No. 747,212. PATENTED DEC. 15, 1903.

D. J. O'BRIEN.

DISPLAY LIGHT.

APPLICATION FILED MAY 20, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

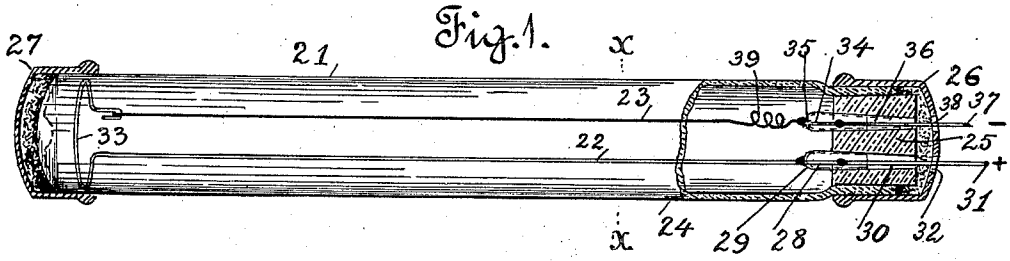


Fig. 2.

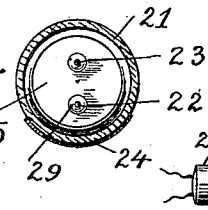


Fig. 3.

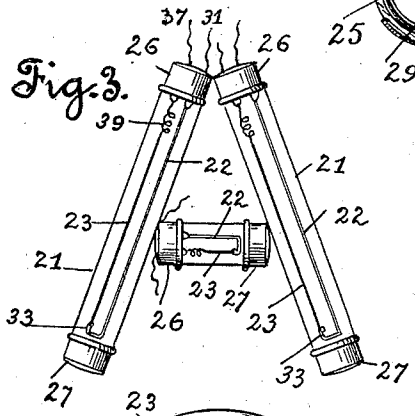


Fig. 4.

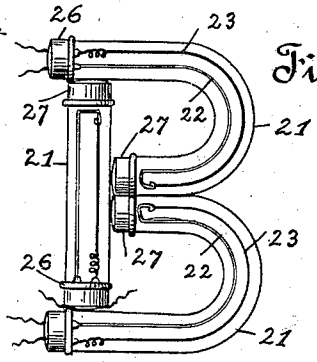


Fig. 5.

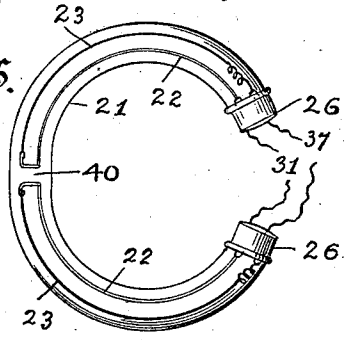


Fig. 6.

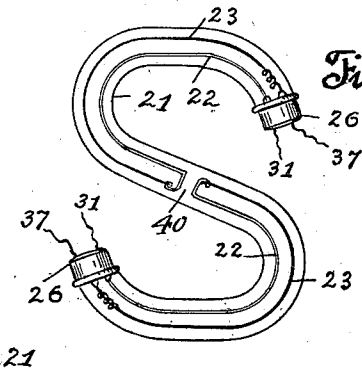
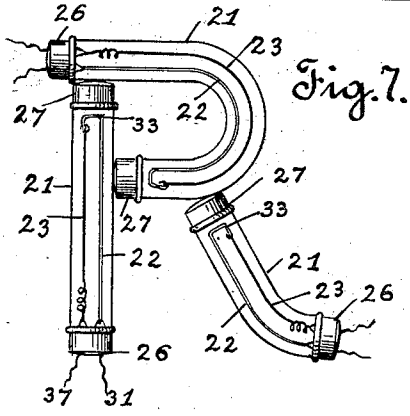


Fig. 7.



Witnesses.

Fellowtevendl.

Inventor.

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by A. H. Ste Marie

atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 8.

