(No Model.) 2 Sheets—Sheet 1.

G. VAN DETH.

PROCESS OF AND BURNER FOR PRODUCING INCANDESCENCE.

No. 575,137. Patented Jan. 12, 1897.

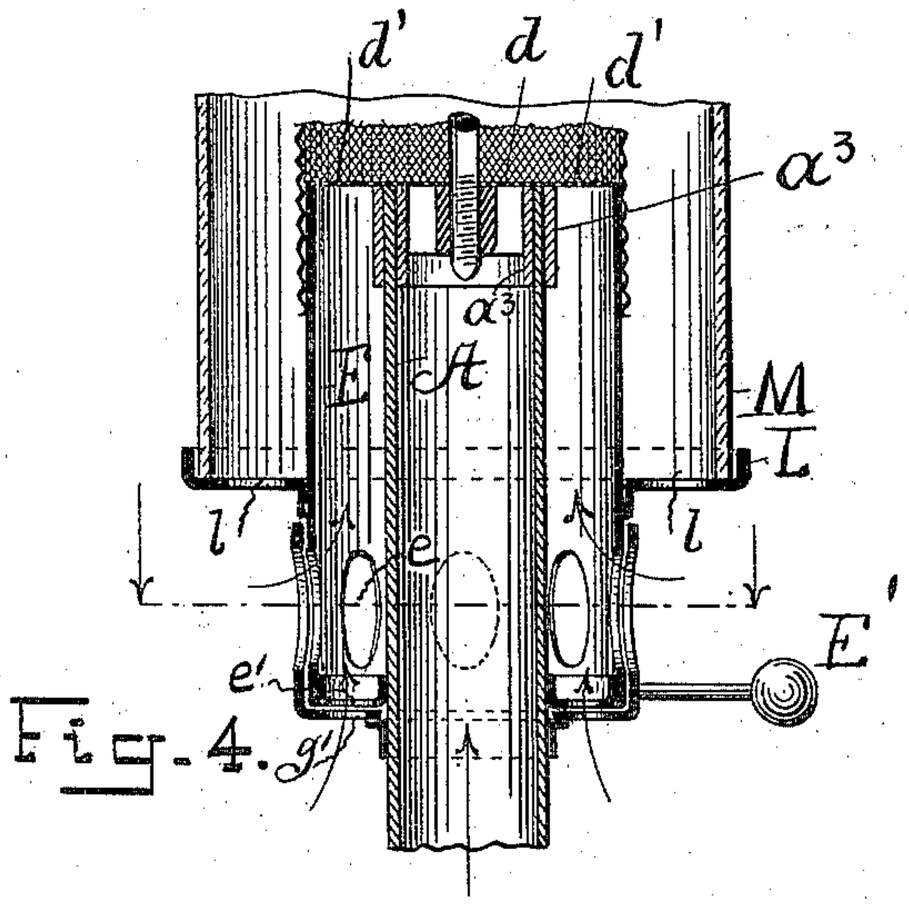


Fig. 4.

