No. 614,583. Patented Nov. 22, 1898.

A. SIMONINI.

ART OF AND MEANS FOR LIGHTING GAS OR VAPORS.

(Application filed Apr. 19, 1898.)

(No Model.)

Fig. 1.

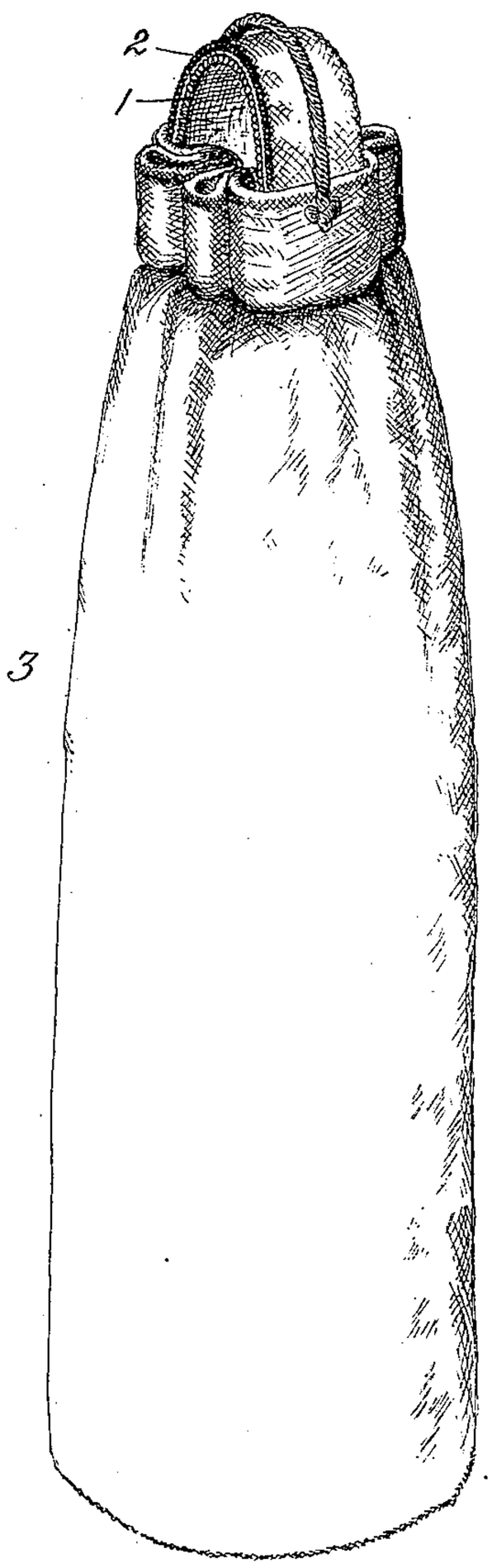


Fig. 2.

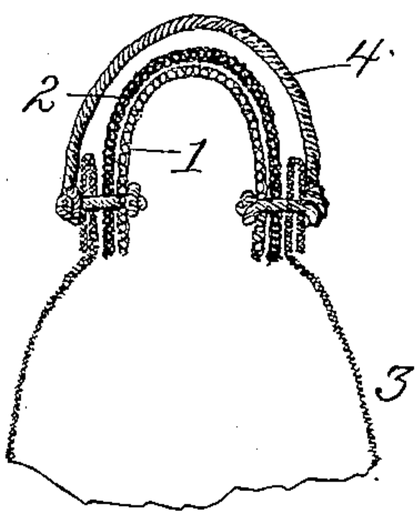
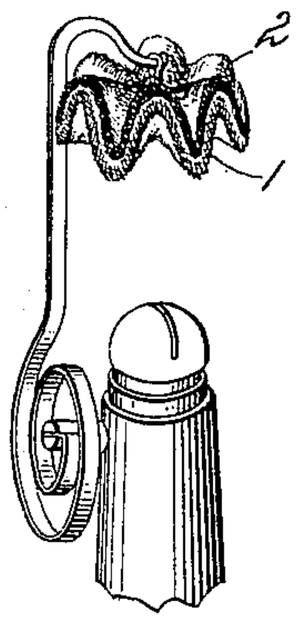


Fig. 3.

Fig. 4.



Witnesses
W. C. Burdine.
J. M. Pond.

Inventor:
Angelo Simonini,
by Dodge & Dodge,
Attorneys.

