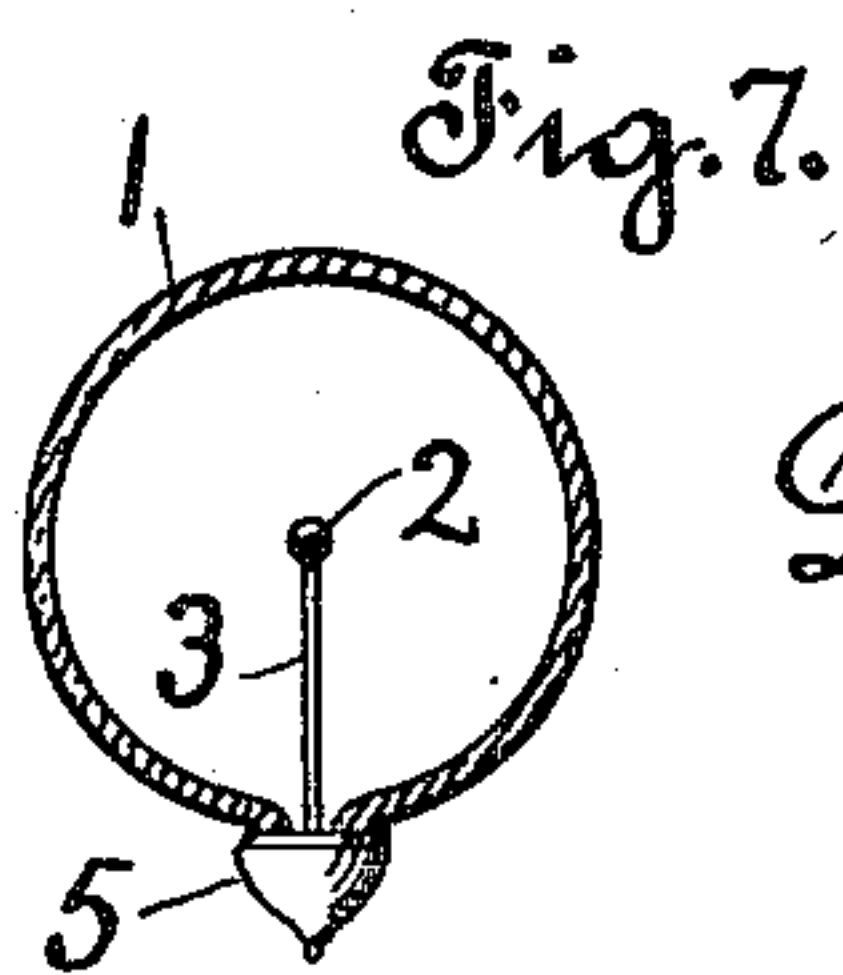
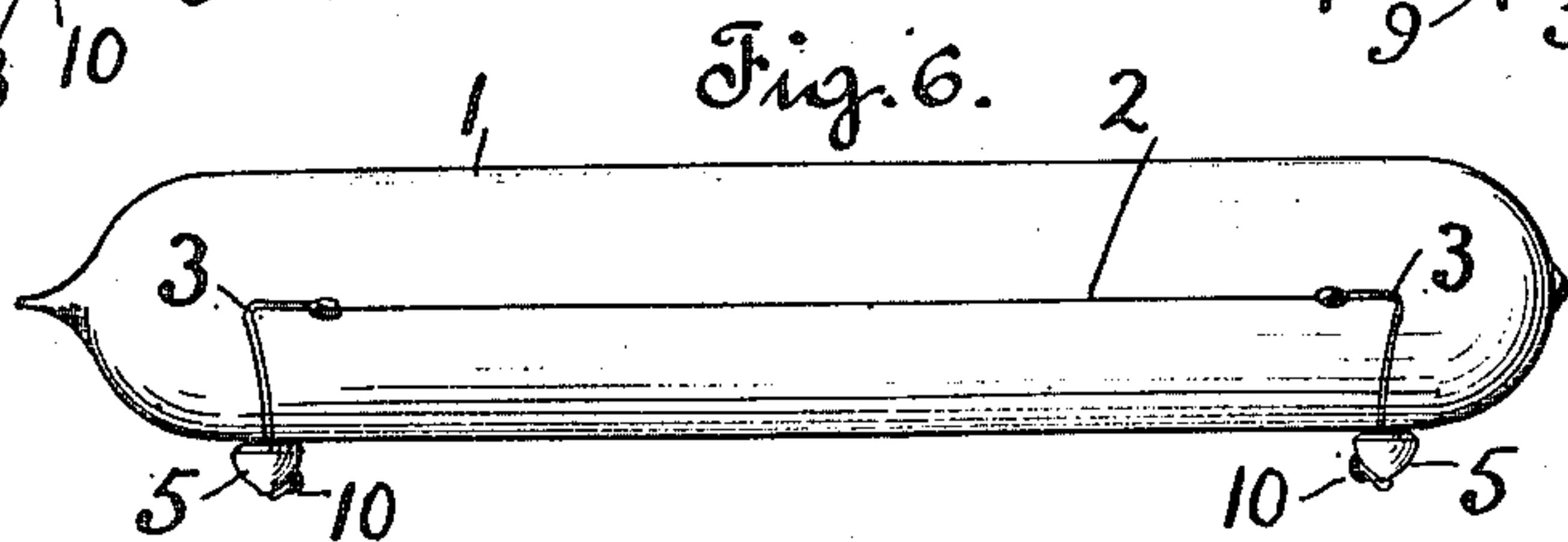
