Aug. 28, 1923. 1,466,110

C. G. BECKWITH ET AL

SYSTEM OF STREET LIGHTING AND APPARATUS THEREFOR

Filed Nov. 17, 1919 3 Sheets-Sheet 1

FIG. 1.

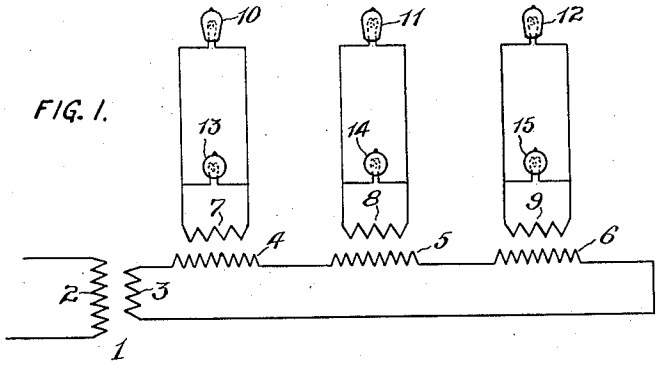


FIG. 2.

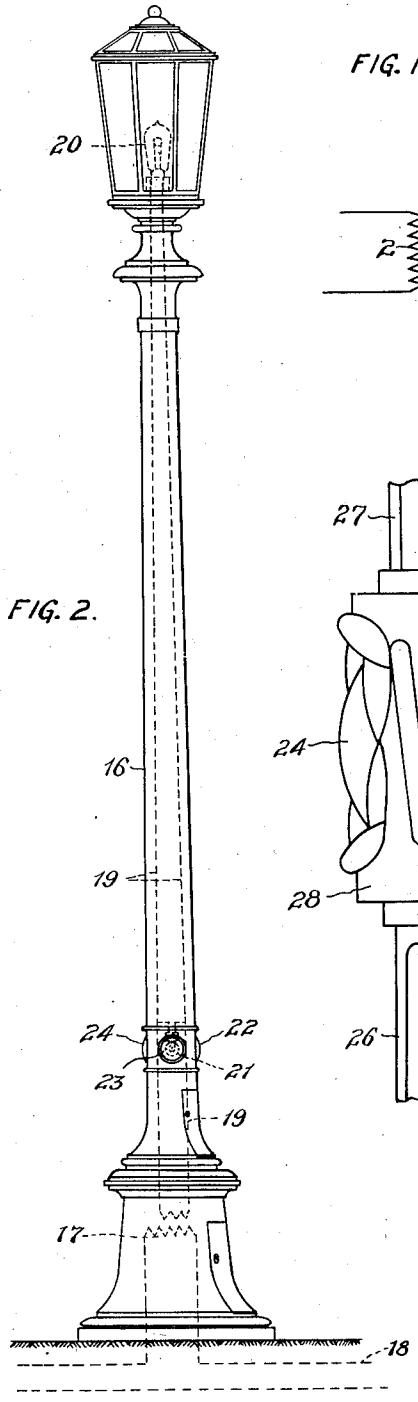
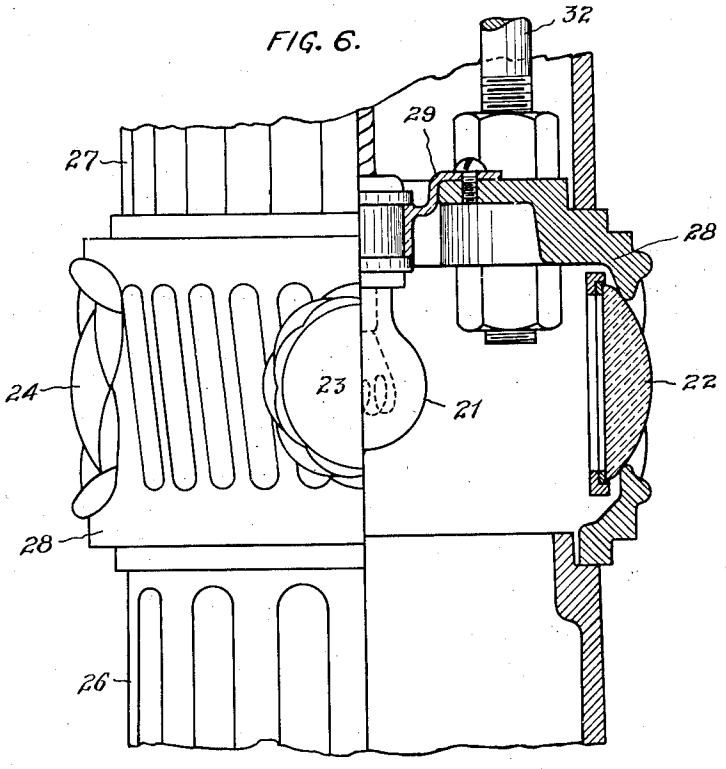


