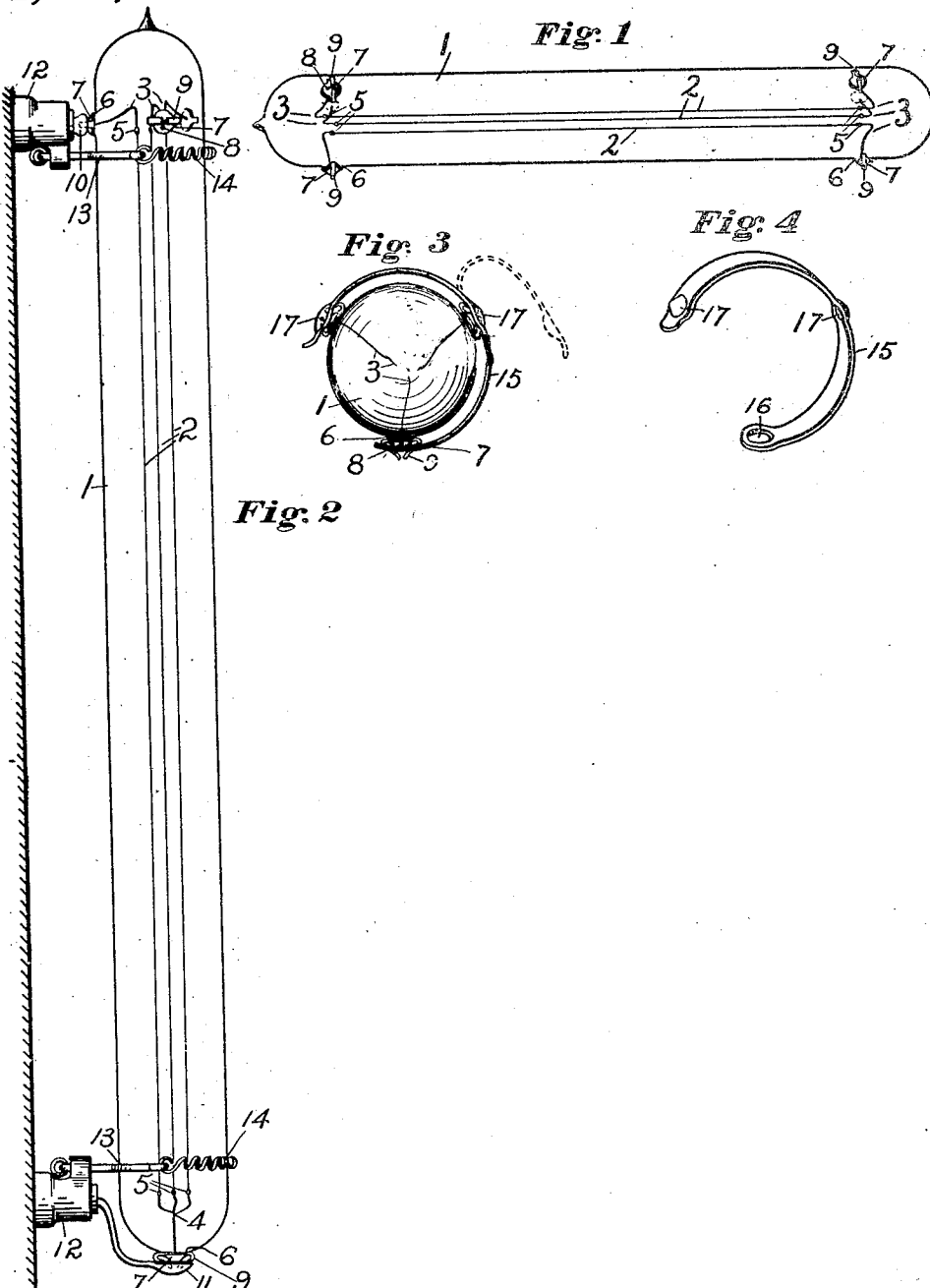


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 INCANDESCENT ELECTRIC LAMP.
 APPLICATION FILED JUNE 14, 1905.

