

No. 759,650.

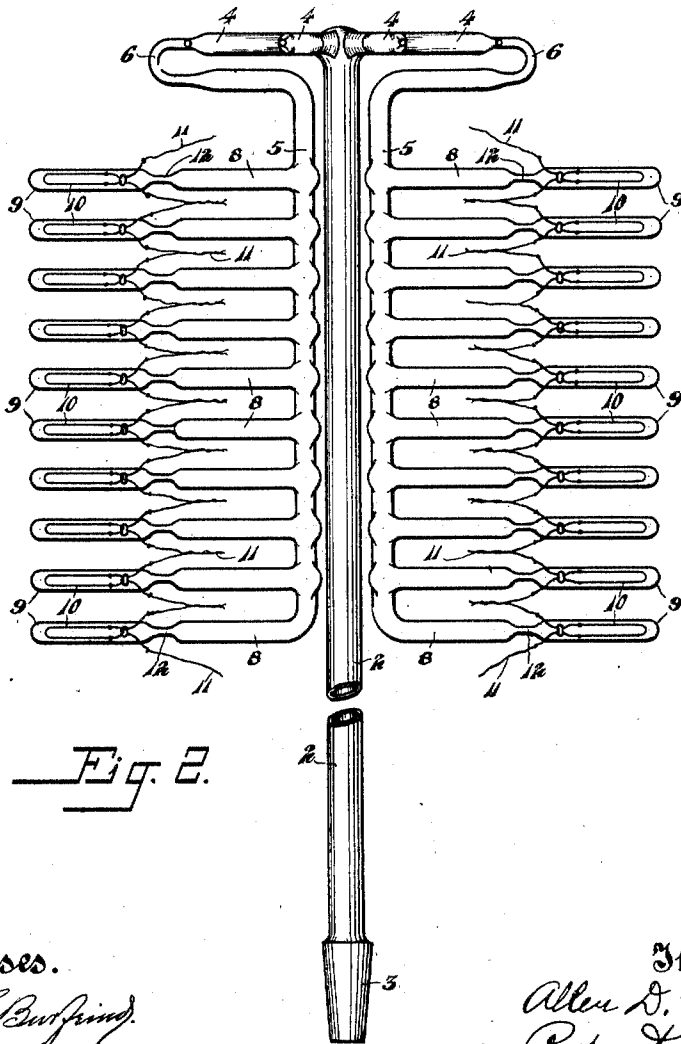
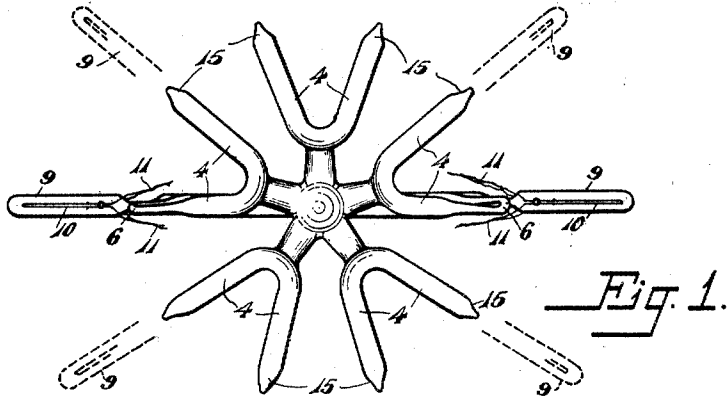
PATENTED MAY 10, 1904.

A. D. WHIPPLE.  
MANUFACTURE OF SMALL INCANDESCENT LAMPS.

APPLICATION FILED DEC. 5, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses.  
*R. H. Burdick*  
*E. A. Harlock*

Inventor:  
*Allen D. Whipple*  
by *Robert Lewis Ames*  
Attorney.

