No. 780,111. PATENTED JAN. 17, 1905.

P. LUCAS.

INCANDESCENT PETROLEUM BURNER.

APPLICATION FILED OCT. 24, 1902.

Fig. 1.

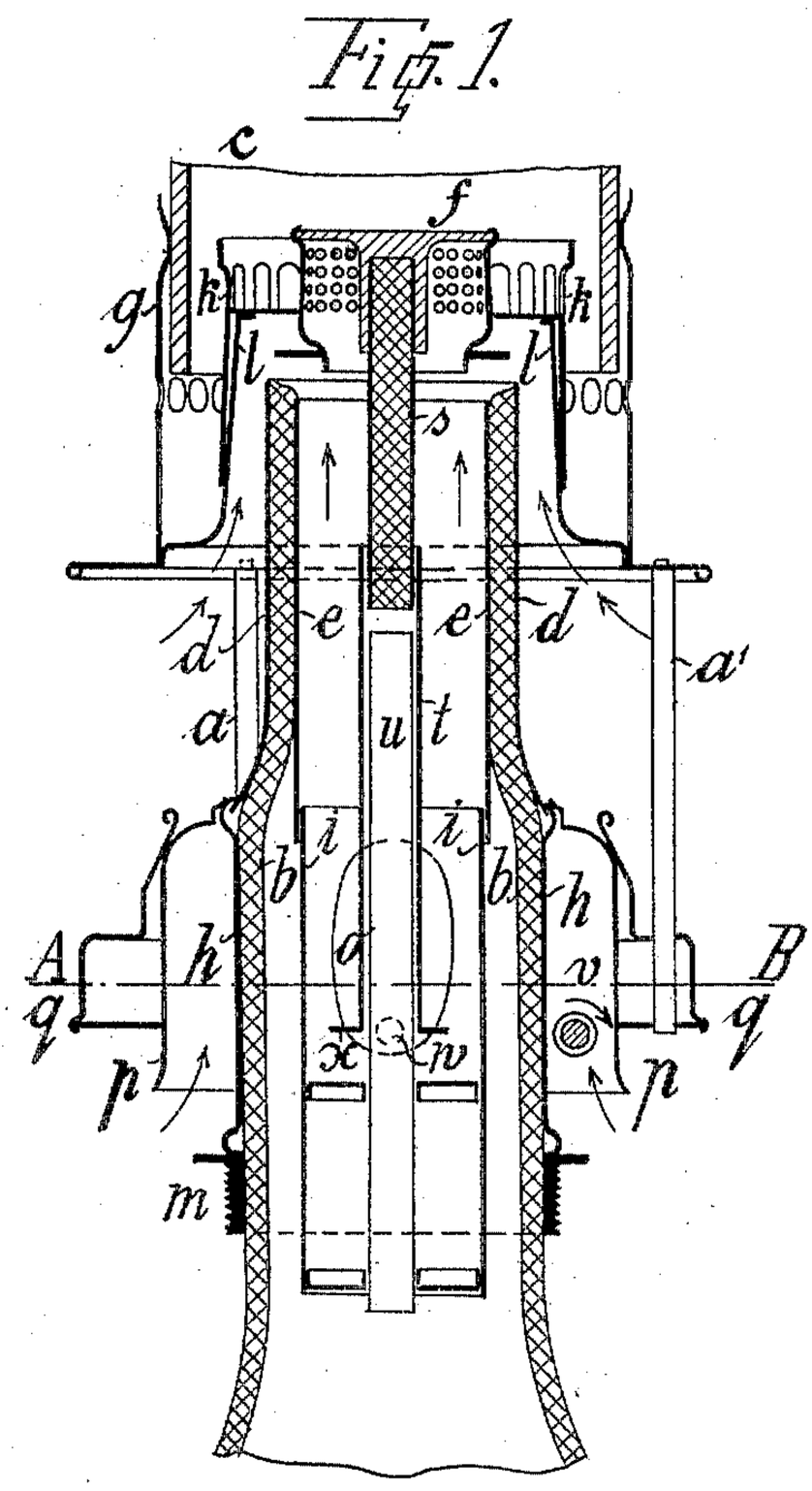
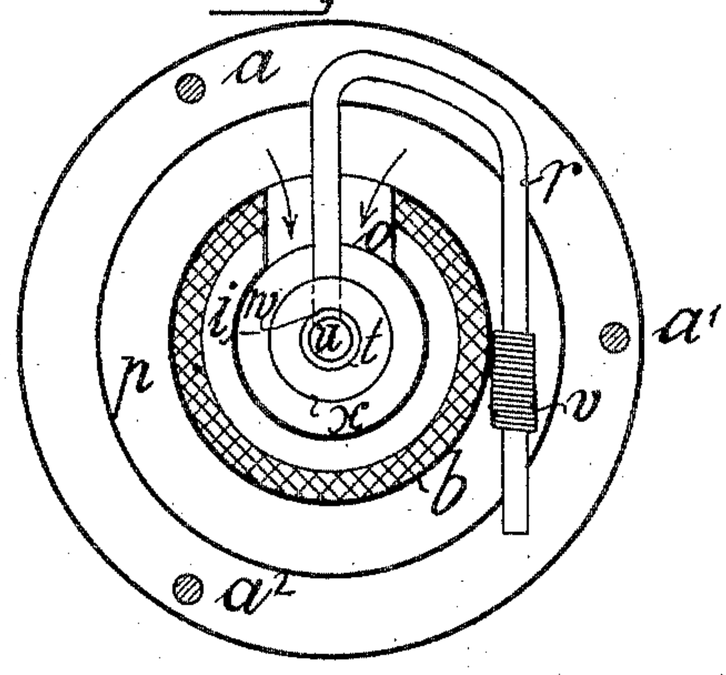


