(No Model.)

E. P. THOMPSON.

PROCESS OF FORMING FILAMENTS FOR INCANDESCENT ELECTRIC LAMPS.

No. 370,998. Patented Oct. 4, 1887.

Fig. 1.

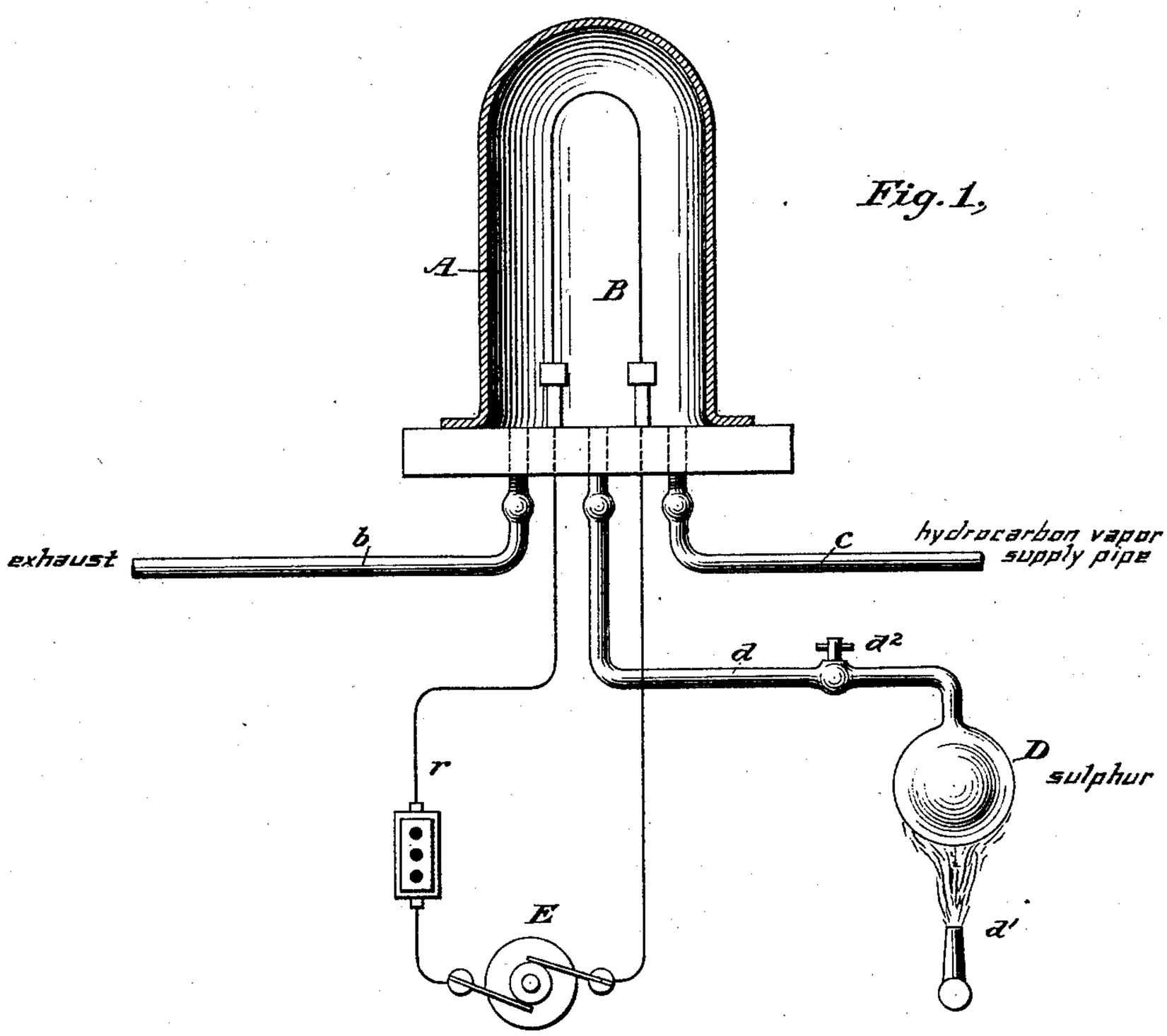
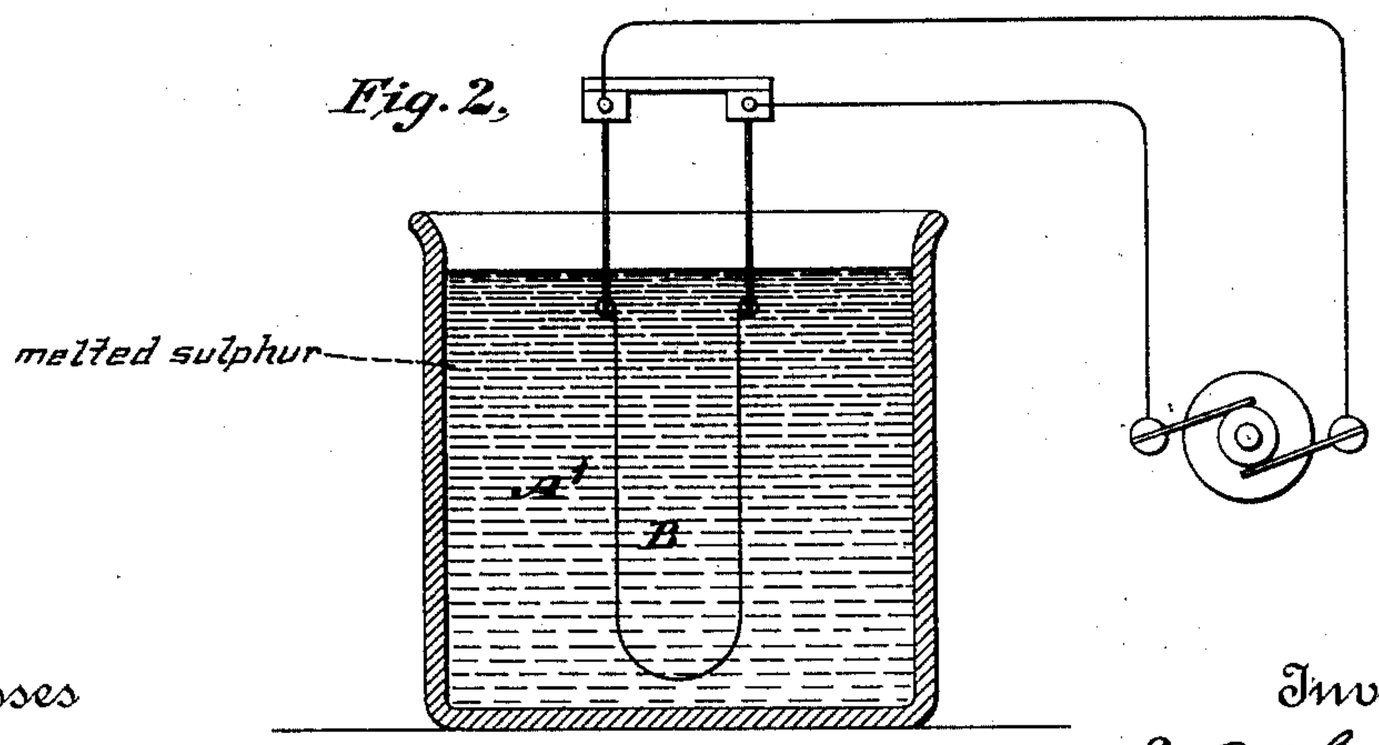