FIG. 6.



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FIG. 3.

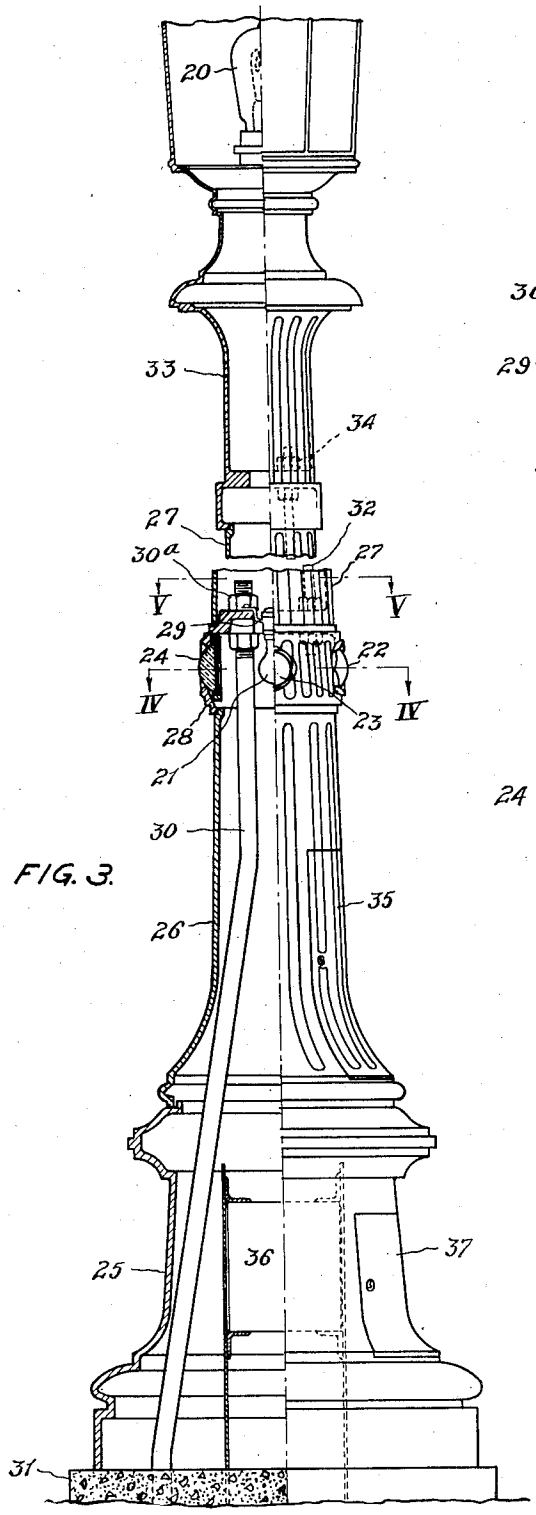


FIG. 5.

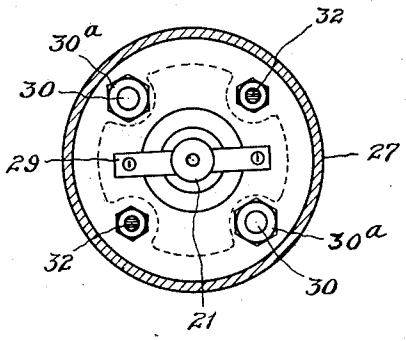
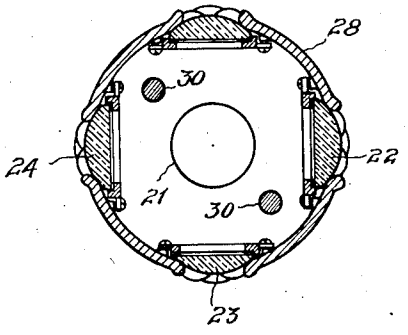


FIG. 4.