Fig. 2.



Witnesses
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No. 780,111. Patented January 17, 1905.

UNITED STATES PATENT OFFICE.

PAUL LUCAS, OF BERLIN, GERMANY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO INCANDESCENT PETROLEUM LIGHT COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF WEST VIRGINIA.

INCANDESCENT PETROLEUM-BURNER.

SPECIFICATION forming part of Letters Patent No. 780,111, dated January 17, 1905.

Application filed October 24, 1902. Serial No. 128,682.

To all whom it may concern:

Be it known that I, PAUL LUCAS, engineer, a subject of the German Emperor, and a resident of Berlin W., Germany, have invented certain new and useful Improvements in Incandescent Petroleum-Burners, of which the following is a specification.

This invention relates to incandescent petroleum-burners in which a primarily luminous flame is rendered completely non-luminous by means of a suitable supply of air. Burners of this kind have in general the disadvantage that the so-called "blue core" of the flame is outside the air-cap, whatever the shape of the latter and the flame-spreader may be. If an incandescence body is suspended over a blue flame of this kind, it frequently happens that said flame will extend into the incandescence body and thereby be converted into a white luminous flame, which will deposit soot on the incandescence body. In addition most incandescent petroleum-burners have the further disadvantage that the condition of the non-luminous flame is liable to become modified during the normal working of the lamp, for the reason that the hotter the burner becomes the more petroleum is evaporated. This so-called "smoking" of the burner is caused by the fact that when the burner becomes hotter more petroleum is evaporated than is in accordance with the quantity of air supplied for combustion. With the incandescent petroleum-burners which have hitherto come into use a very long time is required before a stable condition of heat is established—that is to say, before the quantity of heat given off to the surroundings by the burner parts through radiation and the like is equal to the heat supplied by conduction and radiation. Considerable time elapses before the wick-tubes and wicks and the petroleum sucked up by the latter and also the burner basket or head have reached their maximum temperatures, in some lamps one-quarter hour to one-half hour and more. During this period, therefore, a progressive increase in the quantity of petroleum evaporated takes place, the flame increases in height, the air supplied is no longer sufficient to render the flame completely non-luminous, and the incandescence body receives a deposit of soot. To prevent the incandescence body from extending into the blue flame and the smoking of petroleum during the working, in the first place a double cap is provided instead of a single cap, so that the outer cap over which the incandescence body is drawn entirely surrounds the blue core of the flame, and in the second place the thermal conductivity of the wick-tubes and the other parts of the burner is restricted to the greatest possible extent, means being also provided for the rapid cooling of the heat-conducting parts by the external air and the cold petroleum sucked up. This is done in the incandescent petroleum-lamp of the present invention.