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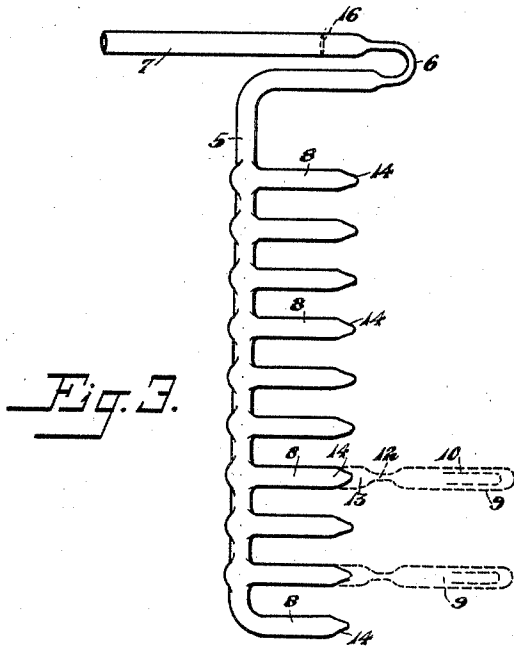


Fig. 3.

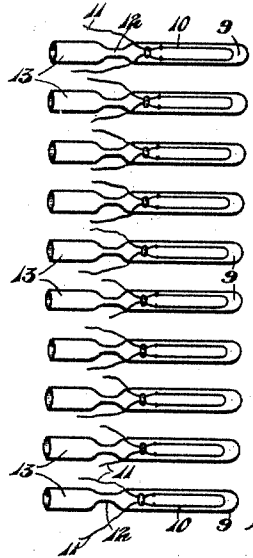


Fig. 4.

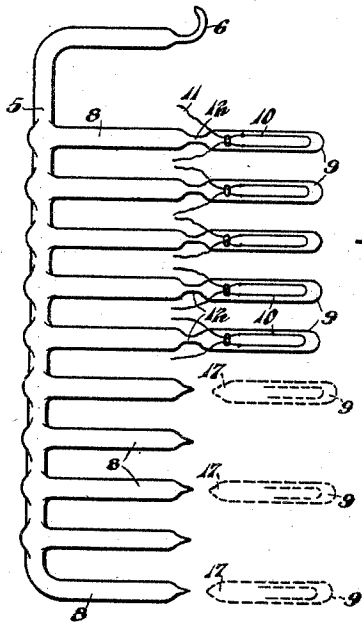


Fig. 5.

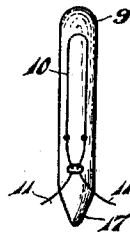


Fig. 6.

Witnesses.

R. H. Burford.  
E. A. Harlock.

Inventor:  
Allen D. Whipple,  
by Robert Leard Ames,  
Attorney.

# UNITED STATES PATENT OFFICE.

ALLEN D. WHIPPLE, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## MANUFACTURE OF SMALL INCANDESCENT LAMPS.

SPECIFICATION forming part of Letters Patent No. 759,650, dated May 10, 1904.

Application filed December 5, 1903. Serial No. 183,867. (No model.)

*To all whom it may concern:*

Be it known that I, ALLEN D. WHIPPLE, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in the Manufacture of Small Incandescent Lamps, of which the following is a specification.

My invention relates to improvements in apparatus for manufacturing small incandescent lamps. In the manufacture of lamps of this type heretofore it has been common to attach the same directly to the fork of a suitable mercury-pump, such fork being detachable, so that the lamps could be connected thereto more readily; but when it came to detaching the lamps after the air had been exhausted from them the fork could not be removed from the pump on account of again letting the air into the lamps. As is well known, in this class of work the lamps must be connected with the tube, so that they may be detached or "sealed off," as it is called, without letting the air either into the fork or into the lamp-bulbs. This is commonly done by means of a sealing-off connection, which consists of a contracted portion of the glass tube that connects the lamp to the fork. A gas-flame applied to the contraction causes its comparatively thick walls to soften, and the pressure of the atmosphere collapses them to close the opening through the tube. Then by skillfully drawing the lamp away from the fork it is separated at the heated portion of the contraction, and as the glass cools both severed ends are sealed. If an attempt is made to seal off a lamp without the contraction, the walls of the tube as soon as they become heated "suck in," as it is termed, to form a bubble in both directions in the tube, which immediately breaks and permits air to rush in. Even with the contractions great skill and care is required in order to thus successfully seal off the lamps.