Fig. 2.



Witnesses

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PROCESS OF FORMING FILAMENTS FOR INCANDESCENT ELECTRIC LAMPS.

SPECIFICATION forming part of Letters Patent No. 370,998, dated October 4, 1887.

Application filed January 22, 1887. Serial No. 225,118. (No model.)

To all whom it may concern:

Be it known that I, EDWARD P. THOMPSON, a citizen of the United States, residing in Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Processes of Forming Filaments for Incandescent Electric Lamps, of which the following is a specification.

The invention relates to a method of building up carbons by deposition from a hydrocarbon compound; and the object of the invention is to provide a filament composed essentially or entirely of the deposit of carbon.

The invention consists, in general terms, in alternately depositing carbon upon a basis of carbonized fiber and removing portions of the basis or original carbon.

In carrying out the invention a filament of any suitable character is placed in a suitable chamber, wherein a deposit of carbon may be made from a suitable hydrocarbon. After a certain deposit has been applied a portion of the original filament is removed in any suitable manner—as, for instance, by admitting heated sulphur, which will act upon the filament carbon before attacking the deposited carbon, thus creating pores in the filament. A second deposit is then made and the operation is repeated. In this manner the filament is alternately rendered of increased and decreased resistance, and essentially the whole of the original carbon is removed and the filament is entirely composed of deposited carbon. The carbon of the filament yields more readily to the heated sulphur because it is combustible at a lower temperature than the deposited carbon.

