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A. SHIELS.

BURNER.

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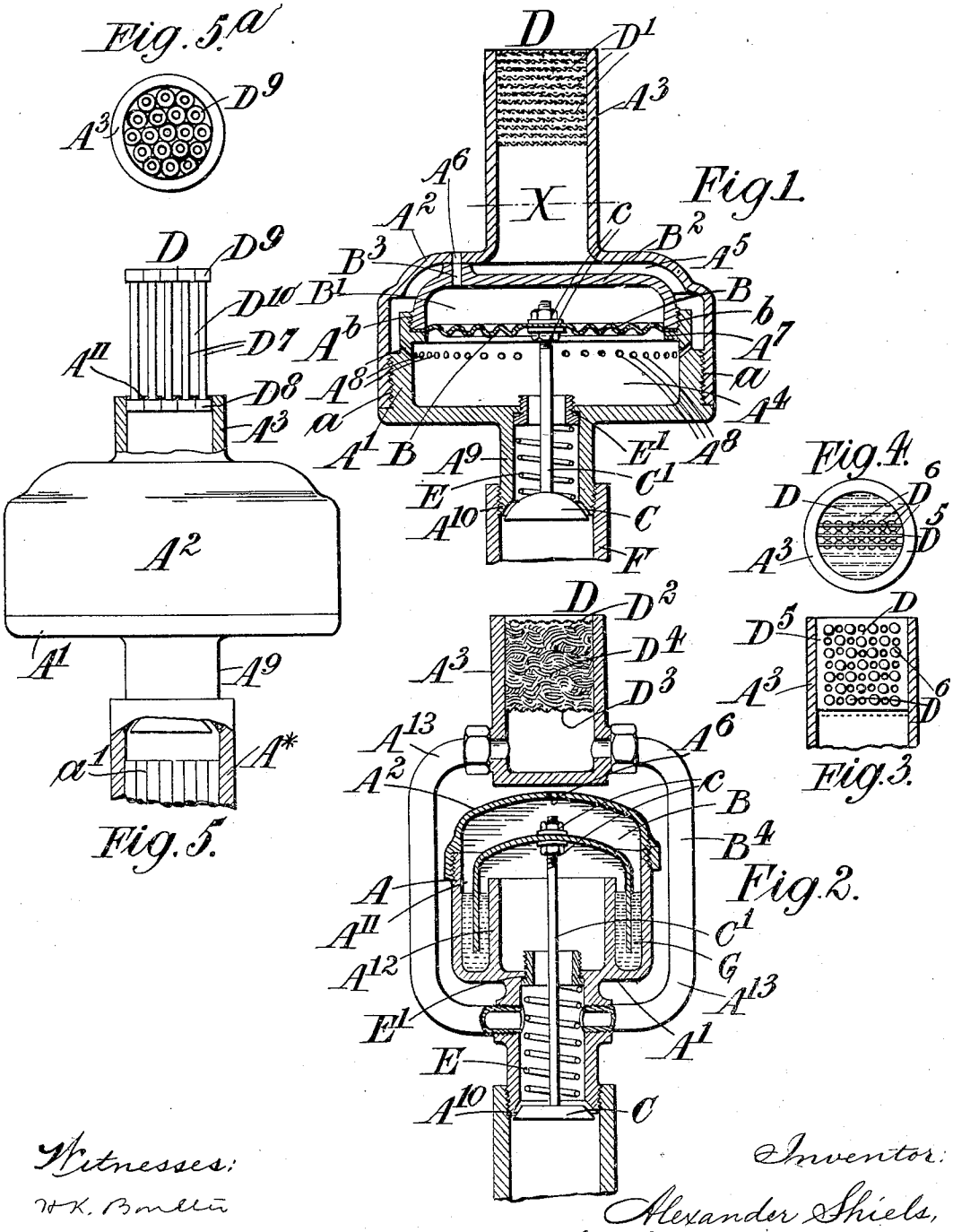


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# UNITED STATES PATENT OFFICE.

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## BURNER.

SPECIFICATION forming part of Letters Patent No. 792,356, dated June 13, 1905.

Application filed January 23, 1905. Serial No. 242,412.

*To all whom it may concern:*

Be it known that I, ALEXANDER SHIELS, a subject of the King of Great Britain, residing at Glasgow, Scotland, have invented certain new and useful Improvements in or Relating to Burners, of which the following is a specification.

This invention relates to gas and similar burners, and refers particularly to burners for use with carbureted air and containing approximately from about three-fourths to five per cent. hydrocarbon vapor.

The burner when used for lighting employs an incandescent mantle or body and may also be employed for heating purposes.

According to this invention the head or outlet of the burner is provided with a device for splitting up the gas into many small streams and obstructing its free passage, an automatically-operating governor being employed to control the pressure of gas supplied to the burner. The gas is split up into minute streams and passes through very fine conduits, channels, or passages, and an additional supply of air conveniently heated by the flame may be intermingled with the gas passing through the head of the burner at the point of ignition.