UNITED STATES PATENT OFFICE.

ANGELO SIMONINI, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNITED STATES NOMATCH LIGHT COMPANY, OF WEST VIRGINIA.

ART OF AND MEANS FOR LIGHTING GAS OR VAPORS.

SPECIFICATION forming part of Letters Patent No. 614,583, dated November 22, 1898.

Application filed April 19, 1898. Serial No. 678,154. (No model.)

To all whom it may concern:

Be it known that I, ANGELO SIMONINI, a subject of the Emperor of Austria-Hungary, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in the Art of and Means for Lighting Gas or Vapors, of which the following is a specification.

My invention pertains to the ignition of combustible or inflammable gases and vapors and is designed to render such ignition spontaneous upon the turning on of the gas or vapor or upon bringing it into contact with the lighter.

It has been known since the discovery made by Döbreiner in 1825 that platinum, either in the spongy form or in the highly-divided state in which it is known as "platinum-black," possesses a remarkable power of condensing and absorbing gases, it being capable, for instance, of absorbing one hundred volumes of oxygen. This peculiar property, and consequent great oxidizing capacity, long since suggested the employment of platinum in one or the other of the forms mentioned as a means of igniting gases, Döbreiner having himself produced the well-known hydrogen-lamp and others having later applied the principle to ordinary gas-burners. Still more recently numerous attempts have been made so to utilize the oxidizing or oxygen-transmitting properties of platinum as to hasten the lighting action and obviate the serious practical difficulties encountered in the attempted general use of such lighters for ordinary illuminating-gas. Prominent among these difficulties may be noted the relatively slow action of the lighter and the consequent escape of comparatively large and often dangerous quantities of gas before lighting could be effected. Another serious obstacle to the general use of lighters of this class has been the uncertainty of action, particularly in damp weather or in places where the atmosphere contains considerable moisture. Prolonged use also shows material deterioration in the oxidizing action of the platinum or platinum preparation heretofore used, particularly when retained in the flame of the gas or vapor which it ignites.

I have ascertained by careful and prolonged experiment that certain compositions of matter employing platinum as an element will at normal or comparatively low temperature take up sufficient oxygen to be rendered moderately incandescent or glowing and under favorable circumstances sufficiently so to ignite gases and vapors, while other compositions, though incapable of absorbing oxygen at like temperatures, take it up with greater avidity when heated than do those compositions which are affected at normal or relatively low temperatures. By combining in a lighter these two compositions I am enabled to utilize one to heat the other and thus to prepare the latter for acquiring such a degree of incandescence as shall insure the lighting of gases or vapors under all conditions of actual use and despite the deterioration which inevitably occurs in the first preparation when subjected for prolonged periods to the action of the flame.

The invention is susceptible of considerable variation as to its embodiment, the prominent and most important feature of which is the production of the requisite degree of heat or incandescence through a progressive oxidizing action or through a building up of the necessary heat, and this I mean to claim broadly and without restriction to specific details, though also claiming such details separately.

In the practical application of preparations of platinum-black to the lighting of gas-burners and the like great difficulty has been experienced in retaining the materials in place. My present invention looks also to remedying this fault, which I do in great measure by employing two webbings to carry the different preparations, one forming a backing or support for the other.

The preferred forms of the lighter, both for incandescent gas-mantles and for ordinary burners, are illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of an incandescent mantle provided with the lighter; Fig. 2, a view illustrating the formation of said lighter; Fig. 3, an enlarged view of the webbing of one member of the lighter; Fig.

4, a view of the lighter applied to a common gas-burner.

Having pointed out in general terms the prominent features or the general principle involved in my invention, I will now describe in detail the preferred embodiment thereof or that which has proven most satisfactory in the practical tests and applications which I have made.

It has been found most convenient and satisfactory in practice to apply the active elements or agents in the form of solutions to webbing, drying the same, and afterward ashing or burning out the webbing, and this plan I shall ordinarily follow. In some cases I propose to introduce into or form the webbing of a thread having incorporated into or spun with it a fine wire of platinum or platinum alloy to give strength and support to the webbing after ashing the same. This, however, is optional.

In preparing my lighter I first take two pieces 1 and 2 of webbing preferably of cotton, one of which, the lower one advisably, may have the wire in its thread, if desired.

I will first describe the mode of making the lighter using wire in one of the webbings.

