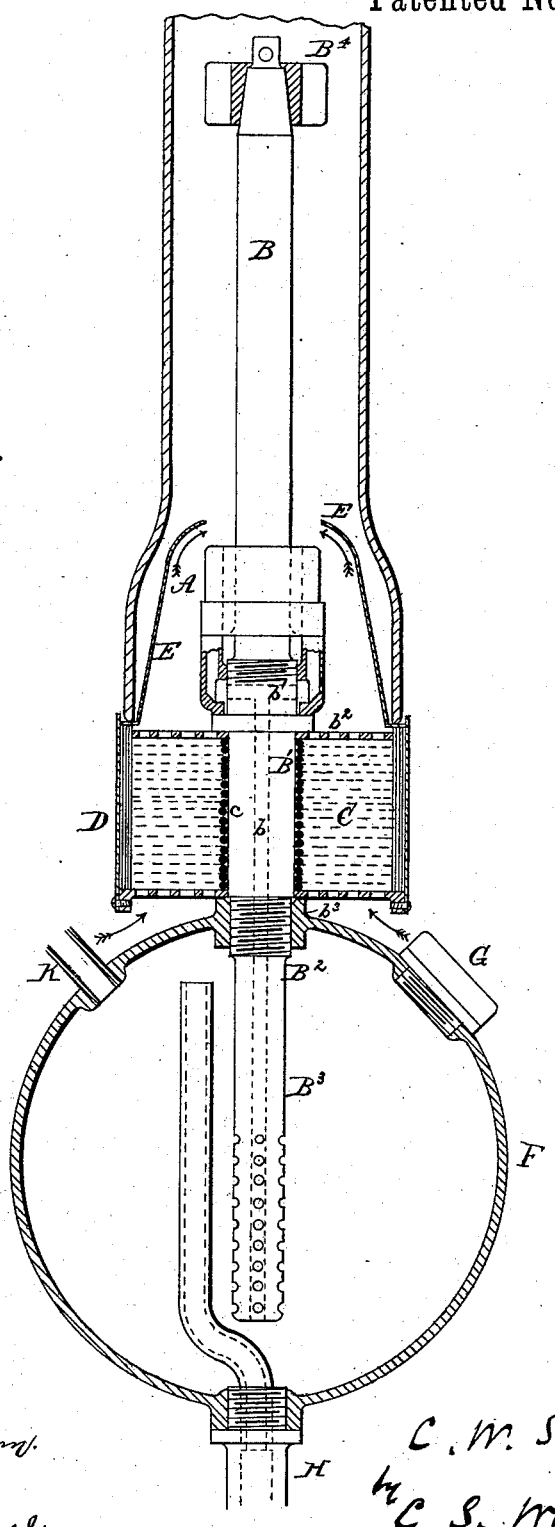
(No Model.) 5 Sheets—Sheet 1.

C. W. SIEMENS.

GAS LAMP.

No. 267,113. Patented Nov. 7, 1882.

Fig. 1.



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Inventor:
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by C. S. Whitman
attorney

(No Model.)

5 Sheets—Sheet 2.

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Fig. 2.

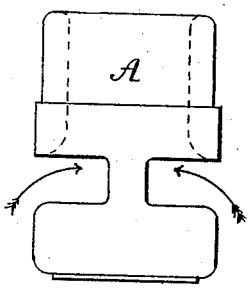

Fig. 3.

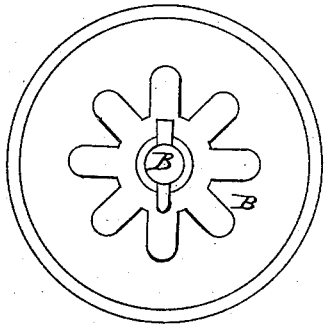

Fig. 7.