Referring to the drawings, Figure 1 is a sectional elevation of a preferred construction of burner in accordance with this invention. Fig. 2 is a similar view showing a modified construction; and Figs. 3 and 4 are respectively a sectional elevation and a plan of the top part or head of the burner, showing still another modified construction; and Fig. 5 shows a preferred construction where an additional supply of air is intermingled with the gas as it issues at the point of ignition. Fig. $5^a$ is a plan view of the burner-head $A^3$ and tubes $D^9$ seen in Fig. 5.

A is the burner-casing; B, the automatic regulator; C, the inlet-valve controlled by the regulator, and D is the device for splitting up the gas into a number of minute streams and interrupting its free passage as it passes through the head of the burner to the point of ignition.

Referring more particularly to the construction shown in Fig. 1, the casing A is formed of two parts $A'$ $A^2$, screwed together, as at *a*, or otherwise connected. The part $A'$ constitutes the base of the burner and communicates with the supply of gas or vapor, and the part $A^2$ forms the outlet end, within which is arranged the device D for splitting up the gas into a series of fine streams or jets. Within the casing is formed a fuel-chamber divided by an air-chamber $B'$ into two parts $A^4$ $A^5$, which communicate by a series of openings $A^8$. The upper side of the wall of the air-chamber $B'$ is formed by a dished or cup-shaped member $B^2$, which is screwed, as at *b*, or otherwise fitted gas-tight into the part $A'$ of the casing. The lower side of the air-chamber is formed by a corrugated or other resilient plate or diaphragm B, preferably made of thin metal. This diaphragm is attached to the stem $C'$ of the fuel-inlet valve C and acts automatically to regulate the pressure of the gas. The chamber $B'$ is open to the atmosphere through one or more orifices $B^3$, which coincide with corresponding openings $A^6$ in the wall of the part $A^2$. The joint between the two parts around the orifices may be made gas-tight in any convenient manner. The diaphragm B rests upon a flange $A^7$ on the part $A'$ of the casing, against which it is pressed by the member $B^2$ and is thus held in position. The stem $C'$ of the valve C may be secured to the diaphragm B by nuts *c*, as shown, or in any other convenient manner. A spring E normally tends to keep the valve C open, and one end of this spring rests upon the valve, while the other bears against an adjustable sleeve $E'$, screwed into the part $A'$ of the casing, so that by rotating this sleeve the power of the spring can be adjusted. The spring E is situated within an extension $A^9$ of the casing, and the end of this extension has a seating $A^{10}$ for the valve C. This extension may be screwed or otherwise attached to the gas-supply pipe F or to a nipple connected thereto.

As above stated, this burner is intended for burning carbureted air or light hydrocarbon gas—for example, a gas containing as low as three-quarters per cent. of hydrocarbon vapor—and can either be employed for heating purposes or with an incandescent mantle or member for lighting purposes. It is neces-

sary when consuming a gas of this nature in order to get satisfactory results that the gas should be divided up into minute streams before issuing at the point of ignition and that the pressure of the gas issuing from the burner should be maintained constant.

The device D (shown in Fig. 1) for splitting up the gas as it issues from the burner consists of a number of pieces of fine wire-gauze D′, which are disposed within the head $A^3$ of the burner. As represented in the drawings, comparatively large spaces exist between the neighboring sheets of gauze; but in reality spaces of this nature will not or need not exist, the drawings being merely shown in this way for the sake of clearness. The sheets of gauze may be soldered or otherwise fixed in position. For example, they may rest on a shoulder within the extension $A^3$ and be retained in place by a ring screwed or otherwise secured to the outer end of the part $A^3$.

The pressure of the gas passing through the device $D^3$ is automatically maintained constant by the regulator above described. The gas enters the burner through a valve C and passes into the part $A^4$ of the fuel-chamber, thence by the openings $A^8$ into the part $A^5$, and thereafter by the extension $A^3$ to the device D, where it is split up into minute streams and its free passage interrupted, as above described.

The diaphragm B is so constructed that should the pressure at which the gas burns most satisfactorily be exceeded this pressure acting on the under side of the diaphragm will force it upward against the action of a spring and also against atmospheric pressure, closing the valve C more or less, and when the pressure has subsequently been reduced the spring will again open the valve, allowing a larger quantity of gas to enter and always tending to prevent any excess of gas-pressure at the point of ignition other than that which gives the most satisfactory results. The regulator also acts to reduce the pressure—as, for example, when more than one burner is connected to the supply-pipe—since when all the burners or some of them are in use the pressure will be lower than should only one burner be ignited. The diaphragm will act to reduce the pressure in the latter case, so that the gas will be burned at the pressure at which it is found to give more satisfactory results.