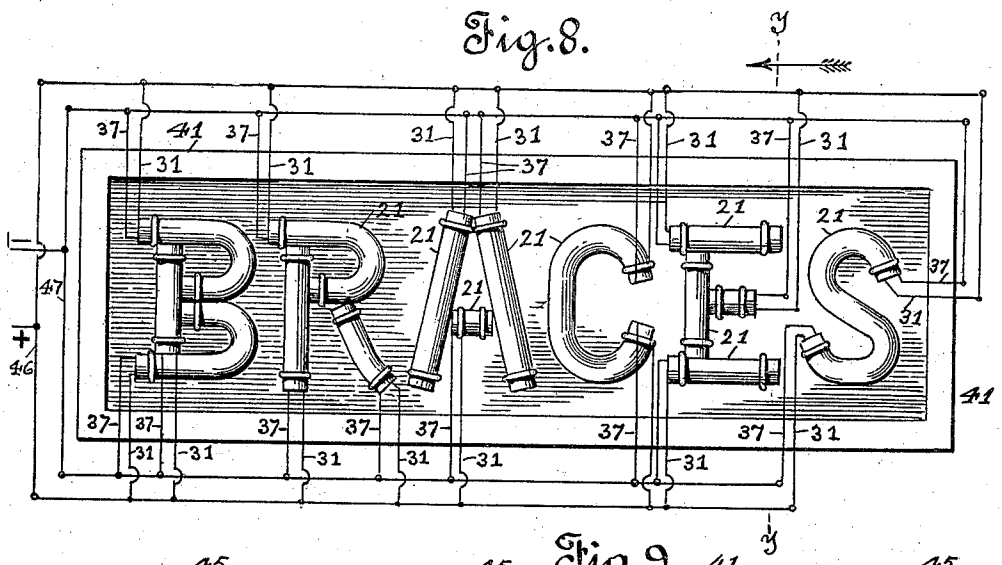


Fig. 9.

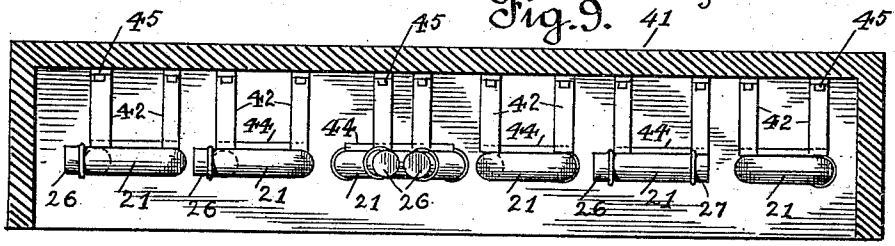
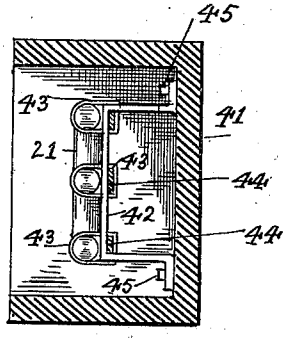


Fig. 10.



Witnesses.

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THE NORRIS PETERS CO. PHOTO-LITHO. WASHINGTON, D. C.

No. 747,212. Patented December 15, 1903.

UNITED STATES PATENT OFFICE.

DENNIS JOSEPH O'BRIEN, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO JOSEPH L. McCORMICK, OF SAN FRANCISCO, CALIFORNIA, AND O'BRIEN ELECTRIC LIGHT LETTER COMPANY, A CORPORATION OF CALIFORNIA.

DISPLAY-LIGHT.

SPECIFICATION forming part of Letters Patent No. 747,212, dated December 15, 1903.

Application filed May 20, 1902. Serial No. 108,287. (No model.)

To all whom it may concern:

Be it known that I, DENNIS JOSEPH O'BRIEN, a citizen of the United States of America, and a resident of the city and county of San Francisco, in the State of California, have invented certain new and useful Improvements in Display-Lights, of which the following is a specification.

This invention is a luminiferous article of manufacture adapted to be worked into a letter, figure, scroll, or other device of any desirable size, shape, design, or outline. It is particularly devised for electric incandescent lighting and in this respect can advantageously be utilized to form illuminated or illuminating signs, signals, symbols, and inscriptions of various sorts whether the same be devoted merely to practical or commercial uses or intended for ornamentation as well. I shall herein describe its application to the forming of letters and signs.

In explaining my said invention I shall refer to the accompanying drawings, in which I employ similar reference-numerals to designate similar parts throughout the several views.