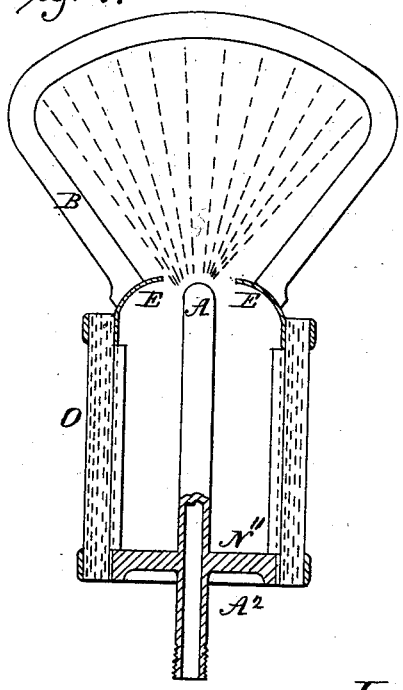

Fig. 4.

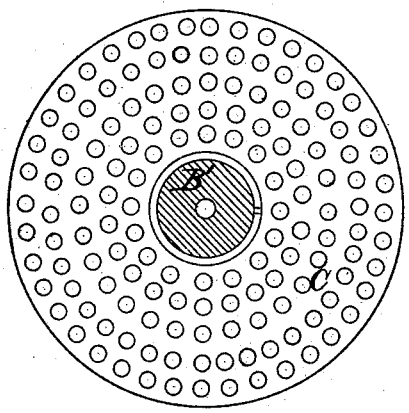

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Fig. 5.

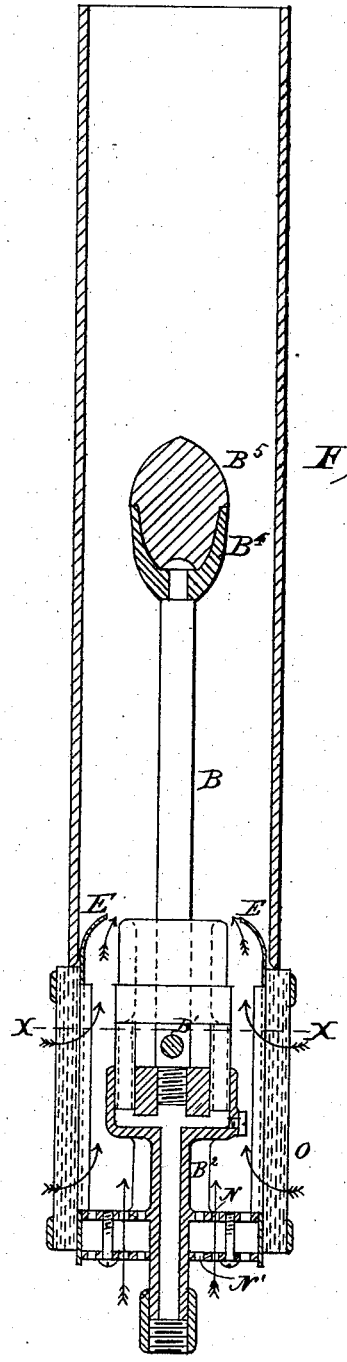
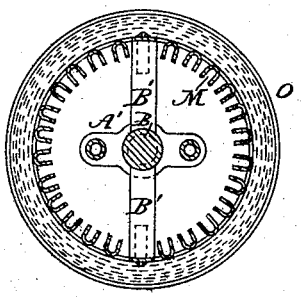


Fig. 6.



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GAS LAMP.