One form of the invention is shown in the annexed drawings, in which—

Figure 1 is a vertical section of the burner, and Fig. 2 a cross-section on the line A B of Fig. 1.

The burner comprises two easily-separable main parts: first, the lower part of the burner, the thread *m* of which is screwed into the reservoir of the combustible fuel, and the upper part, which essentially comprises the chimney-gallery *g*, the double burner-cap *l* and *k*, the outer part *k* of which is provided with apertures, and the incandescence body and its holder, which are omitted from the drawings.

For carrying out the principle of the invention it is important that the construction of the burner shall be such that practically no conduction of heat from the upper part of the burner to the lower part may take place and that cold air from the outside may have access to the lower part of the burner on all sides thereof, it being important that the lower portion of the burner shall be kept relatively cool. To this end the upper part of the burner is supported from the lower part in such manner that the contact between these parts of the burner is reduced to a minimum and that the outside air drawn in by the draft of the lamp may impinge directly on the wick-tube comprised in the lower part of the burner and may travel along the entire upper part of

said wick-tube. The upper part of the burner is provided with a number of supporting-columns a a' a^2, which at their lower ends are connected to a supporting-collar q in any suitable manner—as, for example, by being soldered into the upper part of the collar q and by having their lower ends upset slightly beneath the lower plate of the collar q. The collar q fits over and is supported by the collar p of the lower part of the burner in the manner shown in Fig. 1, only a very small area of collars p and q being in contact, so that for this reason and because of the smallness of pillars a, a', and a^2 there can be only very slight conduction of heat from the upper portion of the burner to the lower portion thereof, if any. Moreover, a wide space is provided between the chimney-gallery g and the collar q for the entrance of air from the outside, and such air impinges directly upon the outer portion d of the wick-tube and travels upward along the same for a considerable distance. This construction involving the use of pillars connecting the chimney-gallery and supporting-column, with a wide space intervening for the entrance of air, constitutes a preferred construction; but I do not limit myself thereto, since obviously the ordinary perforated burner-skirt, such as is commonly used on lamp-burners, would serve the same purpose if provided with very large air-apertures and made of material which is a bad conductor of heat.

Special regard is had to the shape of the lower burner part, the latter comprising the double wick-tube h i, which can be made of ordinary brass. This double tube is provided with a large aperture or apertures o to admit air into the tube i and has an external collar p, which, on the one hand, serves as a rest for the support q of the upper part of the burner, and, on the other hand, collects air for cooling the wick-tube h. Connected to the double wick-tube h i and forming an extension thereof is the double tube d e, which is of considerable length and the walls of which are as thin as possible. It consists of material which is a bad heat-conductor and closely embraces the wick b on both sides.

Owing to the fact that the double tube d e fits closely against the wick b, the petroleum sucked up effects a cooling of this double wick-tube.

The thinness of the walls of the double tube d e has the same purpose—namely, that of furthering its cooling by the unimpeded access of air from outside—so that in this part of the tube no vapors can be generated. The thinness of the walls also restricts as far as possible the conduction of heat from the flame. This conduction of heat is further reduced by constructing the tube d e of material—such as German silver, manganin, constantan, or the like—which has a comparatively low coefficient of thermal conductivity. The conductivity of German silver (neusilber) is given by Drs. Landolt and Bornstein (*Physikalisch Chemischen Tabellen*, issued by Julius Springer, 1894, page 375) as from 7 to 10.94, silver being one hundred. Manganin and constantan are metal alloys used in electrotechnics, the former, according to Uppenborn's *Kalender fur Elektrotechniker*, being an alloy of four parts nickel, twelve parts manganese, and eighty-four parts copper, and the latter an alloy of forty parts nickel and sixty parts copper. The conductivity of these alloys has not been determined; but according to the well-recognized fact that materials having good electrical conductivity are also good heat-conductors and those of lower electrical conductivity bad heat-conductors it may be presumed that these alloys having electrical conductivity below German silver have also a lower thermal conductivity. Of course any suitable non-metallic material can also be used in constructing the double wick-tube d e, provided it has a low coefficient of thermal conductivity and can be made sufficiently thin.