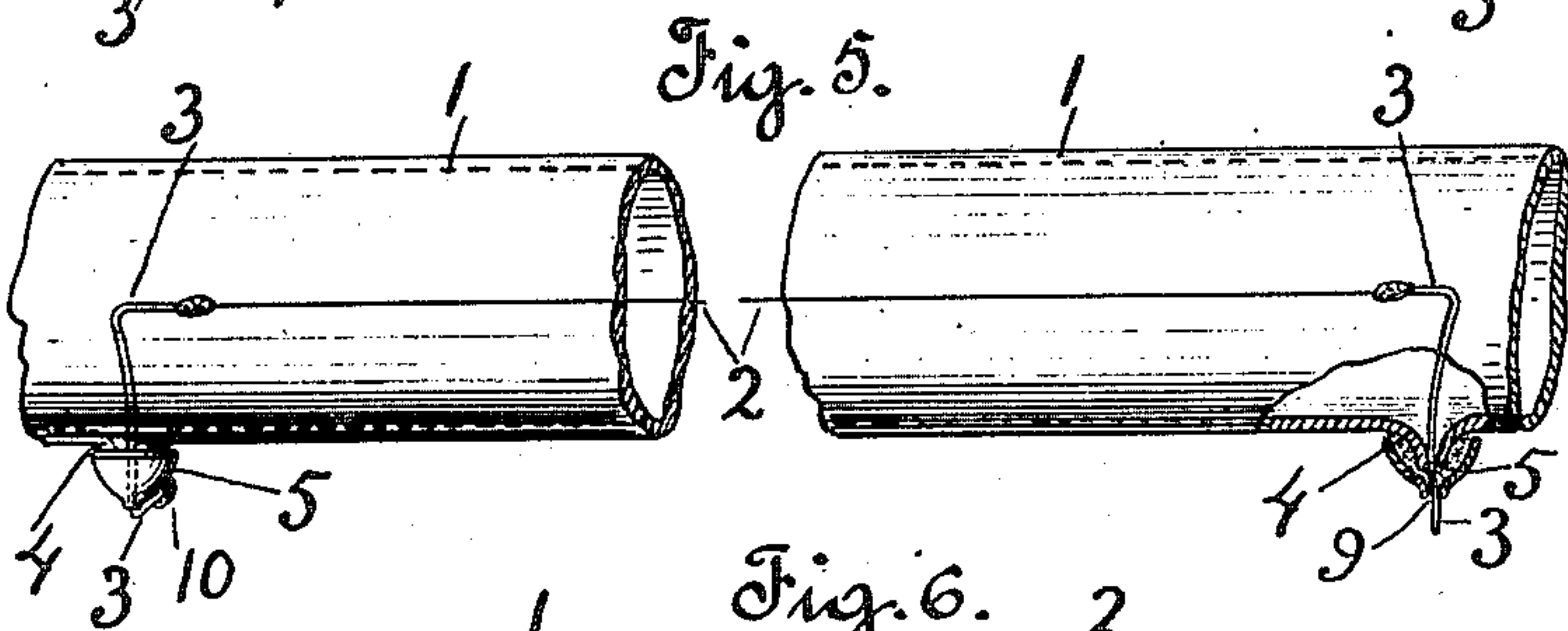