Figure 1 of these drawings is a sectional side elevation of my invention, which is here made to represent the letter "I." Fig. 2 is a cross-section taken on the line $x\,x$ of Fig. 1 looking to the right. Figs. 3 to 7, inclusive, show the invention embodied in the letters "A," "B," "C," "S," and "R," each respectively in the order named. Fig. 8 illustrates one method of making an electric sign in accordance with the invention. Fig. 9 is a horizontal section of this sign, taken on a line running above the lettering and minus the wiring. Fig. 10 is a transverse section on the line $y\,y$ of Fig. 8 looking in the direction pointed by the arrow. The electric wires are also omitted from this Fig. 10.

Speaking first of the embodiment of my invention in simple rectilinear or amorphous devices, such as the Roman letter "I," (represented by Fig. 1,) it may be said to include the following-named characteristic elements: a glass tube, (numbered 21;) an electric conductor 22, lodged in and extending practically the full length of the said tube; a carbon filament or other suitable resistant thread 23, running parallel with and supported in its functional position within the tube by the said conductor, and a backing 24, of tin or silver amalgam, lining that part of the outer surface of the tube which underlies the conductor and is directly opposite the part overlying the said filament. As in ordinary incandescent lighting, the air is exhausted from the glass tube 21, which is afterward suitably plugged, capped, or sealed. In the drawings, Fig. 1, I have shown this tube open only at one end, the right end as the figure lies, and the same is stopped by a glass plug 25, cemented or sealed in. Over the stopper 25 is placed a cap 26, also secured by cement, and for the sake of symmetry a similar cap 27 is similarly fastened upon the opposite end of the tube, thus forming a letter which though plain is when lighted rather pleasing to the eye because of the harmonious relation and proper balancing of its components. Preferably the tube 21 is made cylindrical, as this form affords several advantages in the manufacture and treatment thereof; but it may also be flat-faced or angular or polygonal in cross-section, if desired. No limit is set to the scope of my invention in this respect.

The conductor 22 consists of a wire, copper or nickel preferred, particularly designed to convey the electric current and supply it within the tube 21 to the filament 23 in the manner hereinafter indicated. It is jointed by one end to a short platinum wire 28, fused in a gland-shaped glass insulator 29, that is firmly set in and projects inwardly from an aperture 30, provided in the stopper 25. This platinum wire is similarly connected with the incoming wire of an external electric circuit, which latter wire is marked 31, and enters the letter through an aperture 32 in the cap 26 and thence extends into the aperture 30 of the said stopper. At its other end the said conductor 22 is bent round, so as to form a loop 33, designed to follow more or less closely the inner periphery of the tube 21 and to prevent or nullify by contact therewith the vibratory power which the said conductor would otherwise possess and exert upon the filament

23. I have shown the simplest form of loop that can be made, and as it follows more than three-fourths of the internal circumference of the tube it is thought to be quite sufficient to impart to the conductor the desired stability. However, I may employ several other self-suggesting forms, such as the coil or spiral or convolute or compound curl, all of which are available for use with my invention. To the aforesaid loop 33 at the remote end of the conductor 22 is attached the aforementioned filament 23, which thence runs outward somewhat centrally of the tube 21 and parallel with the said conductor to a platinum wire 34, to which it is jointed. The latter-named wire is fused in a gland-shaped glass insulator 35, fixed in an aperture 36 of the stopper 25, as is done for the above-described analogous wire and insulator provided for the conductor 22. With the platinum wire 34 is also connected the outgoing wire (marked 37) of the electric circuit, which wire 37 passes through the said aperture 36 and a corresponding aperture 38, bored in line therewith through the cap 26. The said filament 23 is laid and stretched so as to be held at its two ends within the opposite ends of the tube 21 and kept moderately taut therein by the said conductor 22 or its loop 33 and by the said platinum wire 34. Thus it will be seen that this filament is supplied with current from its farther end in the tube 21 by the conductor 22, or if the electric current were reversed then the filament would discharge onto the conductor at the same end within the tube. This arrangement enables me to make the filament as long as may be consistent with the voltage to be carried, and therefore to use extra long tubes, without the least danger of its sagging or swaying or dropping while hot against one side of its glass inclosure and ruining it. Only one filament 23 has been shown in the drawings; but it is understood that a duplicate or even triplicate thread may be used, and all manifolding thereof is hereby reserved.