The admission of air to the fork in sealing off a lamp not only renders necessary the repumping of the whole number of lamps attached to the fork, but what is of greater im-

portance the pump itself, which is made of glass and is provided with mercury-valves, is almost invariably broken by the rush of the mercury from one part of the pump to another whenever air is thus accidentally admitted to the fork. The whole top of the pump is usually shattered, and there is danger of injury to the attendants by flying particles of glass. Also in this method of the prior art it was necessary to secure each lamp individually to the pumping-fork by means of a sealing-off contraction, and since the fork is of considerable size and weight, in practice usually about two feet in length and one-half inch in diameter, with heavy walls to withstand the pressure of the atmosphere, and since skill is required to make such connections it was with considerable difficulty that the lamps were attached to the fork in the first place. In fact, owing to the difficulty in handling them the greatest number of lamps that it has been found practicable to thus attach to one stem or fork is about forty, and these are arranged in two clusters about the fork, each cluster consisting of twenty lamps secured to as many radiating branches of the fork.

By my invention I wish to provide means for increasing the output or number of lamps that can be readily pumped, in connection with each fork, to decrease the necessity for the employment of skilled labor in order to attach and detach the lamps, and to decrease the liability of breaking the pump, as well as to prevent the necessity of repumping the lamps. In the accomplishment of these objects I provide a plurality of glass prongs to which the lamp-bulbs are individually attached by means of suitable sealing-off or, rather, tipping connections and which prongs are themselves adapted to be attached by suitable sealing-off connections to the fork. The lamp-bulbs are thus easily attached to the light and easily-handled prongs by a comparatively unskilled operator instead of being individually attached to the heavy and awkward forks used in the old method of pumping. The prong itself, as stated, carries a contraction of suitable size for sealing-off

from the fork, thus obviating the necessity for making a contraction for each individual lamp, as was done in the old process. This saves much time in attaching the lamps, as well as detaching them after the pumping process is completed. In order to detach the lamps after pumping, the entire group is sealed off from the fork at the contraction, thus incurring the liability of breaking the pump but once for each group of lamps instead of once for each individual lamp, as in the old process. Owing to a less number of branches of the fork being required for the said prongs than for the individual lamps of old, the workman has more space in which to perform the sealing-off operations and with a consequent less liability to failure.

When the prongs have once been sealed off, as described, they are comparatively light and can be handled with ease, so that it is possible to take the individual lamps off from the prongs at a bench, and this work can be done by comparatively unskilled labor. When thus working at the bench, the lamps may be turned and twisted by the fingers to form a suitable tip thereon, which is impossible when sealing the lamps off the fork itself.

It is common in the practice of my invention to attach to each fork at least one hundred lamps; but more may be provided, depending on the number of lamps to the prong, which is only limited by the length of the fork-stem and by the number of prongs to the fork. Thus it will be seen that in order to pass, say, one hundred lamps, from the stage in which they are ready to be assembled for pumping to the condition in which they are said to be tipped or ready for the terminals required by the old method one hundred contractions are made and in sealing off two hundred seals are made, one for each lamp in detaching from the pump and one for the tipping operation, while by my invention but ten contractions are made for one hundred lamps, one for each prong and in sealing off only one hundred seals are necessary, because the tip is made in detaching the lamps from the prongs.

My invention is illustrated in the accompanying drawings, in which the same reference characters are used throughout to designate like parts, and in which—

Figure 1 is a plan view of a pumping-fork, showing lamps attached to some of its branches, while other branches show their condition after the prongs have been detached. Fig. 2 is a side elevation of a fork to which the prongs with their group of lamps are attached to its opposite sides. Fig. 3 is a detached view of a prong before the lamp-bulbs are secured thereto and before it is attached to the fork. Fig. 4 is a view of the lamp-bulbs in the condition in which they are attached to the prongs. Fig. 5 shows a view of the prong after it has been sealed off from the pumping-fork, and its lower end shows its con-

dition after the lamps have been sealed off from the prong; and Fig. 6 is a view of the bulb after it has been disconnected from the prong.