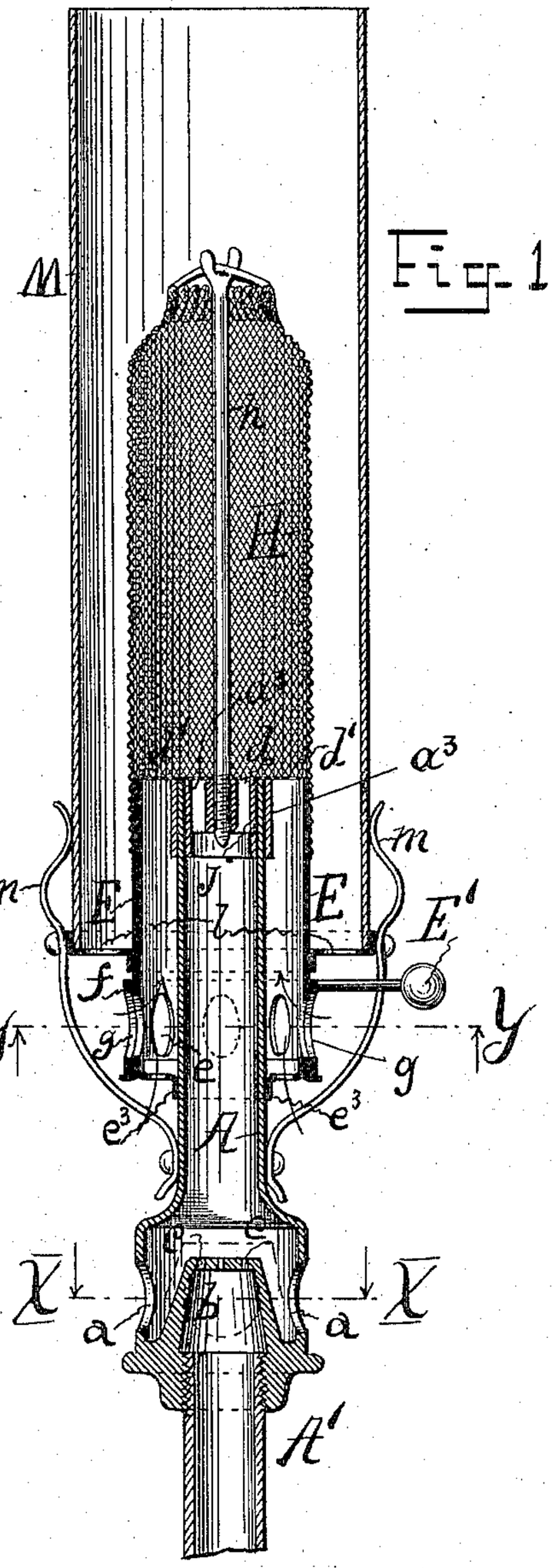


Fig. 1.

Fig. 5.

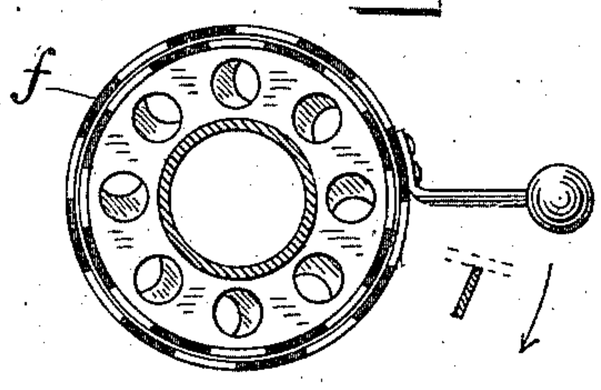
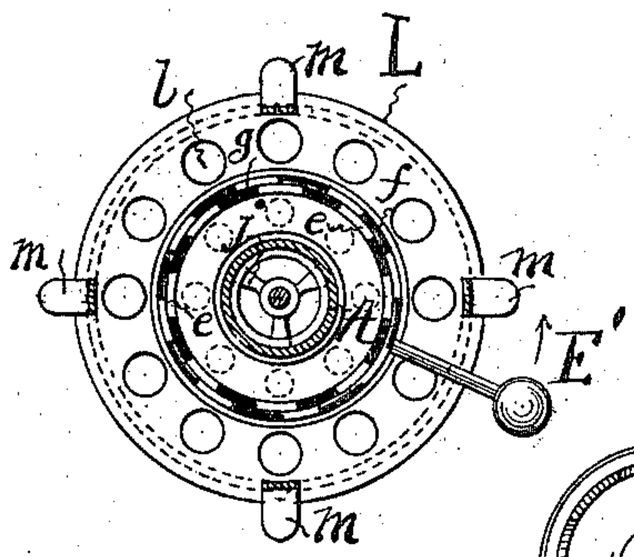


Fig. 3.