In order to provide for the differential expansion and contraction of the filament 23 relatively to the conductor 22, which is due to alternate heating and cooling as the electric current is turned on and off, I usually twist the said filament so as to form a suitable number of convolutions, as 39, at or near its end which is jointed to the platinum wire 34, or, if preferred, the wire 34 may be so twisted. These convolutions are designed to lengthen or shorten the filament gradually in proportion as the heat or cold may affect it.

The amalgam 24 is applied to the tube 21 in a suitable coating on about one-third of its circumference outside directly back of the conductor 22, as indicated in Figs. 1 and 2. This coating 24 forms a back reflecting-surface for the light emitted by the filament 23 when energized and glowing and intensifies it in a very desirable manner, making it appear under favorable conditions as if it had double or treble the candle-power which it ordinarily possesses.

My invention will be recognized as being embodied in substantially the form hereinabove specified with reference to the letter "I" in the other letters illustrated on the drawings hereto annexed and also capable of like incorporation in the entire alphabet from "A" to "Z." Thus it will be noticed that these other letters, Figs. 3 to 7, are each composed of one or more tubes inclosing parallel conductors and filaments interconnected at the end that is remote or farthermost from the outside electric circuit and generally comprise the structural details before noted. As the construction and functional duties of the constituents of each are the same as in "I," excepting the necessary bends and inclines and repeating of parts, it would be superfluous to describe them over again, and therefore they will be merely pointed out in the drawings each by its distinguishing numeral of reference. The composition of the various letter forms will, however, be referred to briefly to expose the peculiarities of each.

"A," Fig. 3, is virtually composed of three "I's"—that is to say, of three straight limbs or members, two disposed at an angle one to the other and the third lying across and interconnecting them. This is, I believe, the simplest and most convenient way of forming the letter "A" in pursuance of my invention, although other ways are also contemplated. In "B," Fig. 4, we likewise have three members—to wit, one straight member for its stem and two oppositely-flexed members for its curves.

The letter "C" (shown at Fig. 5) comprises but one tube bent to the required shape. This tube, on the other hand, includes two conductors and two filaments mated or paired and interconnected, as previously described. These pairs of conductors and filaments, as will be seen, are oppositely turned with relation to each other, and each pair is energized from its own end of the tube. The two pairs divide the letter into two halves, or nearly so, leaving only a small gap or vacant space 40 between them to allow for expansion under heat. I prefer to employ two filaments and their accompanying conductors instead of one filament and conductor in a letter having the development of "C," especially when large-sized, to avoid making the single filament very long, and consequently unable to withstand a strong voltage. The gap 40, it will be understood, is practically obliterated as the paired conductors and filaments approach one another in expanding under the influence of the electric current and owing to the diffusion of the light becomes otherwise imperceptible.

Fig. 6 gives us another example of a single-tube letter. The tube here is doubly curved to make an "S" and, as in "C," comprises two filaments and two conductors with a gap therebetween.

At Fig. 7 we have again a triple tube in the letter "R," each with its filament and conductor. It will be observed that three different forms of the tube appear in this view, making up, respectively, the straight stem or post of the "R," its upper rear curve, and its slanting outwardly-turned appendage.

It will be seen that in Figs. 3, 4, 5, 6, and 7, representing the five letters last described, the several conductors and filaments have been placed side by side as viewed from the face of the letter in each instance. Let it be understood that this arrangement is not the one intended for practical use and is presented merely as a diagrammatic illustration to facilitate the disclosure of my invention. The best practice requires that the filament be placed forward directly in front of the observer, with the conductor a short distance behind it. I have also omitted the reflecting-surface 24 and loop 33 from these views, partly because the views are rather small to show them very clearly and partly to suggest that they are not of the essence of the invention.