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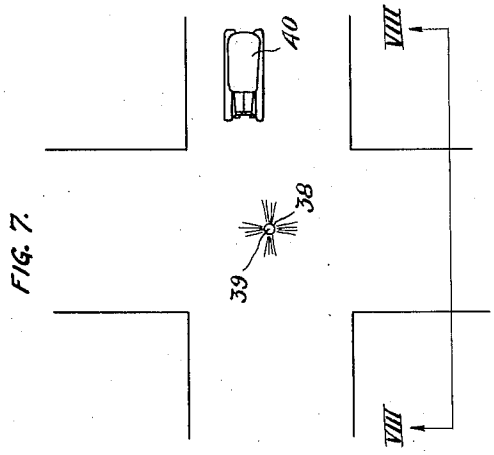


FIG. 7.

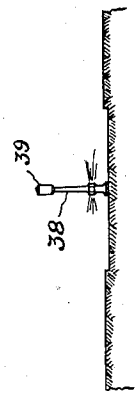


FIG. 8.

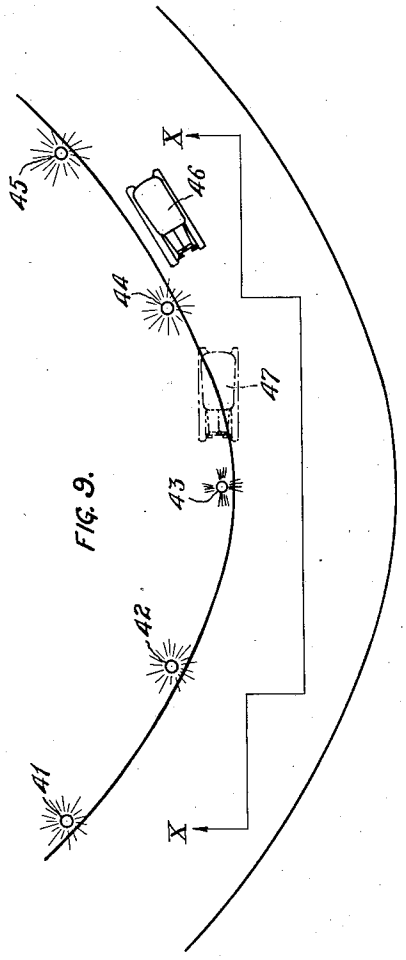


FIG. 9.

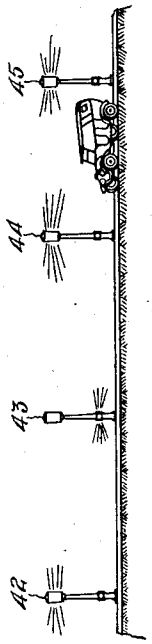


FIG. 10.

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UNITED STATES PATENT OFFICE.

CHARLEY G. BECKWITH, OF CLEVELAND, AND WILLIAM E. DAVIS, OF LAKEWOOD, OHIO.

SYSTEM OF STREET LIGHTING AND APPARATUS THEREFOR.

Application filed November 17, 1919. Serial No. 338,710.

To all whom it may concern:

Be it known that we, CHARLEY G. BECKWITH and WILLIAM E. DAVIS, citizens of the United States, the said CHARLEY G. BECKWITH residing at Cleveland, and the said WILLIAM E. DAVIS residing at Lakewood, both in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Systems of Street Lighting and Apparatus Therefor, of which the following is a specification.

Our invention relates to a system of electric street-lighting and apparatus therefor in which lamps of a relatively high candle-power are supported directly upon lamp posts which stand close to the side of the roadway or are suspended from such posts by bracket arms or suspension wires.

A feature of our invention is the provision of a lamp compartment in the body of the post a short distance above the ground in which there is located a warning lamp of relatively low candle-power, to warn the traffic of the position of the lamp post, particularly when the main lamp at the top of the post is not lighted.

