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METHOD OF CLEANING AND RENEWING ELECTRIC LAMPS.

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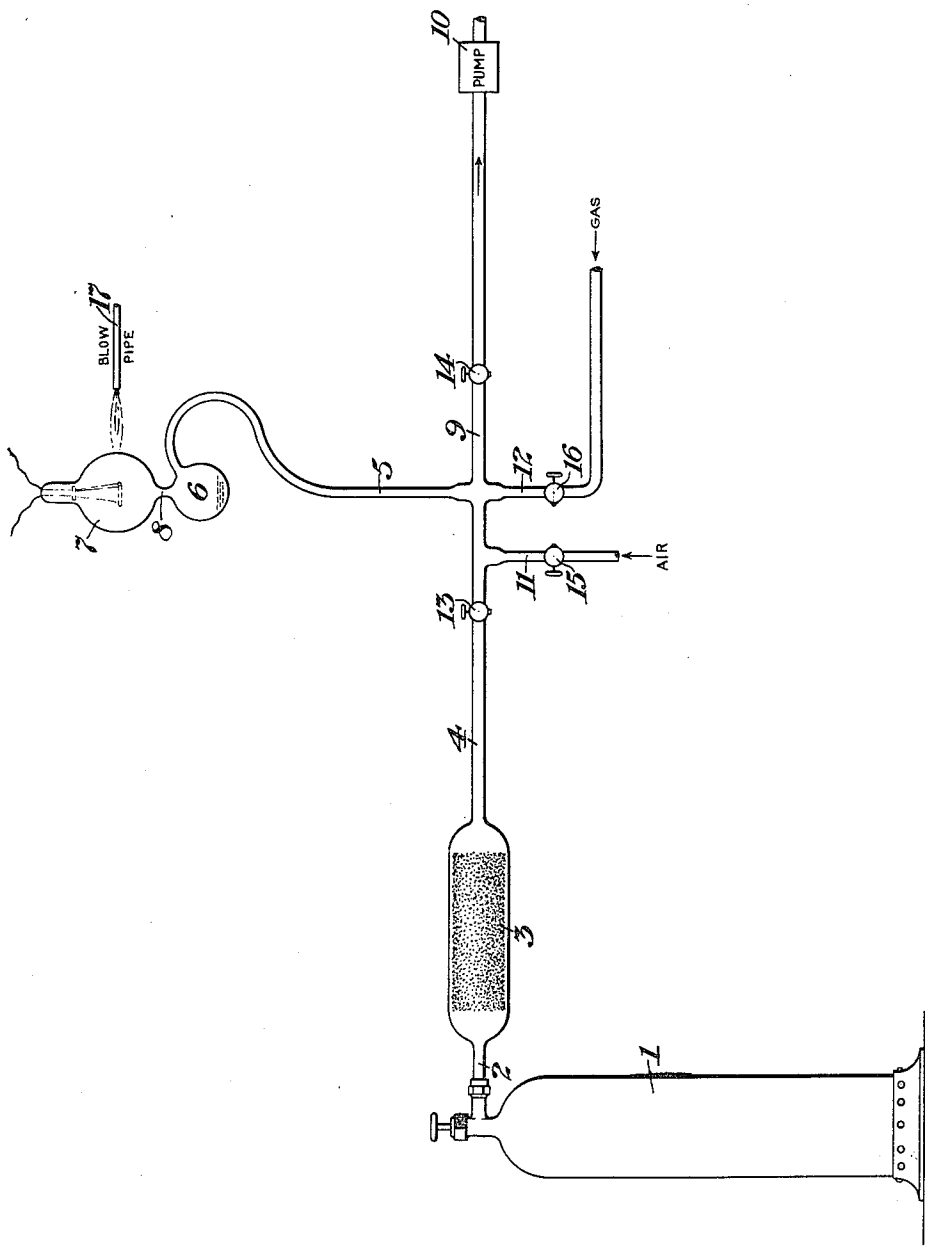
1,237,653. Patented Aug. 21, 1917.



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METHOD OF CLEANING AND RENEWING ELECTRIC LAMPS.

1,237,653. Specification of Letters Patent. Patented Aug. 21, 1917.

Application filed January 28, 1914. Serial No. 814,872.

To all whom it may concern:

Be it known that I, FREDERICK G. KEYES, a citizen of the United States, and resident of East Orange, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Methods of Cleaning and Renewing Electric Lamps, of which the following is a specification.

My invention relates to a method of cleaning filament lamps, such as lamps having tungsten filaments, notably large tungsten filaments wherein, during operation particles of the filament material cause a more or less rapid deterioration of the light-giving capacity of the lamp by being thrown against the inner walls of the light transmitting portion of the lamp and adhering thereto. In extreme cases, after long use, the lamp may become so obscured by the bombardment thereof with minute filament particles as to lower its light-giving power fully 80% or 90%.

Heretofore, it has been customary to scrap lamps which had been brought to such a state and to substitute new lamps in their place. This involves an expense which would be quite needless if it were possible to remove from the lamp walls the accumulated deposit of filament particles.

I have invented a method of cleaning lamps which have been thus spattered or dusted and this method constitutes the subject of the present application. The principle of the method consists in withdrawing the air from the lamp to be treated and forming *in situ* on the glass walls a volatile compound of tungsten.