The pumping-fork consists of a glass tube 2, having at its lower end a connection 3, adapted to be inserted in the cooperating part of the mercury-pump and to form an air-tight joint therewith. At its upper end the fork 2 is provided with a plurality of radiating branches 4, preferably ten in number, to which the prongs are adapted to be connected. These prongs, as shown in Fig. 3, consist of glass tubes 5 of smaller size than the fork 2, provided with sealing-off contractions 6 and with a portion 7, to which the glass-blower's rubber tube is connected during the process of attaching the lamps to the prong, as hereinafter described. The tube 5 has a series of branch tubes 8 at an angle thereto and preferably horizontal, to which the lamp-bulbs (shown in Fig. 4) are adapted to be connected. These lamp-bulbs 9 are formed in the usual way and when so formed include the filaments 10, with their terminal wires 11 leading out at the sides of the bulb. At the end of the bulb a sealing-off contraction 12 is provided, by means of which the bulb may be sealed off from the prong after having been pumped and a suitable tip at the same time formed upon the lamp-bulb. This may be termed a "tipping" connection or contraction. Beyond the contracted portion 12 the tube is extended, as at 13, and is adapted to be secured by this portion 13 to the branches 8 of the prong 5. This connection of the bulbs to the branches 8 is accomplished in the usual manner by heating the pointed end 14 of the branch 8 in a suitable gas-flame and then blowing off said heated portion through the medium of the operator's tube connected with the end 7 of the prong, after which the end of the branch 8 thus blown off and the end of the tip 13 are placed together and heated in a gas-flame and welded to form the connection between said portions 8 and 13, as shown in Fig. 2. When all of the branches 8 have had connected therewith the bulbs of the type shown in Fig. 4, the prong 5 is secured to one of the branches 4 of the fork 2 in the same manner as the bulb itself was secured to the branch 8. For this purpose the pointed end 15 of the branch 4 is heated and blown off in the usual way, and the end 7 of the prong 5 is severed at about the point 16, (indicated in Fig. 3,) and the ends of the branch and the tube are then welded together to form a suitable connection, as is indicated in Figs. 1 and 2. When all of the branches 4 have been thus supplied with prongs, the fork, with its cluster of lamps, is connected with the mercury-pump and the air is exhausted from the bulbs. At the termination of the pumping operation each prong is sealed off from the fork by heating the portion 6 in a gas-flame and drawing the prong away from the branch 4, thereby

leaving the end of the branch 4 sealed, as well as the end of the prong 5. This stage of the manufacture is illustrated in Fig. 5, the prong being represented as sealed off at its upper end. Great care is required in this operation to prevent breaking the pump, with which the fork 2 is now secured. The formation of the slightest vent in one of the branches 4 is sufficient to admit the air and cause a shattering of the whole upper part of the pump. As such pumps are expensive and as the breaking is extremely dangerous to the workman, the greatest pains are taken to avoid such accidents. Then there is additional disadvantage that the whole cluster must be repumped, which takes several hours' time. After the prong has been thus sealed off the lamp-bulbs are sealed off from the branches 8 at the contractions 12, and at the same time a suitable tip is formed upon the bulb by twisting the bulb in the fingers of the operator, to thus form a properly-tempered and a neat and symmetrical end upon the bulb, as indicated at 17 in Figs. 5 and 6. Of course this operation must also be carried out without admitting air to either the bulb or the prong 5. This operation of detaching the lamps, owing to the lightness of the prong 5 and the fact that it is entirely separated from the pump, may be carried out at the operator's work-bench, where he is provided with the usual glass-worker's apparatus. Under the old method of working it was impossible to seal off the individual lamps from the fork and at the same time tip them, owing to the inconvenient methods that were necessary to be employed in severing the same while it was still attached to the pump. There was no opportunity for properly timing the operation to impart the proper temper to the tip, without which it would in time crack, and break, and there was no chance to properly shape and form the tip. Thus it was common to provide each lamp with a sealing-off connection and with a tipping connection, the latter being carried out at the bench in the same manner as in the case of the prong of the present invention.