Inside the tubes e and i is a shorter length of tube t, with a flange x at its lower end and having inserted into it a rod u of suitable material. The tube t, with the rod u, is pressed upward by a rod r, the inwardly-bent end w of which tends to move upward under the action of a spring v. Above the rod u is placed the rod s, consisting of material which is a very bad thermal conductor and carrying the spreader f, which thus touches only the rod s and cannot conduct heat to the lower parts of the burner. When the upper part of the burner is taken off, this spreader f is lifted by the spring v and rods r, u, and s sufficiently high above the upper rim of the wick to allow of the latter being easily ignited. When the upper part of the burner has been put on, however, the support q bears on the curved part of the rod r, and the spreader f moves downward into the low position adapted to produce the blue flame.

The action of the burner is as follows: The upper part of the burner having been removed, the flame is ignited at the upper rim of the wick. When the wick-tubes and the spreader f have become sufficiently heated to maintain the evaporation of the combustible at the upper edge of the wick, the upper part is put on. The draft of the chimney c and supply of air through the air-caps k and l and the downward movement of the spreader f immediately produce the non-luminous flame, which is adapted to heat an incandescent body. During the working of the lamp only those parts of the burner in immediate proximity to the flame are hot. All the other burner parts retain an equal degree of coolness at all conditions of the flame by reason of the construction described. In fact, owing to the construction of the double wick-tube d e of very thin material which is a bad thermal con-

ductor heat from the flame can only be conducted for a very short distance, and the cold petroleum in the wick, which lies closely against the tube-walls, and the outside air given access to the latter by the construction described cool the wick-tubes from inside and outside. This conducting away of heat balances the supply of heat by conduction and radiation a very short distance below the upper edge of the burner, and the double wick-tube *d e* always remains cool. Smoking is hereby entirely prevented. In fact, the double wick-tube *d e* is hotter before the upper part of the burner is put on than when the lamp is working, since after the chimney has been placed in position a powerful air-current continuously cools the outer and inner walls of the wick-tube, so that in contradistinction to all other incandescent petroleum-lamps the flame is not more powerful after a certain period of working, but rather weaker, so that the wick requires to be raised and not lowered. For this reason the lamp can be left burning for hours without inspection and without fear of blacking by soot. For this favorable result it is also important that the spreader *f* should be fastened in such a manner as to insulate heat, as above described.

I declare that what I claim is—

1. In incandescent petroleum-burners, the combination of a lower burner part adapted to be inserted into a lamp-reservoir, an upper burner part comprising a burner-head, means for connecting said upper and lower burner parts so that they are separated by an air-interval, a double wick-tube in said lower part, means for admitting air to the interior of said double wick-tube, means for collecting air to cool the exterior of said wick-tube, a double wick-tube in the upper part forming an extension of the wick-tube aforesaid, said upper tube having thin walls and being made of a bad thermal conductor, and a heat-insulated flame-spreader substantially as described.

2. In incandescent petroleum-burners, the combination of a lower burner part adapted to be inserted into a lamp-reservoir, an upper burner part comprising a burner-head, means for connecting said upper and lower burner parts, so that they are separated by an air-interval, a double wick-tube in said lower part, means for admitting air to the interior of said double wick-tube, means for collecting air to cool the exterior of said wick-tube, a double wick-tube in the upper part forming an extension of the wick-tube aforesaid, said upper tube having thin walls and being made of a bad thermal conductor, a tube in the interior of said double wick-tubes, a heat-insulated flame-spreader, and means partially in said interior tube for supporting and raising and lowering the flame-spreader, substantially as described.