Assuming that wire is to be used in one of the webbings, said webbing 1 will be placed beneath the webbing 2 and made to act as a support for the latter, the webbing 1 in such case being treated to produce the initial heating effect and the webbing 2 being relied upon to ignite the gas. The webbing 1, containing the wire, is impregnated with an aqueous solution of platinum and thorium or of platinum and cerium in the proportions of from sixty to forty per cent. of platinum and forty to sixty per cent. of thorium, or of sixty to forty per cent. of platinum and forty to sixty per cent. of cerium, is then dried, and is afterward impregnated with a second solution, which will contain thorium or cerium, according as one or the other is employed in the first solution. In other words, if the first solution contains thorium, then the second solution will likewise contain thorium, and if the first solution contains cerium then the second solution will also contain cerium. The first solution will, in case wire-strengthened webbing be used, consist of approximately one liter of water with from five hundred to seven hundred and fifty grams of the platinum-thorium or platinum-cerium mixture. If the platinum-thorium solution is employed for the first impregnation, then one or the other of the following solutions, numbered 1 to 9 and of a strength of approximately one liter of water with five hundred to seven hundred and fifty grams of the salt mixture or compound, will be used; but if the platinum-cerium solution be used for the first impregnation then one of the solutions given below, numbered 10 to 14, will be used for the second impregnation, such solution being of the strength above indicated or thereabout.

Second solution for webbing first impregnated with platinum-thorium solution: 1, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; iridium chlorid, 0.2 to two per cent.; or, 2, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; osmium chlorid, 0.2 to two per cent., (osmium in this combination is not volatile;) or, 3, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; rhodium chlorid, 0.2 to two per cent.; or, 4, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; ruthenium chlorid, 0.2 to two per cent.; or, 5, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; palladium chlorid, 0.2 to two per cent.; or, 6, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; neodymium nitrate, 0.2 to two per cent.; or, 7, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; praseodymium nitrate, 0.2 to two per cent.; or, 8, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; didymium nitrate, 0.2 to two per cent.; or, 9, thorium nitrate, thirty to seventy per cent.; platinum chlorid, seventy to thirty per cent.; cerium nitrate, 0.2 to two per cent.

Second solution for webbing previously impregnated with platinum-cerium solution: 10, cerium nitrate, twenty-five to seventy-five per cent.; platinum chlorid, seventy-five to twenty-five per cent.; iridium chlorid, 0.2 to two per cent.; or, 11, cerium nitrate, twenty-five to seventy-five per cent.; platinum chlorid, seventy-five to twenty-five per cent.; osmium chlorid, 0.2 to two per cent.; or, 12, cerium nitrate, twenty-five to seventy-five per cent.; platinum chlorid, seventy-five to twenty-five per cent.; ruthenium chlorid, 0.2 to two per cent.; or, 13, cerium nitrate, twenty-five to seventy-five per cent.; platinum chlorid, seventy-five to twenty-five per cent.; rhodium chlorid, 0.2 to two per cent.; or, 14, cerium nitrate, twenty-five to seventy-five per cent.; platinum chlorid, seventy-five to twenty-five per cent.; palladium chlorid, 0.2 to two per cent.

Of course the platinum and cerium or platinum and thorium will jointly equal one hundred per cent. less the percentage represented by iridium, osmium, rhodium, or the like.

The foregoing solutions 1 to 14 are to be understood as the equivalents of one another, subject to the condition noted—viz., that if the first impregnation be made with a thorium solution the last must also be with a solution containing thorium, and that if the first impregnation be with a cerium solution the last must likewise be with a solution containing cerium. The composition or preparation thus formed is but slightly affected by dampness when iridium, rhodium, or cerium is present in substantially the proportion stated, the

moisture being driven off in the form of a white vapor or mist and the webbing impregnated with the preparation beginning to glow promptly upon the turning on of the gas or immediately thereafter.

The addition of iridium, rhodium, ruthenium, neodymium, or of any other of the substances noted in the foregoing list in the proportion of from 0.2 to two per cent. materially increases the efficiency of the platinum.