Our invention is particularly adapted for use in the lighting of park drives, boulevards, winding streets and roadways where the lamp posts stand close to the roadway. It is also valuable for traffic guide-lamps or "silent policemen" at street intersections and "safety zones."

In other systems of street lighting with which we are familiar, frequent accidents occur in which the lamp posts, due to their low visibility, are struck by passing vehicles and considerable property damage or serious personal injury, or both, result. In some systems of lighting the destruction or overturning of a single lamp post or the breaking of a single lamp darkens all of the lamps on the same circuit.

We have observed that the lamp post most frequently struck by a passing vehicle is that one whose lamp is not lighted while the adjacent lamp in either direction is lighted. We have further observed that lamp posts bordering curved roadways are more frequently struck than are those which border straight roadways.

The principal object of our invention is to provide a system of street lighting and apparatus therefor, which will prevent the occurrence of such accidents, the resulting personal injuries and property damage, and the darkening of the street lamps mentioned in the foregoing.

We accomplish the objects of our invention by using the system and apparatus described in the following specification and shown in the accompanying drawings in which:—

Fig. 1 is a diagram of the electrical connections of our system of electric street lighting;

Fig. 2 is a side elevation of a lamp post constructed and equipped in accordance with our invention;

Fig. 3 is a part elevation, part vertical section of a lamp post suitable for use with our system of electric street lighting;

Fig. 4 is a section on line IV—IV of Fig. 3;

Fig. 5 is a section on line V—V of Fig. 3;

Fig. 6 is a fragmentary vertical section through the post at the point where the warning lamp is located;

Fig. 7 is a plan, and Fig. 8 is a sectional elevation of a street intersection with a traffic guide-lamp post at the center thereof; and

Fig. 9 is a plan, and Fig. 10 is a sectional elevation of a curved roadway lighted in accordance with our invention.

Referring to the drawings, 1 represents a constant potential or constant current transformer of which. 2 is the primary winding and 3 the secondary winding.

From the secondary winding 3, runs the primary circuit of the lighting transformers 4, 5, and 6. The primary windings of these lighting transformers, 4, 5 and 6, are connected in series. It will be understood that any desired number of such transformers may be employed in the circuit, it being only necessary to properly design the main transformer, 1, to serve any predetermined number of lighting transformers.

4, 5 and 6, respectively, represent individual transformers having their primaries connected in series but their secondaries, 7, 8 and 9, connected respectively to separate lamps, 10, 11 and 12, which are the main lamps used for illuminating purposes.

A characteristic of the lighting transformer such as we prefer to employ in our system of lighting is such that the voltage

of the secondary when only the warning lamp is burning is higher than it is when the main lamp is burning.

This is accomplished by so proportioning the magnetic core and the primary and secondary windings of the lighting transformer that with a predetermined, constant current flowing in the primary the counter electromotive-force so nearly approaches the induced electromotive-force of the secondary that practically no more current can be drawn from the secondary than that required to cause the main lamp to glow at full candle power.

If a curve be drawn with secondary volts as ordinates and secondary amperes as abscissas for such a transformer with constant current in the primary, it will be inclined downward (at about forty five degrees in a specific instance) until the current value is reached where the counter electromotive-force approaches the induced electromotive-force in the secondary from which point the voltage curve turns abruptly, almost vertically, downward to zero.

At any less current in the secondary than that required to operate the main lamp, a higher effective voltage will be maintained in the secondary and, consequently the warning lamp may be made suitable for operation at any desired point on the voltage-current curve. We prefer to employ a warning lamp consuming about fifteen watts. In a specific instance such a lamp requiring about three tenths of an ampere at about forty five volts, connected in parallel with a three hundred watt, main lamp requiring about twenty amperes at about fifteen volts has been used by us.

Such transformers as we have described and which we prefer to use are known by various trade names, for instance, those made by the General Electric Co. are called their "type I. L." (presumably signifying incandescent lighting); those made by the Westinghouse Electric and Mfg. Co. are called "safety coils"; those made by the Kuhlman Transformer Co. and those made by the Maloney Transformer Co. are called "series-multiple transformers." All are built upon substantially the same principles and are in every day use. We do not herein claim such transformer as our invention except in combination as indicated in the claims.