It has been found that the tungsten halids are volatile and, moreover, that fine tungsten particles re-act with the halogens at comparatively low temperature (about 300° C.) Owing to its cheapness and general availability chlorin is the halid I usually employ. For example, tungsten hexachlorid boils at approximately 350° C. These characteristics I utilize in carrying out my cleaning process. The idea is that the deposited particles on the glass walls of the lamp are subjected to contact with one of the halids, forming a volatile compound therewith when the lamp is subjected to a moderate heat from the outside. The said volatile compound may then be pumped out or collected in a separate chamber, leaving the lamp walls as clean as new. The process may be aided by rinsing the interior of the lamp with air introduced for the purpose.

In order to illustrate the process herein described, I have caused to be prepared a drawing representing schematically a system adapted to the carrying out of the process.

Chlorin in liquid form being now obtainable in steel cylinders, I generally make use of such a cylinder of chlorin, shown in the drawing at 1. Connected to the cylinder by a suitable tube, 2, is a cylindrical vessel, 3, containing phosphorus pentoxid. The contents of the vessel 3 serve to remove all moisture from the chlorin gas and thus avoids the formation of tungsten oxychlorid, since tungsten hexachlorid re-acts with water to form such compounds. A system of tubing, 4 and 5, connects the vessel 3 with a chamber, 6, usually in the form of a bulb above which is the lamp bulb, 7, joined to the bulb 6 by a neck 8. By a tube, 9, the tubes 4 and 5 are joined to an exhaust pump, 10, and other tubes, 11 and 12, are joined respectively to a source of air and a source of some gas, such as argon, helium, hydrogen or indifferent gas which may be passed into the lamp bulb in order to diminish the tendency of the lamp filament to spatter against the walls of the lamp.

The object of the air-inlet is to provide means for rinsing out the lamb globe and causing the impurities to fall into the chamber 6 or permitting them to be drawn off by the pump 10. Suitable cocks, 13, 14, 15 and 16 provide for the opening or closing of the various tubes mentioned above. The operation is as follows: The lamp 7 having been exhausted, the cock, 14, is closed and by opening the cock, 13, dry chlorin is admitted to the lamb globe. That portion of the globe wherein tungsten has been condensed is then warmed, as by a blow-pipe, 17, tungsten hexachlorid is formed, and at the completion of this operation, the cock 14 is opened. The volatile tungsten hexachlorid may now be pumped out, being collected in the chamber 6. In some instances the stop cock, 15, may be opened, thereby permitting the lamp to be rinsed out by the admission of air to the lamp, and again the cock, 16, may be opened to admit a suitable gas, such as argon, helium or hydrogen, or

one of these elements mixed with a halid, such as chlorin, the object being to diminish the spattering of the filament particles against the vitreous walls of the lamp. Suitable means (not shown in the drawing) are provided for determining the quantity of gas best suited to diminish the spattering referred to. At the completion of the operations above described, the lamp may be sealed off from the system at the neck 8.

While the invention last described is applicable to filament lamps of practically all descriptions, yet it will be found particularly useful in connection with lamps provided with heavy filaments having large current carrying capacity. Such a lamp, which may have been previously rendered useless owing to the deposition of metallic tungsten upon the light transmitting portion, may be then rendered quite as good as new without disturbing any portion of the lamp, except the seal off at 8. The absolute amount of tungsten thrown off, even up to the point where very little light is transmitted, is very small. Consequently, with thick filaments, the lamp may be indefinitely renewed by the process described above.

In certain cases, owing to accidents, air may be admitted to the lamp and, when the lamp is filled with nitrogen, a deposit of tungsten nitrid may be formed upon the vitreous envelop. The presence of air would result in the formation of tungsten trioxid and nitrid. These substances are readily soluble in aqua ammonia or a strong, hot concentrated solution of either caustic soda or caustic potash and, accordingly, may be easily removed by the application of such a solution.

It has been noted above that chlorin, for example, forms a compound with tungsten, namely either tungsten hexachlorid or tungsten pentachlorid. As a result of the high temperature at which filaments are operated, the walls of the light transmitting portion of the envelop are brought to a temperature of about 200° C. to 300° C. It is proposed, therefore, since the reaction temperature of finely divided tungsten and chlorin is in the neighborhood of 200° C. to 300° C. to introduce a small amount of chlorin along with the restringent gas suggested in the foregoing. A lamp prepared according to this description would function as follows:

The particles of tungsten thrown off from the filament would re-act at once with the chlorin or other halid present. The tungsten halid would then distil or deposit or condense on the coolest portion of the lamp, namely, the upper portion. The vapor of this volatile compound would, of course, always be present, but when coming into contact with the hot filament would there dissociate, depositing metallic tungsten and liberating free halids, which latter would in turn re-act with further tungsten particles thrown off so that the cycle of reactions would be indefinitely continued throughout the life of the filament, thus automatically preventing any particles of tungsten ever obstructing the passage of light through the vitreous envelop.

I claim as my invention:

1. The method of cleaning filament lamps which have been darkened or blackened by the spattering of filament material upon the walls of the transparent portion of the lamp which consists in forming on the said walls a volatile compound of tungsten and removing the said volatile compound.

2. The method of cleaning filament lamps which have been darkened or blackened by the spattering of filament material upon the walls of the transparent portion of the lamp which consists in forming on the said walls a volatile compound of tungsten, removing the said volatile compound and rinsing the lamp with air.

3. The method of cleaning filament lamps which have been darkened or blackened by the spattering of filament metal upon the walls of the transparent portion of the lamp which consists in forming on the said walls a volatile compound of tungsten, removing the said volatile compound, and introducing into the lamp a restringent gas.

Signed at New York in the county of New York and State of New York this 26th day of January A. D. 1914.

FREDERICK G. KEYES.

Witnesses:
GEORGE H. STOCKBRIDGE,
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