Platinum is usually alloyed with about five per cent. of iridium to facilitate the drawing of the metal into wire. The chemicals used in the first solution have a powerful action upon the metal, roughening its surface, and attacking the iridium to such an extent as to leave upon the surface of the wire a small percentage of iridium. For this reason the first solution is devoid of iridium; otherwise the percentage of iridium in the deposit would be unduly great. The action and result are in some degree analogous to that of a mordant and a dye in dyeing fabrics, the first impregnation preparing the wire to better receive the deposit from the second solution, besides producing a more extended surface for such deposit. This I believe to be the correct explanation of the action; but whatever may be the true theory the result is improved by the second impregnation when wire is used.

If the first webbing be not provided with the wire, but be merely of cotton or other vegetable fiber, then the first impregnation above described is omitted, and it is dipped, saturated, or coated with a solution containing one of the compounds numbered 1 to 14 in the foregoing list without any previous or subsequent treatment.

The preparation above set forth, whether involving one or two solutions or compounds, becomes blackened when subjected to the heat necessary to ash the lighter and the mantle. In itself the webbing so ashed possesses little or no strength or power of cohesion, but is very liable to fall to pieces under slight jar or vibration, and the importance of providing some other support or strengthening device for it is therefore evident. While the wire serves this purpose measurably well, there are other considerations which render its use undesirable, and these are regarded as outweighing the advantages incident to its use. Thus the high cost and limited supply of the wire interfere greatly with the commercial success of a lighter dependent upon its use. It is likewise found that where the mantle makes contact with the wired webbing the mantle is very liable to be worn or broken through by such contact, and, as is well known, such injury to the mantle generally results in the fracture of the inclosing chimney within a short time.

While, therefore, the wire may be used as above set forth, I do not mean at all to restrict myself to its use, nor do I contemplate its employment ordinarily, having found that the second webbing if placed beneath the webbing No. 1 will afford an adequate support therefor under all ordinary conditions.

When the unwired webbing is employed, the solution should be somewhat stronger than in the case of the wired webbing, since but one impregnation will ordinarily be made with the wireless webbing. A suitable strength will be one kilogram of the salt compound to one liter of water.

The webbing No. 2 is impregnated with a solution of nitrate of cerium, or nitrate of didymium, or nitrate of praseodymium, or nitrate of neodymium, or with a mixture of thorium nitrate with one or more of the other nitrates named—cerium, didymium, praseodymium, or neodymium—with or without a very small percentage of ruthenium. A very effective preparation consists of ninety-two per cent. of thorium nitrate, four per cent. of neodymium, and four per cent. of cerium nitrate in a suitable quantity of water—say one liter of water to one kilogram of the salt compound. Ruthenium, if used, should not exceed 0.2 of one per cent., and it is preferred that it be as low as 0.1 per cent. Ruthenium is found when used in this small quantity to hasten the lighting action.

The solution with which the second webbing is treated leaves a yellowish precipitate, which under the heat employed in ashing the mantle or lighter takes a brownish hue. The webbing so treated is materially stronger than the ashed webbing No. 1.

The webbings treated with the above-named solutions are sewed or otherwise secured in the top of the mantle 3 or are made into a hood or rosette if to be used with an ordinary burner and are then ashed by the heat of a Bunsen or other sufficient flame. The nitrates are thus converted into oxids, which fill the interstices and fibers of the webbing and present a very extended surface for the absorption and condensation of oxygen. The lighter thus prepared and consisting of the two webbings will be found highly efficient when placed in the path or flow of hydrogen gas, carbureted hydrogen, hydrocarbon vapors, and the like mingled with air, as in the case of the Bunsen burner used with the well-known forms of incandescent gas-burners or with the common gas-burner, the flow of gas from which mingles with the surrounding air and carries the latter along with it. The webbing No. 1 speedily begins to glow by reason of the absorption and condensation of oxygen, while the webbing No. 2 is but little affected thereby, if at all, until the heat of webbing No. 1 raises the temperature of the webbing No. 2 and renders it capable of absorbing oxygen with far greater avidity, resulting in a brilliant incandescence of the webbing or hood and insuring the speedy ignition of the gas.

The high efficiency of the second webbing

is attributable to the great capacity of neodymium, cerium, praseodymium, and didymium oxids for transmitting oxygen or of absorbing oxygen from the atmosphere, condensing the same, and transmitting it to other bodies.