3. In incandescent petroleum-burners, the combination of a lower burner part adapted to be inserted into a lamp-reservoir, an upper burner part comprising a burner-head, means for separably connecting said upper and lower burner parts so that they are separated by an air-interval, a double wick-tube in said lower part, means for admitting air to the interior of said double wick-tube, means for collecting air to cool the exterior of said wick-tube, a double wick-tube in the upper part forming an extension of the wick-tube aforesaid closely inclosing the wick, said upper tube having thin walls and being made of a bad thermal conductor, a tube in the interior of said wick-tubes, a rod passing through said interior tube, means for raising and lowering the rod in the latter, and an insulated flame-spreader adapted to be supported and raised and lowered by the said rod substantially as described.

4. In incandescent petroleum-burners, the combination of a lower burner part adapted to be screwed into a lamp-reservoir, an upper burner part comprising a burner-head, means for separably connecting said upper and lower burner parts so that they are separated by an air-interval, a double wick-tube in said lower part provided with an aperture for admittance of air to the interior thereof and an external collar for collecting air to cool the exterior thereof, a double wick-tube in the upper part forming an extension of the wick-tube aforesaid and closely inclosing the wick, said upper tube having thin walls and being made of a bad thermal conductor, a tube in the interior of said wick-tubes, a rod passing through said interior tube, means for raising and lowering the rod in the latter and a flame-spreader provided with a rod extending into said tube and adapted to be supported and raised and lowered by the first-mentioned rod substantially as described.

5. In an incandescent petroleum-burner, the combination of a double wick-tube, composed in part of a bad thermal conductor, said wick-tube provided with an inner air-passage and with means for admitting air thereto, a flame-spreader, and means causing the passage of air around said wick-tube to the flame.

6. In an incandescent petroleum-burner, the combination of a double wick-tube the portion of which nearest the flame is composed of a bad thermal conductor, said wick-tube provided with an inner air-passage and with means for admitting air thereto, a flame-spreader, and means causing the passage of air around said wick-tube to the flame.

7. In an incandescent petroleum-burner, the combination of a double wick-tube composed in part of a bad thermal conductor, said wick-tube provided with an inner air-passage and with means for admitting air thereto, a flame-spreader, supporting means therefor composed of a bad thermal conductor, and means causing the passage of air around said wick-tube to the flame.

8. In an incandescent petroleum-burner, the combination of a double wick-tube provided with an inner air-passage and with means for admitting air thereto, a flame-spreader, supporting means therefor composed of a bad thermal conductor, and means causing the passage of air around said wick-tube to the flame.

9. In an incandescent petroleum-burner, the combination with a lower burner-section comprising a double wick-tube having an inner air-passage, and a support for an upper burner-section, of an upper burner-section comprising a chimney-gallery, a supporting member below said gallery resting upon the said supporting portion of the lower burner-section but having a small area of contact with said support, and means connecting said gallery and supporting member having small cross-sectional area and wide openings for the passage of air.

10. In an incandescent petroleum-burner, the combination with a lower burner-section comprising a double wick-tube having an inner air-passage, and a support for an upper burner-section, of an upper burner-section comprising a chimney-gallery, a supporting member below said gallery resting upon the said supporting portion of the lower burner-section but having a small area of contact with said support, and pillars of small cross-sectional area connecting said gallery and supporting member and permitting the passage of air between them.

11. In an incandescent petroleum-burner, the combination with a lower burner-section comprising a double wick-tube having an inner air-passage and composed in part of a bad thermal conductor, and a support for an upper burner-section, of an upper burner-section comprising a chimney-gallery, a supporting member below said gallery resting upon said supporting portion of the lower burner-section, and pillars connecting said gallery and supporting member.

In witness whereof I have signed this specification in the presence of two witnesses.

PAUL LUCAS.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.