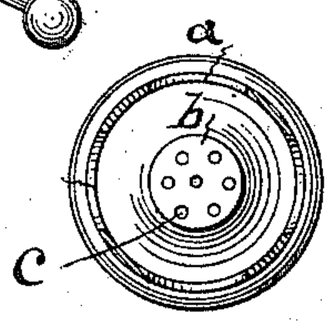


Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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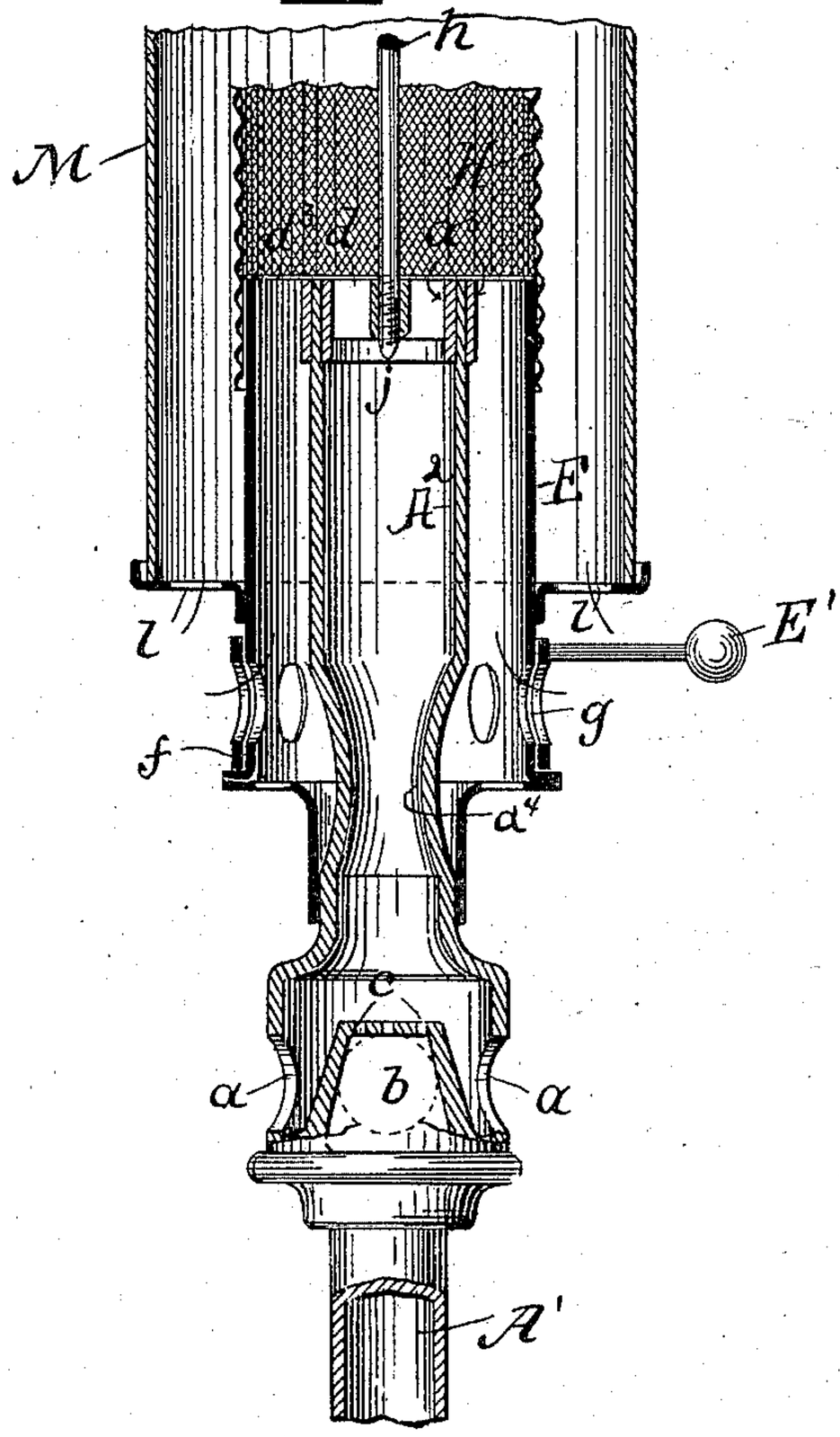
Fig. 6.



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PROCESS OF AND BURNER FOR PRODUCING INCANDESCENCE.

SPECIFICATION forming part of Letters Patent No. 575,137, dated January 12, 1897.

Application filed January 29, 1896. Serial No. 577,326. (No model.)