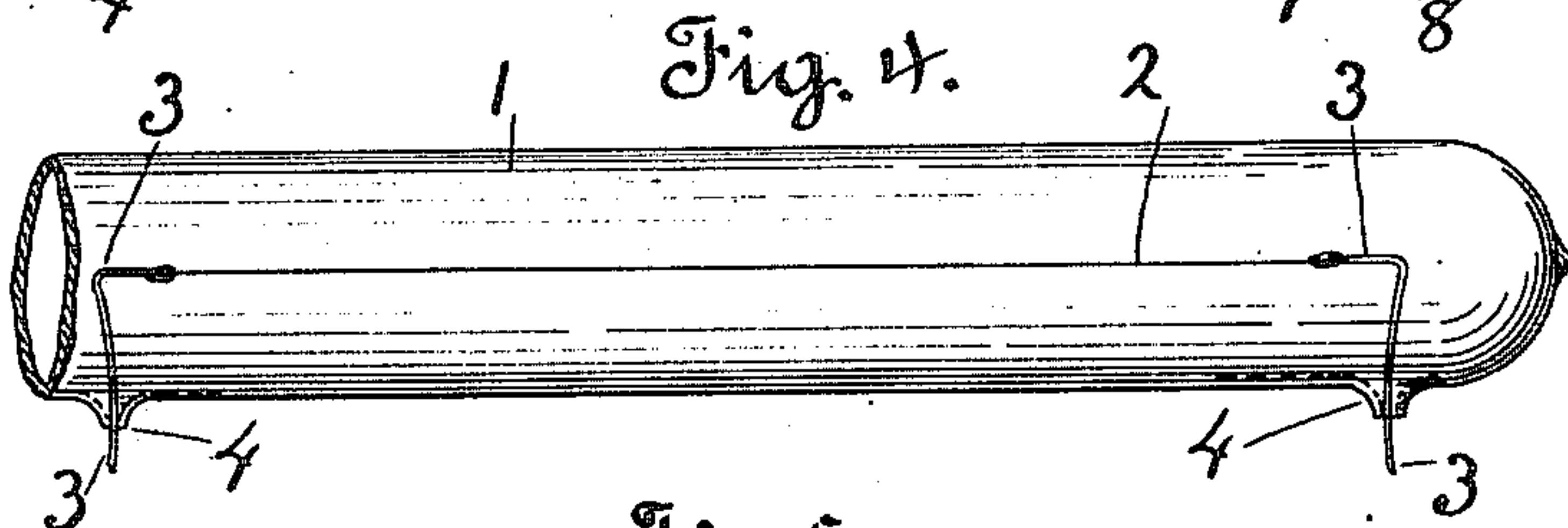
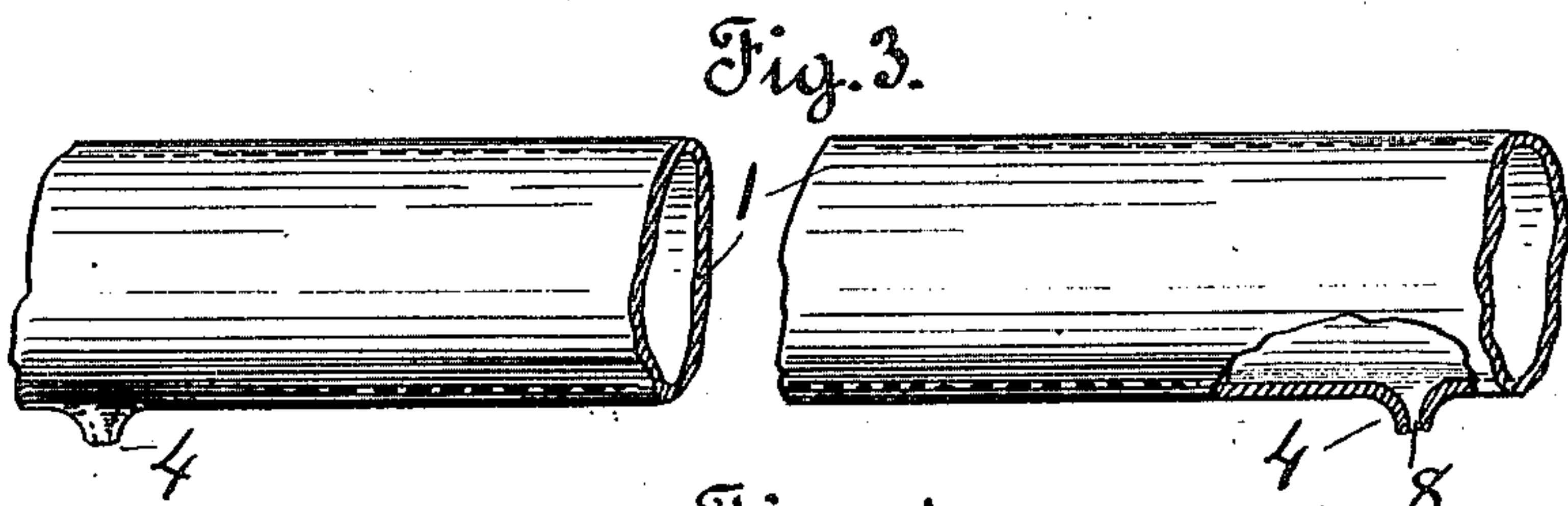