Across the secondaries of the lighting transformers, 4, 5 and 6, are connected the warning lamps, 13, 14 and 15, in multiple with the main lamps, 10, 11 and 12 respectively. The warning lamps 13, 14 and 15, require for full candle-power a smaller current but higher voltage than do the main lamps, 10, 11 and 12.

In Fig. 2, there is shown a lamp post 16, within or below the base of which there is located a lighting transformer, 17, of the type shown at 4, 5 and 6 in Fig. 1.

The primary circuit supplying current to the lighting transformer is shown in dotted lines, 18, and the secondary circuit supplying current to the lamps is shown in dotted lines at 19. The main illuminating lamp, 20, is shown in dotted lines within the lantern at the top of the post, while the warning lamp, 21, is shown in dotted lines in a compartment, near the base of the post. Lenses, such as 22, 23 and 24, of either clear, white or colored glass, may be provided to project the light from the warning lamp.

When the primary circuit 18, is properly energized, the main illuminating lamp, 20 will burn at full candle-power. We have found it convenient to so design the lighting transformers, such as 17, that when the main lamp, such as 20, is burning, the potential of the secondary circuit is approximately one-third what it is when only the warning lamp is burning. The lamp, 21, being preferably of relatively low candle-power, may be made to give its full candle-power upon the voltage of the secondary circuit when the main lamp is not burning. Under such conditions, when the main lamp, 20, burns out or its circuit is broken due to any cause, the warning lamp, 21, which has been energized at approximately one-half its normal voltage so long as lamp 20 has been burning will immediately have its normal full voltage applied to its terminals and will burn at full candle-power. Light shining through the lenses 22, 23, 24 ets., will be of clear visibility and the driver of a vehicle approaching the post will be warned of its location and will avoid striking it.

Under the conditions just described the warning lamps will glow, though at less than normal candle-power, when the main lamps are burning and thus the location of the posts will be indicated to the driver of an approaching vehicle. It is obvious that when the main lamp is burning the need of the warning lamp is not as great as it is when the main lamp is out.

It will be seen that an economy of current for the operation of the warning lamp is effected by our system of lighting and that we employ no mechanical, or electro-mechanical devices such as relays or switches to cut the warning lamp into or out of circuit. Nevertheless, so long as the lighting circuit is energized, the warning lamp is automatically and positively operated at full candle-power when the main lamp circuit is broken at the lamp and operated at reduced candle-power and small current consumption while the main lamp is burning.

In Figs. 3, 4, 5 and 6 we have shown the construction of a post suitable for use with the system of electric street lighting of our invention. 25 represents a sub-base, 26 the

pedestal of the post and 27 the upper portion of the post. 28 is a short joint inclosing the warning lamp compartment, located between the pedestal, 26 and the upper portion 27, of the post. The lenses 22, 23 and 24 are mounted in the wall of the member, 28.

It will be understood that any desired number of lenses may be employed. The warning lamp, 21, has its socket mounted upon a suitable support, 29, secured to, or made part of the member 28. Bolts, such as 30, secure the members, 25, 26 and 28 to the concrete foundation, 31. Other bolts, 32, extend from member 28, upwards through the upper part, 27, and through the cap member 33, to securely clamp these members together. It will be seen that we have provided a simple, rugged construction for a jointed lamp post in which the joints are detachably secured together and to the foundation.

In assembling the post upon the concrete foundation, 31, the sub-base, 25, and pedestal, 26, are set down over the bolts, 30, which were set in place when the concrete foundation was being formed; the short joint member, or warning lamp compartment, 28 is put in place on top of the pedestal, 26, with the bolts, 30, extending through suitable holes in the joint, 28, and then the nuts, 30^a, are threaded upon bolts, 30, to anchor the sub-base, pedestal and short joint securely to the foundation. The bolts, 32, are then put in place in suitable apertures in joint, 28, and the upper part, 27, of the post is let down over bolts, 32, into position on joint 28.

The top ends of the bolts, 32, extend above the top of the section, 27, through suitable holes in the cap member, 33, to receive the nuts, 34, and thus detachably secure the upper part of the post to the lower part.

A suitable door, 35, is preferably provided in the side of the pedestal, 26, for access to the warning lamp, 21. The door, 35, may be provided with a suitable lock to prevent unauthorized persons from having access to the interior of the post.