To all whom it may concern:

Be it known that I, GERRIT VAN DETH, a subject of the Queen of the Netherlands, and a resident of the city of New York, in the county and State of New York, have invented a new and useful Improvement in Processes of and Burners for Producing Incandescence, of which the following is a specification.

My invention relates to improvements in the process of and burner for producing incandescence in mantles or hoods of the so-called "incandescent gas-lights."

My process by which, in combination with my burner, the illuminating power of the light is increased fifty to sixty per cent. with a given consumption of gas is closely connected with a discovery which I have made in the nature and cause of the incandescence of the mantle. These mantles generally consist, as is well known, of a skeleton or framework of the oxids of the rare metals, such as oxids of thorium, cerium, lithium, zirconium, and yttrium, the skeleton or framework being produced in various ways, as, for example, by the method described in my application filed March 28, 1895, Serial No. 543,578, and now pending in the United States Patent Office.

By careful investigation, involving the making of hundreds of tests, I have discovered the incandescence of such mantles as are above referred to to be wholly or largely due to a chemical action which takes place just at the inside of the mantle, and I have also discovered that the effective operation of the process depends upon the supplying to the light of a quantity of air much greater than has heretofore been attained, and that the excess of air must be brought between the flame and the surface of the mantle. Therefore, whereas others have sought in every way to bring the flame as closely into contact as possible with the filamentary structure of the mantle, I aim to have a substantial space between the flame and the mantle structure and to bring into this space a large quantity of air, which acts, in the manner hereinafter explained, as an intercepting medium between the flame and the mantle. In my opinion the incandescence is due to a series of chemical reactions which succeed each other with enormous rapidity, and the molecular vibrations in the mantle induced by these intensely-rapid chemical changes are the cause of the incandescence.

The chemical reactions may be described as follows: Momentarily the carbon of the gas is converted into carbonic dioxid (CO_2) and the hydrogen of the gas momentarily set free. This hydrogen momentarily reduces the metallic oxids of the mantle structure to metals, water (H_2O) being momentarily generated. Instantly these metals are again oxidized by the air, which is at a high temperature, and instantly again these oxids are reduced to metals by the next hydrogen produced by the action of the oxygen of the air on the gas, and so these reactions occur with enormous rapidity, inducing molecular vibrations in the structure of the hood and probably also in the gases, which generate light waves and produce incandescence.

I have also discovered the cause of the carbonizing of many mantles and how to effectually prevent the same. That the carbonizing is not due to a common precipitate of soot is indicated by the fact that the mantle does not grow thicker, but the deposit spreads laterally. The cause I believe to be principally as follows: The gas contains a certain quantity of acetylene (C_2H_2) and even when the flame is burning normally it frequently happens that the acetylene of the gas is not thoroughly combusted and reduced before reaching the mantle. When the reduction of the acetylene is thus imperfect, the acetylene is momentarily reduced by the oxids of the metals, and metal, water, and carbon are produced. Thus, supposing we have oxid of thorium (ThO_2) in the mantle, we have $ThO_2+2(C_2H_2)=Th+2(H_2O)+4C$. The metal becomes covered with the carbon, which momentarily prevents the metal from oxidizing. This carbon deposit takes place especially when the gas-flame draws down the burner-tube to the surface of the gas-inlet. Now I find that placing a carbonized mantle over the ordinary burner with the key turned so as to shut off a half or three-quarters of the gas, so that there will be proportionally a very large quantity of air admitted, the oxygen of the excess of air will oxidize the carbon deposit on the mantle and then immediately oxidize the metal of the mantle.

By my burner, by which the application of

my process is made effective, I introduce a layer of heated air between the flame and the mantle, and this air forms a protective layer, since it oxidizes any carbon before the carbon can reach the mantle, and the mantle will never carbonize.

Besides the great increase in illuminating power, my process greatly increases the durability of the mantles.