The office and advantages of the second webbing may be enumerated as follows: It insures the ignition of the gas or vapor and the production of a flame even after deterioration of the first mixture. It ignites the gas in an incandescing gas-mantle without explosion, such as frequently or commonly occurs with various forms of self-lighters heretofore sought to be used. It prevents the flashing back of the flame if the webbing be of proper length and avoids the rupture of the mantle, which is very liable to occur if a line of the self-lighting preparation be carried lengthwise down the mantle, as has been necessary with lighters heretofore proposed. The mantle retains its proper form, which is apt to be lost in case the line of lighting material be extended down its side, owing to the relatively different expansion and contraction of the portion containing said line and the other portions of the mantle, and the webbing adds to the strength of the mantle.

The drawings show the mantle 3 provided with a suspending loop or bail 4, of asbestos, such as is commonly employed.

While webbing is deemed the most advantageous vehicle or support for the lighting preparations, it is obvious that any other suitable holder or support may be used and that the preparation may be mixed in the form of a paste or molded in blocks, pellets, or the like.

Instead of platinum chlorid being employed in the solution for impregnating the webbing No. 1 I may employ a solution containing palladium chlorid, palladium being a metal of the platinum group, and it is possible that other metals of the same group may be thus employed to advantage, though I deem platinum itself preferable. The proportions in the case of palladium compounds may be cerium nitrate twenty-five to seventy-five per cent. and palladium chlorids eventy-five to twenty-five per cent., with water in the proportion of one liter to one kilogram of the salt compound.

I have above stated that the wire is found to cause a breaking or wearing through of the mantle. This is apparently due to the fact that the thorium of the mantle shrinks under prolonged heating, while the wired webbing does not, and the mantle is thus caused to press with some force against the wired webbing even if there be no independent movement of the mantle and the webbing, such as frequently occurs in fact.

By reason of the arching form given to the webbings the supporting effect of the webbing No. 2 is utilized to the greatest practicable degree. Either webbing, or both of them, may be doubled, if desired, though this is not deemed necessary under ordinary circumstances.

It is important that the percentage of iridium, rhodium, palladium, ruthenium, or the like be not in excess of two per cent., and it may be as low as 0.2 per cent. in the solution for treating the webbing No. 1. If used in a proportion greater or less than indicated, the effect becomes inappreciable.

It has been above intimated that the webbing No. 1 might in some cases serve to ignite the gas; but experience shows that in all cases the preparation used for such webbing loses its heating capacity to such an extent when subjected for a considerable time to the heat of the burner that it cannot be relied upon to ignite the gas. This is perhaps due to the fact that the thorium shrinks and the particles join or unite, so that it no longer remains in the finely divided and separated state in which it first exists, hence does not present so large an oxygen absorbing and condensing surface. Whatever the reason may be the deterioration takes place.

Rhodium or osmium may be used in lieu of ruthenium in connection with the second impregnation, though ruthenium is preferred.

Having thus described my invention, what I claim is—

1. The herein-described art of igniting gas or vapor, which consists in placing in the path or flow of such gas or vapor two preparations, one having at normal temperature an avidity for gases and capable of becoming heated by absorption thereof, and the other possessing an avidity for gases when heated; causing gas or air to flow in contact with the first preparation and to heat the same; transmitting the heat from the first to the second preparation, and thus causing the compound to take up gas and become highly incandescent, thereby igniting the gas or vapor.

2. A lighter for gases or other vapors, consisting of webbings or other vehicles or supports, one provided with a preparation capable of absorbing and condensing gases at normal or moderate temperature and being thereby rendered more or less incandescent; the other capable when heated, of absorbing and condensing large volumes of gases and being thereby rendered highly incandescent, and consequently able to ignite gases and vapors.

3. A lighter for gases and vapors, comprising a fibrous body having its pores and interstices first charged with a preparation of platinum and thorium, or platinum and cerium, and afterward with a solution containing the same nitrate as the first preparation, together with platinum chlorid, with iridium, or osmium, ruthenium, rhodium, palladium, neodymium, or praseodymium chlorid, in substantially the proportions stated; and a second webbing or body impregnated with a solution of nitrate of cerium, didymium, pra-

seodymium or neodymium, with or without thorium nitrate.

4. A lighter for gases and vapors comprising a hood or support having one portion charged with a preparation capable at normal temperature of absorbing and condensing gases, and another portion charged with a preparation capable when heated of absorbing and condensing gases, the first serving to prepare the second for action.

In witness whereof I hereunto set my hand in the presence of two witnesses.

ANGELO SIMONINI.

Witnesses:

WILLIAM W. DODGE,

HORACE A. DODGE.