 15 while the battery-charging circuit is controlled by the break between contact 16 and the casing, with this break capable of being bridged through the charging system for the unit during the charging operation. Since the contacts 12a and 12b are of the spring type and not secured to the battery terminals, it can be readily understood that the battery is free to be removed through a casing opening for the purpose of substitution of batteries when/or if needed.

With the bulb of small wattage, the voltage of the cell is small—two volts, for instance—so that the lamp can remain active for a number of hours without complete depletion of the battery; and if the casing be positioned rela-

tive to its charging support, with switch 15 open to break the lamp circuit, the battery can be recharged during the period when the lamp is not in use, with the lamp and its casing always ready so that it need only be lifted from its usual (charging) support to render it ready for use. The charging support is not specifically disclosed herein, as it forms a portion of the companion application filed of even date herewith, Serial No. 706,285.

In other words, the same battery terminal contacts are used for the completion of both charging and lamp circuits, so that the battery need carry but two terminals, with the result that the battery dimensions can be retained sufficiently small as to enable it to be used within the dimensions of the lamp casing. This is made possible through the fact that the lamp circuit switch is opened when the unit is taken out of lighting service, and in doing this the lamp circuit is rendered inactive, so that during such period the charging circuit can be completed through the same contacts by placing the casing in position on its support. As a result, the two circuits, both controlled from outside the casing, can have portions of the line common to both circuits, with these portions active to provide the current path for the active circuit whenever the latter is completed. With the circuit controls wholly independent of each other there is little likelihood of both controls being active concurrently.

The specific application of the diagrammatic showing is presented in the remaining views.

For instance, in Figs. 2 to 6, I have shown it applied to a lighting structure in which the bulb and its reflector and lens are located at the side of the casing. The casing 20 is indicated as of metal, and somewhat rectangular in form, the front carrying a circular flange 20a threaded to receive the lens-retaining cap 21, which retains the reflector 22 and lens 23 in position. The bulb 24 is carried by a socket 25, with the socket terminals connected with the contacts 12a and 12b respectively, the latter being carried at the upper part of the annular portion of the casing, which also carries a suitable switch 15a active in the lead 14a shown as a sliding contact engageable with contact 12a. The rear of the casing is closed by a removable door 20b, secured in suitable manner, as by a set screw 23c. A handle 26 is secured to the annular portion of the casing.

The bottom of the casing is shown as provided with a base 20d having a rolled flange to produce characteristics of a depressed bottom 20e which carries a contact 16a mounted in a suitable insulating bushing 16b mounted in the bottom. Contact 16a is connected with contact 12a by the lead 17. The bottom carries a resilient plate 27 on which the battery 11 is seated, with the battery terminals 11a and 11b in engagement with the contacts 12a and 12b. Since the latter are also resilient, it can be understood that the battery is practically yieldingly supported so that the structure may be subjected to hard usage with minimum likelihood of damage to the structure.

In practice, the support for the casing is arranged to receive the rolled flange 20d with contact 16a in contact with a terminal of the charging line, the other terminal of that line being carried by the support so that the positioning of the lamp brings the casing into circuit relation with the line.

Since the normal position of the unit when not in use is in its support the normal operation would set up conditions practically preventing a short-circuiting of the battery by bridging contact 16a with the casing. However, should it be desired to meet this condition, the arrangement of contact 16a and its insulating bushing may be such as to locate the contact depressed below the plane of bottom of the casing, but accessible to a contact of the support, so that short circuiting of the battery in this way would be rendered difficult. A suitable arrangement of this kind is illustrated in Fig. 6; obviously, a similar result may be obtained in other well-known ways.

Figs. 7 to 10 illustrate the application of the invention to units of the well-known flashlight type, the disclosure being illustrative only, since the characteristics of the invention can be utilized in various ways in structures of this type, the particular illustration indicating ways in which specific problems incident to the form of the type can be readily solved.