The process is effectively operated by my burner, which is illustrated in the drawings which accompany the specification, and whereof—

Figure 1 is a vertical section of the burner and of a mantle in position over it. Fig. 2 is a cross-section on the line X X. Fig. 3 is a cross-section on the line Y Y of Fig. 1. Fig. 4 is a section, and Fig. 5 a plan view, of a modification wherein the regulating-sleeve is adapted to control the orifices in the bottom of the tube E. Fig. 6 is a modification of the burner enlarged a very little at the top and contracted near the middle.

A is the tube of an ordinary Bunsen burner, *a* being the air-inlets; *b*, the tip; *c c*, gas-passages; A′, the gas-pipe, and *d* being mesh at the top of the tube A to prevent the flame from working down. I prefer to keep the tube A of substantially the same diameter throughout and do not enlarge its upper end, as is commonly done in the case of burners for incandescent gas-lights. I do not wish the flame to be very near the mantle and therefore do not substantially enlarge its diameter. Said tube A may be provided with a soapstone ring a^3 on the inside, as also on the outside, to prevent the heat from working down.

E is an outer concentric tube of about the same diameter as the bottom of the mantle H and secured on tube A in any suitable manner, as by flanges e^3, tightly fitting said tube A. Orifices *e*, three or more in number, are made in said tube E near the lower end thereof, and there may be other orifices *e′* in the bottom of said tube E. A revoluble sleeve *f*, supported on the tube E by the flanges e^2, or in any other suitable manner, has orifices *g*, which in one position of said sleeve register with the orifices *e*, while in another position the sleeve closes said orifices *e*.

E′ is a handle for rotating the sleeve *f*.

A wire-mesh *d′* covers the top of the tube E, and this may be one with the mesh *d*, or may be separate and have a central hole to fit over the end of tube A.

L is a plate for the chimney M to rest on, *m m* being the usual springs to retain the chimney in place, and *l* being orifices in said plate L. Said springs *m* may extend down to the tube A and be fastened thereto and aid in positioning the chimney M.

The mantle H, of metallic oxids and of any suitable description, such as that hereinbefore referred to, is suspended in the usual manner above the tubes A E by the refractory rod *h*, which is fixed in a spider or frame *j*, that is set in the top of the tube A. Thus when the gas is ignited and air is admitted to the tube E by the orifices *e* and *g* there will be a protective layer of air between the flame and the mantle H. The burner also admits a great quantity of air into the mantle and thus effects chemical reactions hereinbefore described, by which, as also explained herein, the carbonization of the mantle is prevented. The amount of air admitted is regulated by turning the sleeve *f*, and of course I can provide said sleeve *f* with a flange *f′*, Fig. 4, which is perforated with orifices *g′*, registering with the orifices E′ in the bottom of tube E, so that the turning of the sleeve will regulate the degree of opening of all the orifices *e* and *g*.

The tube A^2 of the burner, Fig. 6, is somewhat contracted at a^4 and slightly enlarged at the top, as shown. There still, however, remains a substantial space for the passage of heated air from the outer tube E between the flame and the mantle.

Now, having described my improvements, I claim as my invention—

1. The process of producing incandescence in mantles of incandescent gas-lights consisting in bringing between the flame and the mantle a quantity of air in excess of that required for combustion, and raising this air to a high temperature, whereby first the carbon in the gas is momentarily combined with the oxygen of the air and the hydrogen set free, next the hydrogen momentarily reduces the metallic oxids of the mantle to metals, and finally the oxygen of the air again momentarily oxidizes the metals of the mantle, and so on in intensely-rapid succession, substantially as described.

2. The combination in an incandescent gas-light of an incandescing mantle, and a burner therefor, and said burner being provided with a Bunsen-burner tube, an outer tube adapted to deliver around the flame and between it and the mantle an excess of air over that required to maintain combustion, and a regulating-valve on said outer tube for controlling the quantity of air admitted between the flame and the mantle, substantially as described.

3. The combination with an incandescing gas-light mantle, of a burner having a Bunsen tube of substantially uniform size throughout, an outer tube for delivering an excess of air over that required to maintain combustion around the flame and between it and the mantle, and a regulating-valve on said outer tube for controlling the quantity of air admitted between the mantle and the flame, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 18th day of January, 1896.

GERRIT VAN DETH.

Witnesses:

BERNARD J. NECKE,

DANA W. BROWN.