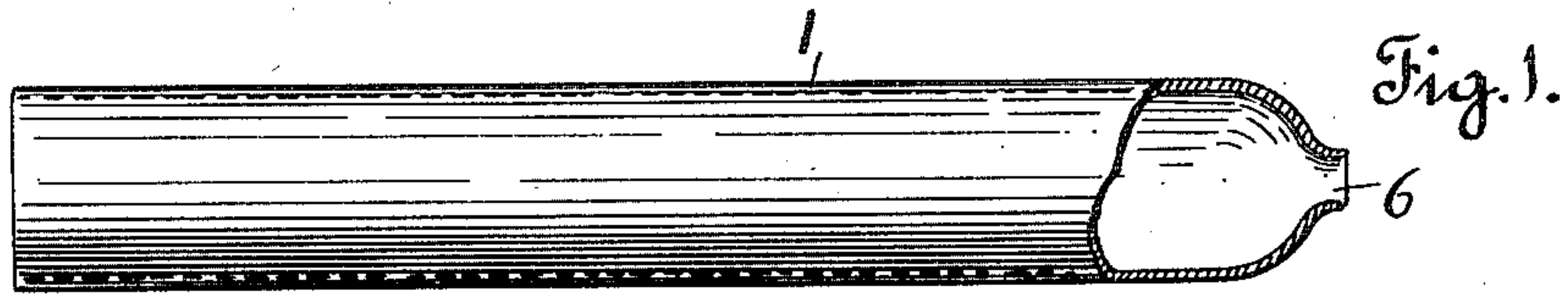