For instance, in this type, the illuminating assembly of bulb lens and reflector are located at one end of an elongated casing while the battery is insertible through the opposite end of the casing, with the latter closed by a closure which is generally threaded to position. Since rotation of the closure is essential, the simple arrangement for lead 17 is changed to permit the closure rotation without affecting this connection. Other differences are present due to the change in the form of the casing.

The casing body indicated at 30, is tubular in form and may be of composition or of metal—either material may be employed, the composition form being preferred since it sets up an insulating relationship between the end structures. A conventional form of illuminating zone assembly is shown, threaded to the casing, the assembly including a reflector 31, bulb 32 and lens 33, the assembly including annular metal structures which, in effect, provide an annular band-like formation 34 at this end of the casing. As will be understood, this assembly can serve as the casing exposed portion active in the several circuits as previously described.

The battery is indicated at 11 with its terminals 11a and 11b. Contact 12a is shown as in two parts, one of these (35) being carried by the sliding switch element, the other part (36) being shown as elongated and secured intermediate its ends to the casing. The lateral extension 35a of part 35 is adapted to contact a bulb terminal in one position of the switch, while the lateral portion 36a of part 36 is in contact with terminal 11a. The parts 35 and 36 are in sliding contact relation. Contact 12b is shown as contact 37, carried by the casing, and having one end contacting with terminal 11b, the opposite end of the contact having a contact relation with a metal part of the illuminating assembly, the drawings indicating the reflector as such metallic part.

As will be understood, with the switch 15b shifted to provide contact with the bulb terminal, a lamp circuit will be completed between terminals 11a and 11b through parts 35 and 36, the bulb, reflector to contact 37; with contact 37 engaging the annular band formation instead of the reflector, the circuit includes the band formation. With the switch moved to the position shown, this circuit is broken between the bulb terminals and the portion 35a.

The opposite end of the casing is closed by a

threaded closure 38 which carries the contact 16a in insulated relation to the closure. To meet the conditions of the rotation of the closure, the latter is shown as having a cup-shaped member 39, insulated from the closure but having contact relation with contact 16c. When the closure is threaded to its seated position, member 39 will be brought into contact relation with the lower end 36b of part 36, thus connecting contact 16c with terminal 11a. If desired, the closure may also carry the usual spring 40 to support the battery, thus setting up the cushioning condition of the battery.

As will be clear, if one charging system terminal engage the contact 16c and the other engage the band formation 34 a charging circuit will be completed through the battery with the circuit including the equivalents of contacts 12a and 12b also active in the lamp circuit.

As before pointed out, the casing body 30 may be of composition or of metal. Where the composition is used an additional advantage is had in that the band formation 34 is not only remote from contact 16c but the latter is located on a different face of the structure, so that the difficulty of bridging these is increased; with the casing 30 of metal, this result could be obtained by insulating the closure 38 from the casing. If the casing be of metal and the closure 38 have the contact relation, the second terminal of the charging system can be applied to the closure, thus having the charging terminals in adjacent relation; such arrangement would permit easier bridging of the casing charging terminals, but would operate similar to the composition casing structure in other respects. Obviously, the support for the unit is arranged to meet the particular condition employed.

As heretofore pointed out, the details of the various structures may be varied to suit individual desires, the forms shown being illustrative only. And in this respect, it will be understood that in the second form shown the casing is assumed to include the illumination zone assembly as well as the closure 38, these completing the enclosing casing for the open-ended tubular casing 30.

From the above it will be readily understood that in each of the forms two circuits are possibilities with the battery in its normal position—the lamp circuit and the charging circuit—with terminal contacts 12a and 12b, or their equivalents, active in both circuits. The lamp circuit is controlled by switch 15 while the charging circuit is completed by placing the complete unit in the charging system. As a result, the space within the casing occupied by the connections is materially reduced and enables a battery of sufficient dimension to provide efficient unit operation to be provided, and at the same time permit recharging of the battery at will without disturbing the battery position. As a result the cost of recharging is reduced to a minimum, since there is no requirement for removal of the battery for charging and its re-positioning when charged, in addition to which the unit is always available for instant use, a condition not present where such use would be required during the period when the battery was removed for charging.