Patented Sept. 8, 1914.

1,110,076.



WITNESSES:
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UNITED STATES PATENT OFFICE.

DENNIS JOSEPH O'BRIEN, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO STRAIGHT FILAMENT LAMP COMPANY, A CORPORATION OF NEW YORK.

INCANDESCENT ELECTRIC LAMP.

1,110,076.

Specification of Letters Patent.

Patented Sept. 8, 1914.

Application filed June 14, 1905. Serial No. 265,276.

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 a new and useful Improvement in Incandescent Electric Lamps, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention has for its object both to prolong the life and to increase the light-giving capacity of incandescent electric lamps.

It is a well-established fact that the standard grades of these lamps average but a little over 265 hours of life, and the poorer kind proportionately less, some being quite short-lived and becoming extinct or passing out of the domain of usefulness after a service of scant duration. With the best lamps of any make, the time comes when their filament gets so attenuated through usage and offers such resistance to the passage of the electric current as to increase the waste thereof beyond reasonable limits and render it advisable to replace them by new ones rather than maintain them at a greater expense. This failure of the filament, whether entirely consumed or worn out, is the principal cause of the lamp being unfitted for use and then treated as totally worthless, that is, as an object to throw away. Because the filament fails, though representing only a fraction of the cost of manufacture, the whole lamp ordinarily goes to the scrap-heap, notwithstanding that vast sums of money have been expended in the endeavor of finding a means to avoid such waste, and save an otherwise good lamp by changing or renewing its filament. Another fact, worthy of full consideration in this matter, is that filament-lamps, like other lighting devices, are used mostly at night, and when they do give out it is often impossible to replace them at once, or during the same night, with the result, frequently observed, that a place will be for a longer period than desired without its accustomed light or its complement of lights, for instance where the failing lamp or lamps formed part of a line or group, as in a display-window or in the several letters of a sign. Besides, there are numerous occasions, as during festival nights or on evenings specially devoted to business,

when a liberal user of electricity would welcome the possibility of heightening the candle-power of his or her lamps and not mind the extra expense in current, could it be done with the supply of lamps ordinarily employed, that is to say, without incurring the additional expenditure of a special installation for the purpose and using more lamps than are lighted at any other time.

For the above reasons, it is eminently desirable to have an incandescent electric lamp that will be longer-lived than any lamp of the same class heretofore made; one also whose capability to give light will not be permanently impaired or destroyed by the mere attenuation or burning out of a filament with which it is placed into circuit; and one capable further of yielding a high, divisible candle-power, the units whereof may be utilized singly or cumulatively or conjointly in divers combinations. The present invention produces such a lamp by providing it with a plurality of filaments capable of use together or in rotation. Two, three, or more filaments are placed in the one tube or bulb, and they are set and arranged so that each of them can be connected in the electric circuit separately and lighted alone, or any two, or any three or more, or all of them can be combined in the circuit and caused to burn collectively. By using the filaments successively one at a time, the life of the lamp is naturally lengthened as many times as there are filaments. When one of the filaments is burned out, it matters not whether the occurrence be nocturnal or diurnal, for nothing need be replaced and it is simply required, in order to keep the lamp burning, to change its position or connect in the circuit, as the case may call for, the second, third, fourth, or other of its reserved filaments, and the same lamp will continue to give light till each and every one of them has been consumed. On the other hand, when a more intense light than the ordinary is desired, the filaments can be brought into the circuit in twos and threes and so on according to the candle-power wanted, in which case, of course, none of the lamps that may thus be used will last as long as it would by consuming a single filament at a time and the expense will be higher, but the candle-power will be twofold, threefold, or manifold without corresponding increase

either in the number of lamps employed or of their attachments, fixtures, circuits, etc. The invention as here outlined is believed to be applicable to all forms of incandescent electric lamps, though for the sake of brevity and conciseness it has been deemed best to describe and illustrate the same only in connection with a well known form of tube-lamp.