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MANUFACTURE OF INCANDESCENT ELECTRIC LAMPS.
APPLICATION FILED JULY 22, 1904.

964,474.

Patented July 12, 1910.



Witnesses.

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UNITED STATES PATENT OFFICE.

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MANUFACTURE OF INCANDESCENT ELECTRIC LAMPS.

964,474.

Specification of Letters Patent.

Patented July 12, 1910.

Application filed July 22, 1904. Serial No. 217,739.

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 the Manufacture of Incandescent Electric Lamps, of which the following is a specification, reference being had therein to the accompanying drawing.

It is the object of this invention to provide a simplified, accurate, and, at the same time, cheap method or process of manufacturing tubular incandescent electric lamps having rectilinear filaments, that is to say, lamps in which the vacuum-chamber consists of a transparent glass tube of substantially the same cross-sectional area throughout and incloses a centrally disposed straight-line filament that is anchored at opposite ends thereof, usually by means of more or less resilient platinum wires protruding exteriorly of the tube, through metallic caps or bells thereon, to which these wires are respectively soldered. By the previously employed methods of manufacture, it was impossible to produce a given number of this form of incandescent lamps of uniform length, as the operations of adjusting and anchoring the ends of the filament and of sealing the ends of the tube were necessarily simultaneous. Since the platinum springs, to which the ends of the filament were secured, were anchored in the ends of the tube, the only manner in which the filament could be properly adjusted was by drawing out the ends of the tube to a greater or less extent during the process of sealing them. This also necessitated the use of a lateral vacuum-tube, fused into a specially made opening on one end of the main tube, in order to exhaust the air, and when that had been accomplished and the special opening sealed, a projection was left upon the end, which was found to be not only inconvenient, but dangerous as, if broken, air would be admitted into the tube, rendering the lamp useless. The variation in the length of the lamps made it difficult to secure proper connections between the bells or caps placed on the ends of the tube and the metallic springs into which they were usually fitted when the lamp was placed in circuit; as, for instance, if the springs were placed at a dis-

tance of twelve inches apart, a lamp a quarter of an inch greater or less in total length could not be fitted into them.

The faults and inconveniences prevailing in the old methods of manufacture, and the difficulty experienced in adapting the lamp to its connections, will be obviated by the substitution of the new and improved process herein disclosed.

The accompanying drawing is a part of this specification and in it Figure 1 is a partly broken side elevation of the glass tube from which the body of the lamp is to be made, showing how one end thereof is nearly closed, which is the first step in the process. Fig. 2 is a partial side elevation of the tube represented in Fig. 1 after a smaller tube has been fused into the partly closed end preparatory to creating a vacuum in the body of the lamp. Fig. 3 is a somewhat enlarged side view of the tube broken and sectioned, showing glands drawn out at the points where the filament anchors are to be fixed. Fig. 4 is a view of the tube with the filament inserted and adjusted therein, both its anchors having been fixed and sealed in the glands, and one end of the tube closed. Fig. 5 presents another enlarged view of the tube, similar to Fig. 3, with metallic caps in position upon the glands. This view illustrates both the capping of the glands and the soldering of the anchors under the same. Fig. 6 is a side elevation of the complete lamp. Fig. 7 is an enlarged central cross section of Fig. 6, looking from either side.