In the accompanying drawings, Figure 1 illustrates a method of building up the carbon by means of a hydrocarbon compound and burning out or removing the original carbon filament by means of heated sulphur. Fig. 2 illustrates a different method of treating the filaments for producing essentially the same results.

Referring to the figures, A represents a containing-chamber of any suitable character, in which is placed a filament, B. This filament is preferably connected at its respective terminals with the respective poles of a generator, E, of any suitable character, whereby a current of electricity may be sent through the filament, as desired. A tube, *b*, leads to a vacuum-pump of any suitable character for withdrawing the atmosphere from the chamber A. A tube, *c*, leads to a suitable reservoir of hydrocarbon vapor, which is designed to be introduced after the atmosphere is exhausted. A tube, *d*, leads to a flask, D, designed to contain sulphur, which may be heated to a vapor by means of a flame, as shown at *d'*. A stop-cock, d^2, in the tube *d* controls the introduction of the sulphur-vapor.

In carrying out the invention a deposit of carbon is made from the atmosphere by hydrocarbon vapor introduced through the tube *c*, the filament B being heated at the same time by means of a current from the generator E. After a suitable deposit is made the hydrocarbon is exhausted from the chamber A by means of the vacuum-pump, and afterward a quantity of sulphur-vapor is introduced through the tube *d*. The current meanwhile is diminished by means of a resistance, *r*, or in any other suitable manner, so that the filament is heated only to a red heat, and the sulphur-vapor will attack the carbon of the original filament, forming a bisulphide of carbon and rendering the filament more porous and of higher resistance. It may be necessary to graduate the current during the time the sulphur is acting upon the filament. The sulphur attacks the carbon of the orignal filament more readily than the deposited carbon, and the former may be removed to a more or less extent without affecting the latter. The sulphur is then withdrawn from the chamber A, and the hydrocarbon vapor is then again introduced, and the temperature of the filament is increased. This operation is repeated until practically all the original filament is removed and the resultant filament is one composed essentially of the deposited carbon.

In Fig. 2 the process is illustrated as being carried out by means of heated sulphur, in which the original carbon is removed by alternately placing the same in a bath of heated sulphur and depositing carbon by placing it in a hydrocarbon vapor. Essentially the same operation takes place, with the exception that, instead of causing the carbon to be removed and deposited in the same chamber, the fila-

ment is first placed in the sulphur-bath and then placed in the depositing-chamber. In this figure, B represents the filament, as before, and A′ the sulphur-bath, which is melted in any convenient manner. From this bath the filament is placed in a carbon-depositing chamber, such as illustrated in Fig. 1, and the operation is repeated until the required result is obtained.

It is evident that it may be necessary to repeat the operation a great many times in order to render the process entirely satisfactory and perfect. It may not always be necessary to apply heated sulphur, but it may be heated to only a red heat in the open air, and the oxygen of the atmosphere will attack the original filament.

Instead of heating the filaments by means of a current, it may in some instances be desired to place them in a furnace of any suitable character, preferably a reverberatory furnace wherein oxygen is constantly supplied, and this will secure the result in the manner specified in the preceding modification. The temperature of the filament should be kept at only a red heat to prevent the deposited carbon from consumption. The filaments are then mounted in a vacuum-globe in the usual manner.

I claim as my invention—

1. The hereinbefore-described process of building up filaments of deposited carbon, which consists in alternately depositing carbon upon a carbon-core and removing portions of the said core independently of the carbon deposit.

2. The hereinbefore-described process of manufacturing incandescent electric lamps, which consists in depositing carbon upon a core of carbonized fiber, removing portions of such core by chemical action or combustion independently of the carbon deposited, and mounting the filaments in a vacuum-globe.

3. The hereinbefore-described process of forming filaments for incandescent electric lamps, which consists in depositing carbon upon a core throughout its length and alternately removing portions of such core independently of the carbon deposit.

4. The hereinbefore-described process of building up filaments of deposited carbon, which consists in alternately depositing carbon upon a carbon-core and removing portions of said core by heating in a sulphur fluid.

In testimony whereof I have hereunto subscribed my name this 21st day of January, A. D. 1887.

EDWARD P. THOMPSON.

Witnesses:

DANL. W. EDGECOMB,

CHARLES A. TERRY.