While I have herein described and illustrated the general principles of the invention and illustrated several ways in which these principles may be placed into efficient service, it will be readily understood that changes and modifications with respect to the disclosures may be found desirable or essential to meet the various ex-

gencies of commercial production and usage in service conditions, and I therefore reserve the right to make any and all such changes or modifications as may be found desirable or essential, insofar as the same may fall within the spirit and scope of the invention as expressed in the accompanying claims when broadly construed.

I claim:—

1. In portable electric lighting structures of small wattage and low voltage characteristic, a casing carrying the lamp socket and its lamp, a rechargeable battery enclosed within the casing and carrying a pair of terminals, a pair of relatively insulated contacts for and individual to said terminals, said contacts being carried by the casing, one of said contacts being insulated from the casing and the other in metallic contact with the casing, connections for completing a circuit between the battery terminals and the lamp, said circuit including said contacts, said casing also having relatively insulated portions respectively operatively connected to said terminals through the contacts, said casing portions being exposed exteriorly of the casing and operative to complete a charging circuit through the inclosed battery with the charging circuit including said contacts when positioned relative to terminals of a charging instrumentality, said lamp circuit including a manual switch operative to make and break said circuit while retaining operative relation of contacts and battery terminals to thereby permit completion of the charging circuit when the lamp circuit is broken.

2. A structure as in claim 1 characterized in that the battery terminals are located on the same face of the battery, co-operating contacts serving as a cushioning means in supporting the battery in service.

3. A structure as in claim 1 characterized in that one of the casing portions is in the form of an externally exposed contact carried by and insulated from the casing and positioned remote from the terminal contact through which it is operatively connected with the battery terminal.

4. A structure as in claim 1 characterized in that one of the casing portions is in the form of an externally exposed contact carried by the bottom of the casing.

5. A structure as in claim 1 characterized in that one of the casing portions is in the form of

an externally exposed contact carried by the bottom of the casing, the exposed face of the contact being depressed with respect to the normal plane of the exposed face of the bottom.

6. A structure as in claim 1 characterized in that one of the casing portions is in the form of an externally exposed contact carried by the bottom of the casing, said bottom also carrying a cushioning element co-operative with the terminal contacts in cushioning the battery in service.

7. A structure as in claim 1, characterized in that the casing includes a removable closure dimensioned to permit battery substitution.

8. A structure as in claim 1, characterized in that casing wall portions are active in the completion of both lamp and charging circuits.

9. A structure as in claim 1, characterized in that the casing is elongated with the illuminating zone located at one end, an assembly producing the illuminating action at such end when the lamp circuit is closed, said casing having an opening at its opposite end for battery reception and removal, a removable closure for said opening said closure carrying one of the exposed casing portions in the form of an exposed contact insulated from the closure and active as a portion of the charging circuit.

10. A structure as in claim 1, characterized in that the casing is elongated with the illuminating zone located at one end, an assembly producing the illuminating action at such end when the lamp circuit is closed, said casing having an opening at its opposite end for battery reception and removal, a removable closure for said opening, said closure carrying one of the exposed casing portions in the form of an exposed contact insulated from the closure and active as a portion of the charging circuit, said assembly presenting the other of said exposed casing portions.

11. A structure as in claim 1 characterized in that the casing carries an illuminating zone assembly positioned on a side of the casing, the opposite side of the casing having a removable closure dimensioned to permit battery reception and removal to and from its enclosed position.

12. A structure as in claim 1 characterized in that the casing portions active in the charging circuit are located on different faces of the structure.

KENNETH R. BLAKE. 50