The electrical conductors which carry current to the post lamps may be put in place as the post is being assembled.

To provide a convenient and accessible yet protected location for the individual lighting transformer, 36, the sub-base, 25 may be made hollow, and may be provided with a door, 37.

To set up or to remove one of these posts is but the work of a few minutes.

It will be seen that putting one of the main lamps such as, 11, out of commission by accident or other cause, will not darken the remaining lamps in the circuit, and that the location of the post which supports the lamp which is not burning will be indicated by a bright warning lamp.

In Figs. 7 and 8 there is shown a traffic guide lamp post, or "silent policeman," 38, located at the center of a street intersection. At the top of the post, 38, there is a main lamp, 39, while near the base of the post, one of our warning lamps is shown installed. An approaching automobile is shown at 40. Should the main lamp, 39, be broken, the warning lamp will apprise the driver of the approaching vehicle of the position of the lamp post, 38.

In Figs. 9 and 10 there is shown a curved roadway bordered by street lights, 41, 42, 43, 44 and 45. The main lamp, 43, as indicated on the drawing is not burning. If the night be dark or rainy, and particularly if there be no curb to the roadway next to the lamp posts, the driver of an approaching vehicle such as 46, is very apt to mis-judge the curvature of the roadway between the lights, 42 and 44, when light, 43, is not burning, and, as has frequently happened, drive directly against the lamp post, 43 as the vehicle shown at 47 is about to do. If one of our improved lamp posts and our system of lighting be employed, the location of the lamp post, 43, is clearly indicated to the driver, in this case preferably by a red light, and an accident will be avoided.

The color of the warning-lamp lenses may be made suitable for the location of the lamp posts. For instance, the lamp posts along the right hand side of the roadway may present red warning lights, while those on the left hand side of the roadway may present white or green lights to the driver of an approaching vehicle. The warning-lamp lenses in the traffic guide-lamp post, 38, may be either white or green to warn drivers to pass to the right.

The advantages of using our invention, including the avoidance of serious and costly accidents and the reduction of expense of up-keep of street lamps and lamp posts, will be apparent to those skilled in the art.

Having thus described our invention we claim:—

1. In a system of street lighting, a series of lamp posts provided each with two lamps connected in parallel on the same circuit, one of said lamps being of relatively low voltage and high candle power and placed near the top of the post for illuminating purposes, and the other of said lamps being of relatively high voltage and low candle power and placed near the base of the post for warning purposes, and a plurality of transformers each supplying current to the lamps of one lamp post at the normal voltage of said low voltage lamp when both lamps are burning, and at the normal voltage of said high voltage lamp when it only is burning.

2. In a system of electric street-lighting, a series of lamp-posts provided each with a lamp relatively high above the ground, and another lamp relatively near the ground,

both of said lamps being connected to the same source of current, and means whereby when the circuit through said higher lamp is closed said lower lamp is dimmed, and when the circuit through said higher lamp is opened at the lamp said lower lamp burns brightly.

3. In a system of electric street lighting, a lamp support provided with a lamp near the top thereof and a lamp near the base thereof, the normal voltage of the first named lamp being less than that of the second named lamp, and a transformer, said lamps being connected in parallel to the secondary circuit of said transformer, the secondary current-voltage characteristic of said transformer being such that when both of said lamps are burning said first named lamp receives its normal voltage and said second named lamp receives less than its normal voltage and when said first named lamp is disconnected or its circuit is otherwise opened at the lamp said second named lamp receives its normal voltage.

4. In a system of electric street-lighting, a main transformer, a main circuit connected to the secondary of said transformer, a plurality of lighting stations, a plurality of local transformers, one for each lighting station, the primaries of these local transformers being connected in series in said main circuit, the secondary circuit of each local transformer constituting a local lighting circuit for each of said lighting stations, and a pair of lamps connected in parallel in each of said local lighting circuits, one of said lamps being of low voltage, large current and high candle-power and supported in an elevated position for illuminating purposes, and the other being of high voltage, small current and low candle-power and supported near the ground for warning purposes, each of said local transformers having a drooping secondary current-voltage characteristic such that when both lamps are in circuit said high candle-power lamp is served with the voltage and current adapted to cause it to glow at full candle-power and when only said low candle power lamp is in circuit it is served with the voltage and current to cause it to glow at its full candle-power.

