UNITED STATES PATENT OFFICE.

LOUIS HICKS, OF ENGLEWOOD, NEW JERSEY.

SUBSTANCE AND MANTLE FOR INCANDESCENT GAS-LIGHTS.

SPECIFICATION forming part of Letters Patent No. 703,064, dated June 24, 1902.

Application filed December 28, 1900. Serial No. 41,413. (No model.)

To all whom it may concern:

Be it known that I, LOUIS HICKS, a citizen of the United States, residing at Englewood, Bergen county, and State of New Jersey, have invented a new and useful Improvement in Substances and Mantles for Incandescent Gas-Lights, of which the following is a specification.

The metals heretofore used in the manufacture of mantles or hoods for incandescent gas-lights may be divided into two classes. The first class consists of those metals which are not known with certainty to form salts or oxids of more than one stage of oxidation or which if they do, in fact, form salts or oxids of more than one stage of oxidation are of such character that the oxids are not readily transformed from the lower to the higher stage of oxidation, and vice versa. Examples of the first class are thorium, zirconium, lanthanum, yttrium, aluminium, calcium, and magnesium. The second class consists of those metals which are known with certainty to form oxids of two or more stages of oxidation which are readily transformed from the lower to the higher stage of oxidation, and vice versa. Examples of the second class are cerium, uranium, praseodymium, chromium, and manganese. The platinum metals which condense oxygen on their surfaces are to be included in the second class.

Heretofore it has been supposed that a mantle or hood composed of a compound of the oxids in varying proportions of two or more of the metals above mentioned of the first class would when subjected to the non-luminous flame of an ordinary Bunsen burner yield a light of great intensity. Experiment shows, however, that such is not the fact. Especially it has been supposed that a mantle composed of a compound of the oxid of thorium and a comparatively small percentage of the oxid of lanthanum or of the oxid of yttrium would when subjected to the non-luminous flame of the ordinary Bunsen burner yield a light of high illuminating power. Experiment shows, however, that such is not the fact and that neither the oxid of lanthanum nor the oxid of yttrium nor the known oxid of any other metal of the first class is capable of acting as an excitant to the oxid of thorium. In order to produce a mantle or incandescent substance possessing great ray power, vivid incandescence, or high illuminating power, it is necessary to add to the oxid of one or more metals of the first class a small percentage—generally not exceeding one or two per cent.—of the oxid of one or more metals of the second class. For example, a mantle of high illuminating power may be manufactured from a compound consisting of ninety-nine per cent. of the oxid of aluminium and one per cent. of the oxid of chromium.

I have discovered that lanthanum and yttrium have properties which for use in incandescent gas-lighting make them like thorium and the other metals above mentioned of the first class and different from cerium and the other metals above mentioned of the second class. I have discovered that a small percentage (about one per cent.) of the oxid of cerium is capable of exciting to high illuminating power the oxid of lanthanum and the oxid of yttrium. A mantle composed of the oxid of lanthanum or of the oxid of yttrium and a small percentage of the oxid of cerium would not, however, be a durable mantle. An addition of the oxid of thorium gives durability and strength. A compound of the oxid of thorium and of the oxid of lanthanum or of the oxid of thorium and of the oxid of yttrium possesses great durability; but such a compound does not possess high illuminating power, in no matter what proportion, large or small, the oxid of lanthanum or the oxid of yttrium may be added to the oxid of thorium. The addition of a large percentage, preferably not exceeding fifty per cent., of the oxid of lanthanum or of the oxid of yttrium to the oxid of thorium forms a compound which I have discovered is capable of producing an incandescent substance or mantle of high illuminating power when there is added to it a small percentage of the oxid of one or more metals of the second group, preferably the oxid of cerium. It is of advantage to use the oxid of lanthanum or the oxid of yttrium or the combined oxids of lanthanum and of yttrium in a comparatively large percentage, since a light of great intensity is produced by the action therewith of a comparatively small percentage of the oxid of one or more metals of the second group, preferably

the oxid of cerium, and when there is present also in the compound an addition of the oxid of thorium a mantle or incandescent substance possessing great strength and durability as well as high illuminating power is obtained.