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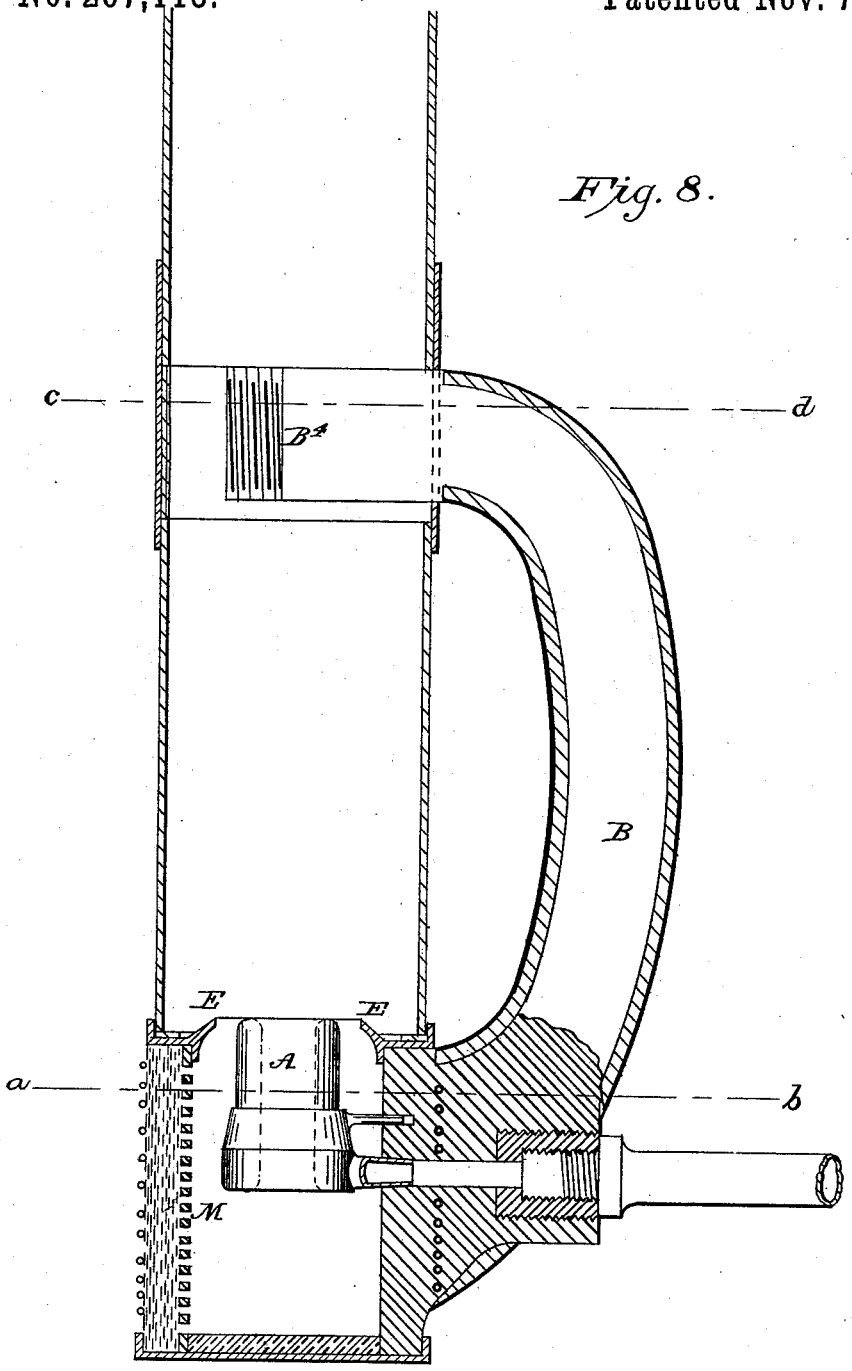
Fig. 8.



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GAS LAMP.

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Fig. 9.

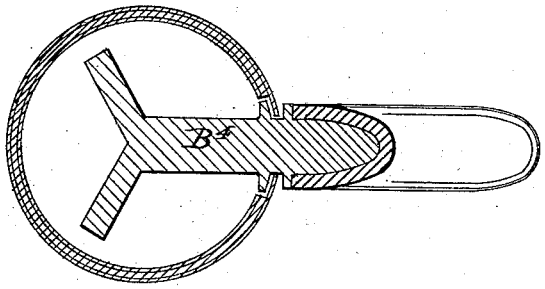
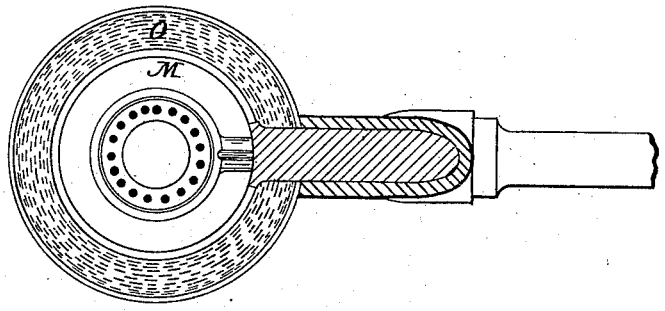


Fig. 10.