As seen in Figs. 6 and 7, the lamp to the manufacture of which this process is intended to be applied consists of a cylindrical glass tube 1, inclosing a carbonized thread or filament 2 sustained in a central position therein by means of two anchors 3, which are sealed in glands 4 drawn out from the under side or wall of the tube. Upon these glands small caps 5, of brass or copper, are cemented in order to adapt the lamp for connection in an electric circuit. The anchors are made of resilient platinum wire bent so as to form angular springs which exert an end-ward pull upon the filament, keeping it taut when cold, and in a straight line at all times, regardless of the presence or absence of the electric current. The ends of these anchors that are remote

from the filament pass through small holes in the central parts of the caps and are bent back and soldered upon them. In order to place this form of lamp in connection with the source of electrical energy, metallic spring-contacts are provided into which the brass or copper caps on the under side of the glass tube fit and against which they are held by spring clamps embracing the tube near the ends. These spring-contacts and clamps are not shown in the accompanying drawing because they constitute no part of the present invention, but suitable forms thereof are illustrated and described and full particulars given about this lamp as an article of manufacture (distinguished from the process of making the same) in a separate application for Letters Patent of the United States filed by me on the 25th. day of May, 1903, Serial Number 158,726, (now Patent No. 768,479, issued on the 23rd day of August 1904) to which reference is hereby made.

As illustrated in the drawing, the improved method or process of manufacture consists of the following steps which are preferably performed in the order given, but which may be transposed to some extent if required. A glass tube 1, sufficient in length to make the body of the lamp the desired size, is partially closed at one end, as in Fig. 1, leaving a small opening 6 therein preparatively to exhausting the air from the tube. This opening is reamed round, by means of the proper tool, and into it is fused a smaller glass tube 7, shown in Fig. 2, to afford a connection with the exhaust pump, through which the vacuum is to be created. At the points on the under side or wall of the large tube 1 where the ends of the anchors 3 are to be fixed, small glands 4 are drawn out and suitably apertured at 8, as seen in Fig. 3, to let one end of each anchor pass; this part of the process being performed in the manner familiar to every glass blower. These glands, as Fig. 6 shows, serve to secure the ends of the anchors in the side or cylindrical part of the tube instead of in the ends as was done formerly, so that it is now possible to anchor the filament and adjust it properly before the tube need be closed at either end. The glands 4 are placed at such a distance from the ends of the tube that the greatest possible length of filament is presented and, at the same time, the danger of contact with the end walls of the tubular glass envelop inclosing it is obviated. Since in manufacturing any number of lamps of a given length by this process, the distance between the glands can be kept uniform, the length of the filament and the strength necessary in the platinum spring anchors to keep it in an uniformly straight line under all thermal conditions may be easily ascertained, and hence,

but little manipulation will be necessary to adjust the filament and its anchors after having inserted them through the open tube. After the anchors with the filament secured to them have been inserted and properly adjusted, as in Fig. 4, they are sealed in the glands, allowing the ends to protrude slightly. One end of the tube is then closed. The small brass or copper caps 5 are perforated centrally as at 9, Fig. 5, and are cemented to the glands so as to permit the ends of the platinum anchors to protrude through both the glands and caps and to be bent back upon the latter and there soldered, as at 10, thus adapting the lamp to be placed in an electric circuit. The small glass tube 7, previously fused into one end of the glass casing 1, is then attached to the exhaust pump, a vacuum created in the body of the lamp and the end sealed in the usual way. After the small tube is removed and the end closed, the lamp is complete and ready to be used. Fig. 6.

The many advantages which this process of manufacture has over those previously in use will be readily seen and hence none but the more important will be enumerated. By this improved process, any number of lamps can be produced of equal size, and the filament inserted and delicately adjusted in each, by means of its spring anchors, while the end of the tube remains open, thus affording facilities and insuring results which it has not heretofore been possible to obtain. The metallic caps, whose function it is to place the lamp electrically in circuit, are placed on the under side and will always be an exact distance apart in any number of lamps of equal size, hence the lamps will be adjusted to their contacts and connections with great ease. As it will be neither necessary nor useful to exhaust the air from the tube through a specially made opening out of line with the filament, there will be no projection on the end of the tube to make the lamp unsightly and dangerous. A great advantage will be the straight, practically unbroken line of light which will be produced by placing a series of lamps end to end, the several ends remaining uncovered owing to the fact that the filament is anchored to the under wall in each lamp and side terminals only are used. The various steps in the process are easily performed and are so timed as to save much labor and inconvenience to the workman, the result being that the cost of production is minimized.