The composing of words for signs made with letters embodying my invention is illustrated in Figs. 8, 9, and 10, where the word "braces" appears. This word includes the five letters of Figs. 3 to 7, with the addition of "E," and will show how their several members (in the letters possessing more than one) may be assembled and how they and all other letters can be grouped and held together. The illustration represents the six letters "B R A C E S" disposed in a longitudinal line and edge to edge vertically in a box-shaped frame 41. This form of frame will be found convenient if mirrors are used in connection with the sign; otherwise a plain board or grating would be sufficient. As shown, the aforesaid six letters are held up within the box 41 each by a pair of vertically-disposed strips 42, rearwardly bent or flanged at the ends to keep the letters at a suitable distance from the back of the box, each strip being provided with clips 43, passed around and grasping opposite ends of each letter or the members thereof. Transversely-laid strips 44 unite the pairs of strips 42 and are embraced by the clips 43 at various points — that is, where bracing or steadying is required. The ends of the strips 42 are firmly secured to the back of the box or to the board by screws or nails, as 45. The electrical connections may be made according to any approved system. I have simply indicated in diagram an electric circuit comprising the customary wires, such as 46 and 47, to which are respectively connected the incoming and outgoing wires 31 and 37, hereinbefore referred to as leading to and from each conductor 22 and its filament 23.

All the letters herein shown and described are plain Roman letters with strokes of uniform width throughout and without serifs. These are the easiest to illustrate and to manufacture. Let it be noted, nevertheless, that it is within my invention, and peculiarly so, to make any letter pertaining to any language, whether it be characterized by homogeneity or by diversity of stroke, devoid or not of kern or serif, and whether a capital or a lower-case letter. Thus, to give but one instance, my invention is well adapted to make words or signs written in script or italics, and it will as well represent German text or old English with their caligraphic variations.

It should now be clear that my invention can assume any conceivable form that one may desire it to indue. I have described its application to the forming of letters and groups of letters solely; but one need not be versed in the science of electricity to perceive that from the variously-disposed straight and curved lines of which the few letters which I have illustrated are composed and their combinations can be formed either plain or decorative devices in endless variety, such as Arabic figures, scrolls, outlines, festoons, garlands, wreaths, &c.

The expression "glass tube" herein is intended to include and signify any hollow body made of any transparent or semitransparent or translucent material that may be found suitable for the purposes of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. In an electric lamp, the combination with a chamber of substantially the same cross-sectional diameter throughout, of a filament within the chamber, the filament having a permanent rigid connection at one of its ends and a permanent elastic connection at its opposite end.

2. In an electric lamp, the combination with a transparent receptacle rendered opaque in part and of substantially the same cross-sectional diameter throughout, of a filament therein provided with a rigid connection at one of its ends and an elastic connection at the opposite end so as to retain the filament in line opposite the transparent portion of the receptacle.

3. In an electric lamp, the combination with a chamber of substantially the same cross-sectional diameter throughout, of a filament therein, a rigid connection extending from one end of the filament to the exterior and an elastic connection extending from the opposite end of the filament to the exterior.

4. In an electric lamp, a transparent receptacle of substantially the same cross-sectional diameter throughout, a filament therein, a rigid connection from one end of said filament to the exterior and a spring connecting the other end of the filament to the exterior.

5. An electric sign comprising straight and curved members forming characters and symbols, the members being of different lengths, each member provided with a filament therein, the filament having a rigid connection secured to one of its ends and a flexible connec-

tion secured to its opposite end, means for securing the members in position and means for connecting them with a suitable source of electric energy.

6. In an electric lamp, the combination with a vacuum-chamber provided with an opening in one end, and an apertured plug closing the open end, of glands secured in the apertures in the plug, an apertured cap inclosing the open end of the chamber and conductors passing into the chamber through one of the apertures in the cap and through one of the glands and out of the chamber through a different gland and aperture.

7. In an electric lamp, the combination with a chamber, of a filament located therein, a permanent rigid connection secured to one end of the filament, the filament having a convolution formed therein and means for connecting the rigid connection and the filament with a suitable source of electric energy.

8. In an electric lamp, the combination with a chamber, of a filament therein, a conductor extending into the chamber, the conductor adapted to engage the interior wall of the chamber, and having one end secured to the filament and means for connecting the opposite end of the conductor and the filament with a suitable source of electricity.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DENNIS JOSEPH O'BRIEN. [L. S.]

Witnesses:

J. L. McCORMICK,

A. H. STE. MARIE.