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Inventor:

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by A. Wilkinson

atty

UNITED STATES PATENT OFFICE.

CHARLES W. SIEMENS, OF WESTMINSTER, COUNTY OF MIDDLESEX, ENGLAND.

GAS-LAMP.

SPECIFICATION forming part of Letters Patent No. 267,113, dated November 7, 1882.

Application filed May 2, 1882. (No model.) Patented in England November 13, 1880, No. 4,683; in France January 6, 1881, No. 140,509; in Germany January 7, 1881, No. 15,467, and in Belgium January 8, 1881, No. 53,520.

To all whom it may concern:

Be it known that I, CHARLES WILLIAM SIEMENS, a subject of the Queen of Great Britain, residing at Westminster, in the county of Middlesex, England, have invented certain new and useful Improvements in Gas-Lamps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to gas lamps and burners; and the nature thereof consists primarily in augmenting the brilliancy of the flame by heating the air supporting the combustion of the gas by the waste heat of the flame, or that portion of the heat produced in combustion which is not utilized as luminous rays.

It also consists in the heating of the air on its way to supply the flame of the burner by means of extended metallic surfaces, which are heated by conduction by a stem or stems of metal exposed to the heat of the flame and products of combustion.

It also consists in providing each stem, which is exposed at the upper part thereof to the heat of the flame and products of combustion, with a refractory substance which is capable of radiating light, and also of protecting the stems from deterioration by the flame.

It also consists in providing the upper end of each stem, which conducts the heat to extended metallic surfaces through which the air passes, with a lump or enlargement, which end, becoming highly heated, serves to produce more complete combustion and to add to the luminous effect of the flame.

It also consists in utilizing part of the heat conducted downward for heating volatile hydrocarbon in a vessel through which air is supplied at a moderate pressure, which air takes up the vapor formed therein, so that the mixture burns as gas.

According to one way of reducing my invention to practice, I place immediately above the flame a grating, cup, lump, or other extended surface of copper or other metal of high conductivity, or of fire-clay, on which the hot products of combustion impinge. Immediately below the burner I place a grating or extended metallic surface for heating the air flowing through the passages or perforations in it to supply the flame. This surface is integral with or in immediate metallic connection with the upper surface by means of a metallic stem of high conductivity, so that a large portion of the heat of combustion is transferred by conduction to the lower surface. This construction is in this case applied to an inclosed burner of the Argand type, and a glass chimney is interposed between the upper and lower heating-surfaces.

In the accompanying drawings, Figure 1 is a vertical section, showing the application of my device to a gas-lamp having an Argand or circular burner. Figs. 2, 3, and 4 are detail views of separate portions of my device.

Similar letters of reference indicate corresponding parts in these figures and in those which I shall subsequently describe.

In the center of the burner A is fixed the cylindrical stem B, of copper or other equally good conductor of heat, preferably coated with platinum, enamel, or other refractory substance, to operate as a reflector and preserve the stem from oxidation by the flame. The stem B extends upward some distance above the burner, and has at its upper end a star or cup shaped crown, B^4. The stem B also extends downward below the burner, and its lower part, B′, is bored longitudinally to form a passage, *b*, for the gas upward, and transversely at *b′* to provide passages for the gas into the cavity of the burner. The gas-supply pipe may be connected to the stem at B^2, or the stem may be carried farther down, forming an extension, B^3, hereinafter referred to.