It is apparent that the number of branches 4 of the fork may be varied more or less, and, similarly, the number of bulbs to the prong may be increased and decreased; but the proportions shown and described have proven satisfactory in practice. Likewise other methods may be employed in securing the parts together; but those described are deemed preferable.

By my invention it is apparent that the liability of breaking the pump is decreased, the output is increased, and the necessity of skilled labor is decreased.

While I have thus described my invention with particular reference to the apparatus shown in the drawings, which has been worked out for commercial purposes, I do not desire to be limited thereto in all respects, as various

changes and modifications may be made without departing from the scope or principle of the invention.

Having thus explained the nature of the invention, what I claim is—

1. In apparatus for manufacturing small incandescent lamps, the combination with a fork adapted to be connected with a vacuum-pump, of a plurality of prongs each secured to said fork through the medium of a sealing-off connection, and a series of small incandescent-lamp bulbs secured to each said prong by tipping connections, whereby each series of lamps may be bodily detached from the fork and said bulbs individually detached from the prongs in completed form, substantially as described.

2. In apparatus for manufacturing small incandescent lamps, the combination with a fork adapted to be connected with a vacuum-pump, of a plurality of prongs secured to said fork, and a series of small incandescent-lamp bulbs secured to each said prong, and means for permitting the sealing off of the prongs from the fork and the bulbs from the prongs after the cluster of bulbs has been pumped and without destroying the vacuum thereof, substantially as described.

3. In apparatus for manufacturing small incandescent lamps, the combination with a tubular glass fork adapted to be connected with a vacuum-pump, of a plurality of tubular glass prongs each secured to said fork through the medium of a sealing-off contraction, and a series of small incandescent-lamp bulbs secured to each said prong, each bulb being secured to its prong by means of a tipping contraction, the said sealing-off contractions permitting each prong with its series of bulbs to be bodily detached from the fork and the tipping contractions permitting the bulbs to be individually detached from the prongs and at the same time tipped, substantially as described.

4. In apparatus for manufacturing small incandescent lamps, the combination with a fork adapted to be connected with a vacuum-pump, of a prong adapted to be secured to said fork by means of a sealing-off connection, and a series of small incandescent-lamp bulbs adapted to be secured to said prong by individual sealing-off connections, whereby after the pumping operation the said prong with its series of bulbs may be bodily detached from the said fork and the said bulbs individually detached from the prong, substantially as described.

5. In apparatus for manufacturing small incandescent lamps, the combination with a fork adapted to be connected with a vacuum-pump, of a prong adapted to be secured to said fork by means of a sealing-off contraction, and a series of small incandescent-lamp bulbs adapted to be individually attached to said prong by tipping contractions and at such relative positions as to permit the tips upon the bulbs to

be readily formed when they are sealed off, whereby the said prong may be bodily attached and detached from the fork and the said bulbs individually attached and detached from  
5 the prong and when so detached are also tipped, substantially as described.

6. In apparatus for manufacturing small incandescent lamps, the combination with a fork adapted to be connected with a vacuum-pump  
10 and having a plurality of radiating branches, of a prong secured to each said branch by a sealing-off connection, the said prongs being arranged in substantial parallelism with the said fork, a series of small incandescent-lamp  
15 bulbs individually secured at different points along each said prong and extending out-

wardly therefrom, each said bulb being secured to its prong through the medium of a sealing-off contraction, whereby the whole forms a compact cluster of bulbs conveniently  
20 arranged for pumping and whereby the prongs may be bodily detached from the fork and the bulbs individually detached from the prongs, substantially as described.

Signed by me at Chicago, county of Cook, 25  
State of Illinois, this 28th day of November, 1903.

ALLEN D. WHIPPLE.

Witnesses:

GAZELLE BEDER,  
ROBERT LEWIS AMES.