The oxids of the metals of the second class can be used to advantage in the non-luminous flame of the ordinary Bunsen burner in small percentages only with oxids of the metals of the first class. For instance, if in a mantle composed of the oxids of thorium and cerium ten per cent. and not one per cent. of the oxid of cerium be used the illuminating power of the mantle is exceedingly low. The oxids of lanthanum and of yttrium differ from the oxids of the second class in this respect and are like the oxid of thorium and other metals above mentioned of the first class. When, therefore, a small percentage of the oxid of cerium is added to a compound of the oxid of thorium and of the oxid of lanthanum or to a compound of the oxid of thorium and of the oxid of yttrium, the oxid of cerium excites the combined oxids of thorium and lanthanum and the combined oxids of thorium and yttrium. Neither the oxid of lanthanum nor the oxid of yttrium when present in large percentage acts as the oxid of cerium acts in reducing the candle-power of the mantle when the oxid of cerium is present in large percentage; but since the oxids of lanthanum and of yttrium have properties like the properties of the oxid of thorium and not like the properties of the oxid of cerium when the oxid of cerium is added in small percentage, as above described, it excites to high luminosity not only the oxid of thorium, but also the oxid of lanthanum or the oxid of yttrium, of which the mantle is composed.

A mantle composed of eighty-nine per cent. oxid of thorium, ten per cent. oxid of lanthanum or ten per cent. oxid of yttrium, and one per cent. oxid of cerium possesses great durability and high illuminating power. The oxid of thorium may be replaced in whole or in part by the oxid of any one or more of the hereinbefore-mentioned metals of the first class, preferably zirconium or aluminium; but I prefer to use the oxid of thorium. Since the oxid of lanthanum and the oxid of yttrium have like properties, the oxid of lanthanum and the oxid of yttrium may be replaced by a comparatively large percentage of the combined oxids of lanthanum and of yttrium.

What I claim is—

1. A hood or frame for an incandescent gaslight consisting substantially of oxid of thorium, a comparatively large percentage of oxid of lanthanum and a comparatively small percentage of oxid of cerium, substantially as described.

2. A hood or frame for an incandescent gaslight consisting substantially of oxid of thorium, a comparatively large percentage of oxid of yttrium and a comparatively small percentage of oxid of cerium, substantially as described.

3. A hood or frame for an incandescent gaslight composed substantially of oxid of thorium, a comparatively large percentage of the combined oxids of lanthanum and of yttrium, and a comparatively small percentage of oxid of cerium, substantially as described.

4. A hood or frame for an incandescent gaslight consisting substantially of oxid of thorium, a comparatively large percentage of oxid of lanthanum and a comparatively small percentage of any one or more of the oxids of the hereinbefore-mentioned metals of the second class, substantially as described.

5. A hood or frame for an incandescent gaslight consisting substantially of oxid of thorium, a comparatively large percentage of the oxid of yttrium and a comparatively small percentage of any one or more of the oxids of the hereinbefore-mentioned metals of the second class, substantially as described.

6. A substance for an incandescent gaslight consisting substantially of the oxid of any one or more of the hereinbefore-mentioned metals of the first class, a comparatively large percentage of oxid of lanthanum and a comparatively small percentage of the oxid of any one or more of the hereinbefore-mentioned metals of the second class, substantially as described.

7. A substance for an incandescent gaslight consisting substantially of the oxid of any one or more of the hereinbefore-mentioned metals of the first class, a comparatively large percentage of oxid of yttrium and a comparatively small percentage of the oxid of any one or more of the hereinbefore-mentioned metals of the second class, substantially as described.

8. A substance for an incandescent gaslight consisting substantially of the oxid of any one or more of the hereinbefore-mentioned metals of the first class, a comparatively large percentage of the combined oxids of lanthanum and yttrium and a comparatively small percentage of the oxid of any one or more of the hereinbefore-mentioned metals of the second class, substantially as described.

In witness whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 24th day of December, 1900.

LOUIS HICKS.

Witnesses:
GRACE GREMMOND,
THOMAS P. DALTON.