Between collar b^2 on the stem B′ and nut b^3 are clamped a number of perforated disks, C. (Shown in detail in Fig. 4.) These disks are held apart by rings *c*, which fit over the stem B′, and near their circumference by studs or rivets in each alternate disk. The disks C are inclosed in a casing, D, of asbestus or ceramic material or other bad conductor of heat.

Above the disks C is fitted a deflecting-cone of ordinary form for directing the air against the root of the flame.

The lamp, being supplied with gas at B^2, operates as follows: The stem B and its crown

B^4 being highly heated by the flame surrounding B, a large portion of the heat is conducted downward to the perforated disks C, whereby the air passing through their perforations becomes heated. This heated air, being supplied to the flame partly outside, as directed by cone E, and partly inside, as indicated by the arrows, causes the gas to burn with great brilliancy. Instead of supplying gas to the stem at B^2, the heat conducted downward may be in part applied to generate gas. For this purpose the prolongation B^3 may be made to extend down with lateral perforations into a vessel, F, containing volatile hydrocarbon, with which the vessel may be charged through aperture G. Through the pipe H or a lateral pipe, K, air may be supplied at a moderate pressure above that of the atmosphere. This air, in passing through the vessel F, becomes charged with hydrocarbon vapors, so that the mixture burns as gas. When the lamp is used in this manner it is necessary in the first place to heat the contents of F, which may be done by applying external heat.

The burner A may be of oblong instead of circular form, in which case, if its width is considerable, two or more heat-conducting stems instead of only one may be employed.

In another form of burner I place immediately above the flame a cup filled with a mass of fire-clay or other suitable refractory material, on which the products of combustion impinge. Immediately below, and at the side of the burner, I place gratings or extended metallic surfaces, for heating the air flowing through passages or perforations therein to supply the flame. These surfaces are placed in immediate metallic connection with the cup filled with fire-clay by means of a metallic stem of high conductivity, so that a large portion of the heat of combustion is transferred by conduction thereto, and thus the combined mass, when highly heated by the flame, serves both to effect the more complete combustion of the gas and to add to the luminous effect of the flame.

In order more fully to utilize the heat, parts of the external surfaces of the burner may be covered with imperfectly conducting or refractory material, such as asbestus.

If the metallic connection of the upper and lower heaters is placed outside the flame, it may be coated with refractory substances to prevent loss of heat by radiation; and it may be of wedge-shaped section, so as to present little obstruction to the lateral radiation of the light; or it may be widened out and faced so as to form a reflector.

Fig. 5 is a vertical section of the upper part of a gas-lamp having my improvements applied thereto. Fig. 6 is a horizontal transverse section of the same, taken on the line X X. Fig. 7 shows a vertical section of a bat's-wing burner. Figs. 8, 9, and 10 illustrate a lamp of the Argand type with heat-conducting stem outside the flame.

In the center of the burner shown in Figs. 5 and 6, I fix a cylindrical stem, B, made of copper or other metal which is a good conductor of heat, and which may be coated with platinum, enamel, or other refractory material, so as to act as a reflector, and also preserve the stem from oxidation from the flame. The stem B extends some distance above the burner, and has fixed on its upper end a piece, B^4, of cup shape, filled with a mass, B^5, of fire-clay or other suitable refractory material, which, on becoming highly heated, serves to add to the luminous effect of the flame. This stem also extends down below the burner, and its lower part is bored longitudinally to form an upward passage and transversely to give passages for the gas into the cavity of the burner. The burner A is surrounded by a cage consisting of ribbed bars M, fixed to a perforated disk, N, round which are wound several coils of wire-gauze, O, secured externally by metal rings. These ribbed bars M may be arranged horizontally, diagonally, or otherwise. From the lower end of the rod B branches B′ are made to extend to the surrounding cage, so as to conduct heat from the former to the latter, a further quantity of heat being conveyed through the disk N, which may conveniently be formed in one casting with the gas-pipe B^2 and base A′ of the burner, into which the rod B is secured. Between the disk N and a second perforated disk, N′, may be secured several layers of wire-gauze, which also become considerably heated, so that the air, in passing through these and also through the wire-gauze casing O on its way to the burner, becomes heated, and is directed by the cone E against the flame. The air thus heated not only increases the quantity of the light, but improves its quality.