10 In the accompanying drawing, Figure 1 is a side view of a small-sized lamp of tubular type, illustrating one embodiment of the invention. Fig. 2 is an elevation of a tube-lamp of larger size, fitted for use in a vertical position on its support. Fig. 3 is an end view of a similar lamp, provided with a connector for combining its filaments in various ways in the one electric circuit. Fig. 4 is a detached view of this connector, in perspective.

20 The tube form of the invention illustrated in Figs. 1, 2, and 3, comprises a glass envelop 1, preferably of uniform cross-sectional area throughout its body, but whose length and diameter may well be varied within certain limits. Lamps of this form are conveniently made in lengths ranging from 20 to 30 centimeters, and diameters varying from 2 to 2.50 cm. The envelop is to constitute the usual vacuum-chamber. The glass may be clear white, frosted, colored, multicolorous, and so on, as preferred.

30 Straight filaments 2 are used in the tubular envelop aforesaid. Any plural number of such filaments may be employed, from two upward, according as the size of the tube inclosing the same will permit. Three filaments have been shown in Figs. 1 and 2, but this number is merely given as an example. Whether in duplicate, triplicate, quadruplicate or higher sets, the filaments 2 are placed centrally within the tube 1, that is, as far removed from the side walls thereof as is practicable to place them, while maintaining them spaced apart sufficiently to prevent mutual interference. They are laid substantially parallel with the longitudinal axis of the tube, consequently in substantial parallelism with one another, and are held in their assigned positions by suitable anchors, as 3 (Fig. 1), or 3 and 4 (Fig. 2), secured to their ends, as at 5 (Figs. 1, 2 and 3). It is believed that the best results will be obtained by having these filaments at equal distances from a common center and one from another, for instance, as shown in Fig. 3, where they are triangularly and equidistantly disposed about the tube's axis, although other arrangements may be adopted with a fair measure of success. By following the arrangement illustrated, each one of the filaments will be seen, and the full quota of light obtained from each and every one of them when lighted, in whatever position the lamp may be turned on its axis.

thereby securing for the aggregate that peculiar advantage possessed by the straight filaments over the curved ones, and which is that they give continuous lines of light that are of uniform intensity, without blotches, and for that reason yield the most light in connection with multiplex reflective surfaces. No part of the light being hid, and none neutralized by convolutions or intercrossing of the filaments, every ray of light which it is possible to get out of the lamp will be gained and hence the highest candlepower obtainable will be had at the ordinary wattage.

80 The anchors for the plural filaments serve as electric conductors and are made of the usual metal or metals, such as platinum, or copper and platinum, or any suitable substitute therefor. One of these anchors, if not the pair, for each filament in the lamp, should have enough resiliency to perform the duty of a spring, to the extent of being kept under tension by the filament when cold and taking up the expansion thereof when hot. The form of anchor herein designated by the numeral 3 is favored for this purpose, the same consisting of a wire, or its equivalent, bent in the shape of an L, and secured to one end of the filament by its base or shorter member, while its stem or longer member is passed through and sealed in a small gland or protuberance, as at 6, on the outside of the lamp tube. The angle of the L will be more or less oblique according to the location of the gland and to what extent the wire must be bent back (or forward) to accommodate the particular filament with which it is connected. Besides operating to keep the filament straight at all times, this L-shaped anchor has the additional advantage of giving a terminal which does not coincide with the point of closure of the tube, but being located on the side allows free access to the wire, the angularity of which can be fixed to adjust the filament while the tube remains open at one end, and after the wire and filament are accurately set in their respective positions the tube can be exhausted of air and closed to insure the necessary vacuum, without using a side tubulure. As to the anchor for the other end of the filament, it may be a duplicate or counterpart of the L, in which case each filament has its two terminals entirely separate from the others, as shown in Figs. 1 and 3; or the anchor 4, which is three-pronged or substantially in the shape of a trident, may be used instead, and in the latter case there is a separate terminal for only one end of each filament and the other ends of the several filaments have one common terminal, as illustrated in Fig. 2. These ends of the filaments, it will be seen, are secured one to each prong of the trident anchor 4, the stem or shank whereof is sealed