No claim is made herein to the above described lamp as an article of manufacture, as this is fully covered in my aforesaid patent application Serial No. 158,726 (Patent No. 768,479), but what I desire to claim herein and to secure by additional Letters Patent of the United States is the art, method or process which enables me to produce the said

lamp, and which art, method or process it is my intention to cover in its sundry steps or phases, with all possible variations.

I claim—

5 1. The herein described process for the manufacture of electric tube-lamps which includes the following operations, viz: preparing the tube for the exhaust-pump; glanding the tube outwardly and laterally; 10 inserting the filament in the open-ended tube and anchoring the ends of the filament to the glands; capping the glands and fitting both their caps and the outer ends of the anchors for connection in an electric 15 circuit; pumping the air out of the tube and sealing the tube.

2. The herein described art, process, or method of manufacturing tubular incandescent electric lamps having rectilinear filaments, which comprises the following steps, 20 to-wit: partially closing the tube at one end; fusing an auxiliary exhaust-tube into the partially closed end of the tube; drawing out glands from the side of the tube and 25 opening the same; inserting the filament in the open tube and fixing and sealing its anchors in the apertured glands so they will exert the proper pull on the filament; closing the end of the tube remote from the exhaust-opening; capping the glands and 30 adapting the anchors and filament for connection in an electric circuit; exhausting the air from the tube; removing the auxiliary exhaust-tube and sealing the lamp.

3. The process of manufacturing electric lamps comprising the formation of a perforated gland at a point intermediate the 35 open ends of a hollow transparent tube, placing an anchor in the perforated gland through the adjacent open end of the tube, 40 adjusting the filament and anchor through the adjacent open end of the tube, securing the anchor in position, exhausting the air in the tube, sealing the end of the hollow 45 tube and securing the contact cap to the protruding end of the anchor.

4. The process of manufacturing incandescent lamps comprising the formation of perforated glands extending laterally relative to a hollow transparent tube open at its 50

ends, placing anchors to which a filament is attached, in the perforated glands, the anchors being positioned in the glands through the open ends of the tube, adjusting the anchors and filament from the opposite open 55 ends of the tube, securing the anchors in the glands, closing one end of the tube, exhausting the air within the tube through the remaining open end, closing such end and securing the contact caps to the protruding 60 ends of the anchors and to the glands.

5. The process of manufacturing incandescent lamps comprising the formation of perforated laterally extending glands intermediate the opposite open ends of a hollow 65 tube, placing anchors to which a filament is secured, in the glands and within the tube, securing one of the anchors in place in the gland, adjusting the remaining anchor through the adjacent open end of the tube, 70 securing such anchor in place, securing the contact caps on the protruding ends of the anchors and to the caps, closing one end of the tube, securing a small tube to the opposite end of the tube and in alinement therewith, exhausting the air from the lamp tube 75 through the small tube and closing the remaining open end of the lamp tube.

6. The process of manufacturing incandescent lamps consisting in forming laterally and outwardly extending perforated glands exteriorly of and adjacent the opposite open ends of a transparent lamp tube, placing anchors, to one end of each of which 80 is secured a filament, in the perforated glands adjusting the anchors in the glands from the opposite open ends of the tube, securing perforated contact caps on the projecting glands, the protruding ends of the anchors passing through the perforations in 85 the caps, securing such protruding ends to the caps, closing one end of the lamp tube, exhausting the air from the opposite open end thereof and then sealing such open end.

In testimony whereof I affix my signature 95 in presence of two witnesses.

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

Witnesses:

AMBROSE GHERINI,

A. H. STE. MARIE.