5. In a system of electric street-lighting, a main transformer, a street circuit in circuit with the secondary of said main transformer, a series of local transformers, one for each lighting station, the primaries of these local transformers being connected in series in said street-lighting circuit, a local lighting circuit for each of said lighting stations in circuit with the secondary of the local transformer, and a pair of lamps connected in parallel in each of said local lighting circuits, one being of low voltage and high candle-power and supported in an elevated position for illuminating purposes, and the other being of high voltage and low candle-power and supported near the ground for warning purposes, the secondary current-voltage characteristic of said local transformer being such that when both lamps are in circuit only the high candle-power lamp glows brightly and when only the low candle-power lamp is in circuit it glows brightly.

6. In a system of electric street-lighting in which individual transformers are employed for supplying current to illuminating lamps, the combination of a plurality of lamp posts each supporting a main illuminating lamp near the top of the post, said illuminating lamp being of relatively large candle-power and low voltage and a warning lamp near the base of the post, said warning lamp being of relatively small candle-power and high voltage, both lamps being connected in parallel across the secondary of said transformer, the secondary voltage of said transformer varying when its secondary current changes, said voltage becoming lower when said current becomes greater, the voltage of said warning lamp being that of said transformer when the current flowing in the secondary of said transformer equals the current required by said warning lamp to produce its normal candle-power.

7. In a system of electric-street lighting, a lamp post, a transformer the voltage of the secondary of which increases when the current in the secondary decreases, an illuminating lamp supported near the top of the post, said illuminating lamp being of relatively low voltage and large candle-power connected to the secondary of the transformer, and a warning lamp supported near the base of the post, said warning lamp being of relatively high voltage and small candle-power connected in parallel with the illuminating lamp, said transformer being so constructed that the voltage of its secondary when only the warning lamp is burning is much higher than it is when the illuminating lamp is burning, said lamps being supported by said post.

8. In a system of electric street-lighting, a lamp post provided with two lamps, one of said lamps being an illuminating lamp supported near the top of the post, said illuminating lamp being of relatively low voltage and the other of said lamps being a warning lamp supported near the base of the post, said warning lamp being of relatively high voltage, said lamps being connected in parallel across the secondary terminals of an alternating current transformer, said transformer being so constructed that the voltage of its secondary when both lamps are burning is the same as the normal voltage of said

low voltage lamp and when only the high voltage lamp is burning is the same as the normal voltage of said high voltage lamp.

9. In a system of electric street-lighting, a lamp post provided with two lamps connected in parallel on the same circuit, one of said lamps being of relatively low voltage and high candle-power, supported near the top of the post, and the other of said lamps being of relatively high voltage and low candle-power, supported near the base of the post, and means supplying current to said lamps at the normal voltage of said low voltage lamp when both lamps are burning, and at the normal voltage of said high voltage lamp when it only is burning.

10. In a system of electric street-lighting a lamp post provided with two lamps connected in parallel on the same circuit, one of said lamps being of relatively low voltage and high candle-power, supported near the top of the post, and the other of said lamps being of relatively high voltage and low candle-power supported near the base of the post, and a transformer supplying current to said lamps at the normal voltage of said low voltage lamps when both lamps are burning, and at the normal voltage of said high voltage lamp when it only is burning.

11. In a system of street lighting a source of alternating current supply, a plurality of transformers having their primary coils connected in series on a constant current circuit from said source, a plurality of illuminating lamps connected one to each of the secondary circuits of said transformers, a plurality of warning lamps connected one each in parallel with said illuminating lamps on said secondary circuits, and a plurality of lamp posts each post supporting one of said illuminating lamps near the top of the post and one of said warning lamps near the base of the post, both of said lamps being connected to the same transformer, said illuminating lamp being adapted to glow at normal candle-power when both said lamps are in circuit and said warning lamp being adapted to glow brightly when it only is in circuit but to glow only dimly when both said lamps are in circuit.

In testimony whereof we affix our signatures.

CHARLEY G. BECKWITH.
WILLIAM E. DAVIS.