in the glass analogously to and does the same work as the longer members of the three anchors, while its prongs respectively replace their shorter members. The stem of the trident is shown as running straight to its own end of the tube, coincidently with the point of closure at that end, which arrangement is suitable, but this can be changed if desired, since there is nothing to preclude bending the anchor 4 so as to lead it in some other direction, it being made of same wire as the anchor 3. The trident itself, it is understood, would be changed to a two-pronged or to a four-pronged or multi-pronged anchor in like ratio as the number of filaments inclosed in the tube and having the common terminal would be diminished or augmented.

To properly adapt the above-described tube-lamp to the electric circuit, metallic caps 7 are cemented over the glands 6, and the outer ends of the anchors 3 and 4 are brought out sufficiently to pass through and be soldered upon them, as indicated at 8, Figs. 1, 2 and 3. These caps are provided each with a pair of marginal lugs 9, extending from opposite sides and folded back and up to fit snugly between or within spatular contact-pieces 10 or 11, secured in sockets 12 and projecting more or less out of the same. The lamp may be held to its sockets by any suitable means, for instance, with the aid of forked holders and light spiral springs, as suggested at 13 and 14, Fig. 2. The lugged caps, it will be noted, are peculiarly well adapted to effect good electric contacts and prevent undue concentration of heat at any single point.

The lighting of the filaments successively, one after another, requires no explanation. It is patent that a partial rotation of the tube-lamp within or relatively to its holders (one-third revolution in the illustration given) will each time bring into action a different filament, whether it be provided with terminals entirely separate from the others, as in Fig. 1, or with one separate and one common terminal, as in Fig. 2. As one filament is consumed, the lamp can be revolved to the next contact points upon its sides, or upon one of its sides and one of its ends, and a fresh filament placed in circuit, which when burned out will in turn be substituted by another, and still another, according to the number of filaments comprised in the lamp. The maximum duration of the lamp may be attained by using it in this manner, and if the glass envelop be properly exhausted of air, and freed from other gases as well, it will not fail to trans-

mit such light as any of the filaments is able to emit under normal conditions.

A connector is employed when it is desired to place two or more or all of the filaments together in circuit. A suitable form of such connector for the filaments of the tube-lamp is shown in edge and perspective views respectively in Figs. 3 and 4, where the same is designated by the reference number 15. As there represented, this form of connector consists of a light band of flexible metal, having a hole 16, through which is passed the lugged cap to be used for making the electric contact, and pockets 17, which the other caps at the same end of the lamp are adapted to enter. When the several caps corresponding with the separate terminals at one end of the lamp are thus connected, and the lamp is socketed, as in Fig. 2 for example, all the filaments are lighted together and burn at the same time. But if it is desired to light only two out of three or less than the whole number of filaments, then the connector can be bent back, as indicated by dotted lines in Fig. 3, and such filament or filaments as one does not want to use will be cut out. The amount of light can easily be regulated in this manner, and the lamp made of 16, 32 or 48 candle-power and over, at option, as circumstances may require or suggest.

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

1. An incandescent electric lamp comprising a glass tube, a plurality of filaments therein, metallic anchors for said filaments secured in outwardly-projecting glands of the tube, metallic caps over said anchors and glands, means for placing the caps pertaining to one filament in the electric circuit, and a flexible metallic band capable of connecting two or more filaments through their respective caps at one end of the tube.

2. An incandescent electric lamp comprising a glass tube, a plurality of filaments placed off center and held in parallelism therein, a plurality of peripheral contacts located opposite the ends of said filaments, anchors connecting said filaments with said contacts, and a flexible connector adapted to encircle one series of contacts at either end of said tube and place any one or all of the contacts of the series in the electric circuit.

In testimony whereof I affix my signature in presence of two witnesses.

DENNIS JOSEPH O'BRIEN.

Witnesses:

A. H. STE. MARIE,
HENRY P. TRICOU.