In the lamp illustrated in Fig. 7 the burner A is surrounded by a wire-gauze, O, formed as described with reference to Fig. 5, upon which is fixed the cone E, carrying the bent metal rod B, so formed as to present considerable surface to the bat's-wing flame. The heat thus taken up by the rod being conducted through the cone E to the wire casing O, the wire passing through the latter to the burner becomes heated as before. The lower end of the casing is in this case closed by a solid disk, N″, fixed or formed on the gas-pipe A^2 and serving to support the casing O and rod B.

The lamp illustrated in vertical section in Fig. 8 and in horizontal section in Figs. 9 and 10, upon the lines *a b* and *c d* of Fig. 8, has an Argand or circular burner, but could have instead a straight burner. At the top of the flame is placed a lump, star, ring, or grating of metal, B^4, in immediate connection with the heat-conducting stem B, communicating below with the passages through which the gas and air reach the burner. The waste heat of the flame is in this case taken up by the grating, and is transmitted downward by the stem situated outside the burner, whereby loss of light due to the presence of a solid body in the interior of a circular flame is obviated. The heat-conducting stem may, moreover, be made

of greatly-increased sectional area to what is possible when placed within the burner, whereby its power of conducting heat will be proportionately increased, and little loss of heat will occur if it be coated with asbestus or other non-conducting substance, over which a material capable of reflecting light may be placed. The presence of a grating at the extremity of the gas-flame serves to improve combustion.

In order to increase the draft of the burner, an additional chimney may be placed above the grating, as shown in the drawings, and for controlling the admission of gas a tap should be used, and for controlling the admission of air a damper may be placed at some point—at the foot of the burner or in the additional chimney above referred to.

It will be noted that the essence of my invention is the utilization of the waste heat from the products of combustion for heating the air and also the gas previous to combustion, and thus improving the illuminating-power of the flame, such heat being conducted to the required point by means of solid metallic conductors, and that this action must not be confounded with the application of a portion of the heat of the flame for heating air or gas, or for generating gas from hydrocarbons, which is effected at the expense of the flame, and which is detrimental to its illuminating-power.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. An appliance placed over and above the flame for abstracting heat from the products of combustion and conveying such waste heat, by means of one or more solid metallic stems or rods of good heat-conductivity, to the lower part of the lamp, wherein the incoming air is heated previous to combustion.

2. A chamber for heating the air on its way to supply the flame, consisting of metallic surfaces externally covered with imperfectly-conducting or refractory material, substantially as described.

3. The appliance herein described, placed over and above the flame, for abstracting heat from the products of combustion and conveying such waste heat, by means of one or more solid metallic stems or rods of good heat-conductivity, to the lower part of the lamp, whereby the combustible gas may be heated or be generated from hydrocarbons previous to combustion.

4. The stem situated outside the burner, with extended metallic surfaces at its upper and lower parts, the former being exposed to the heat of the flame, while the latter serves to heat the air and gas supplying the burner, substantially as shown and described.

5. The combination, with the stem B′, having a collar, b^2, and nut b^3, of a number of annular metal disks, C, kept a little distance apart by rings *c*, as and for the purpose specified.

6. The combination of the burner and the perforated metal plate or wire-gauze, placed over a grating at the foot of the burner, for breaking up the incoming air-current and increasing the heating-surface to which it is exposed.

7. The heat-conducting stem B, coated with a refractory substance capable of refracting light and protecting it from the flame, substantially as described.

8. The heat-conducting stem situated outside the burner, coated with a substance or substances capable of resisting heat and refracting light.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES WILLIAM SIEMENS.

Witnesses:
CHAS. ROCHE,
GEO. WOOLLETT,
Both of 2 Waterloo Place, Pall Mall, London, Notary's Clerks.