Referring now to the modification shown in Fig. 2, the flexible diaphragm B is here replaced by a cup-shaped member $B^4$, to which the stem C′ of the valve is secured. The open end of the member $B^4$ dips into the mercury G or other suitable fluid or semifluid disposed in an annular channel or trough $A^{11}$, which is arranged between the outer wall of the part A′ of the casing and a central extension $A^{12}$ thereon.

The head $A^3$ of the burner forms a separate part from the body A and communicates therewith by an appropriate number of pipes or conduits $A^{13}$, which communicate with the burner-body above the valve C and between it and the automatic regulator conveying the gas to the head below the device D.

The casing A is open on the outer side of the member $B^4$ to the atmosphere through one or more openings $A^6$ in the part $A^2$ of the casing, so that the member $B^4$ is acted upon by gas-pressure on its under side and by the atmosphere on its outer side, the escape of gas being prevented by the mercury or other seal.

The device D, having wire-gauze arranged as described in connection with Fig. 1, may be employed with this construction or, as shown, there may be disposed between two sheets $D^2$ $D^3$, of gauze or the like, a quantity of asbestos-wool or other similar material or a granular substance may be employed to divide the gas up into minute streams as it passes through the device and to interrupt its free passage.

In the modification shown in Figs. 3 and 4 the device D within the head $A^3$ consists of a number of sheets or pieces of metal or other appropriate material $D^5$, having nodules $D^6$ on either or both surfaces and arranged within the head $A^3$ so that the gas in passing through the device is impeded, broken, or split up into a number of minute streams, as already described, or a single sheet of metal may be folded upon itself in opposite directions alternately and the projections or nodules may be arranged to come opposite each other, to project beyond each other or overlap, or in any other appropriate manner.

An additional supply of air may be introduced to intermingle with the gas by arranging air-passages between the gas-passages. For example, in the form shown in Figs. 3 and 4 the casing of the part $A^3$ may be pierced so as to introduce air between the alternate plates. The air will thus pass up and mingle with the gas at the point of ignition. A preferred embodiment of the invention in which this supplementary supply of air is introduced is shown in Figs. 5 and $5^a$. In this case the device D consists of a series of very fine tubes $D^7$, having at top and bottom enlargements $D^9$ and $D^{10}$, respectively. The spaces between the lower ends of these tubes may be closed by a plate or by solder $A^{11}$ or otherwise. The air enters between the tubes and passes up to the point of ignition, issuing in small streams through the spaces existing between the enlarged ends of the tubes $D^9$. The tubes shown are circular; but they may be rectangular, hexagonal, or otherwise shaped, and they may be of the same diameter throughout their entire length, the spaces between their lower ends being closed, so that the gas has to pass up inside the tubes, while the air passes on the outside.

Only a few of the tubes are shown in Fig.

5, the exact position being shown more clearly in Fig. 5ª. The tubes are also larger in diameter than they will be in practice; but this is done for the sake of clearness. The lower stem of the burner—that is to say, the part A—may also be provided with tubes *a'* to divide the gas up before it enters the distributing-chamber.

When the burner is employed for lighting purposes, an incandescent mantle or member may be suspended or fixed above the outlet end of the burner in any appropriate manner, and when employed for heating purposes the burner will be arranged within a stove or fireplace in any desired manner. In place of having a regulator such as described for each light one regulator may serve for two or more.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head or outlet of a device for splitting up the gas into many small streams and obstructing its free passage through the burner and means for controlling the pressure of the gas-supply to the burner substantially as set forth.

2. In a burner of the character described the combination with a head or outlet, of a device for splitting up the gas into many small streams and obstructing its free passage through the burner comprising a series of very fine vertically-arranged tubes as described, said tubes being arranged to provide air-spaces between them, the spaces between the lower ends of the tubes being closed for the purpose set forth, and means for controlling the pressure of the gas-supply to the burner.

3. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head or outlet and means dividing the head up into a series of fine conduits or passages comprising a series of very fine tubes as described, arranged to provide air-spaces between them, of a gas-supply valve, a device operatively connected to the gas-supply valve and arranged to be acted upon by the incoming gas to maintain constant the pressure of the gas entering the conduits and a spring arranged to act upon the gas-valve to tend to keep it open substantially as set forth.

4. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head or outlet and means dividing the head up into a series of fine conduits or passages comprising a series of very fine tubes as described, arranged to provide air-spaces between them, of a gas-supply valve, an automatic regulator operatively connected to the gas-supply valve and arranged to be acted upon by the incoming gas to maintain constant the pressure of the gas entering the conduits, a spring arranged to act upon the gas-supply valve to tend to keep it open and means for adjusting the power of the spring substantially as set forth.

5. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head and means dividing it up into a series of fine conduits or passages comprising a series of very fine tubes as described, arranged to provide air-spaces between them, of a fuel or distributing chamber, an air-chamber within the fuel-chamber and dividing it into two compartments communicating by a series of openings, a diaphragm forming one wall of the air-chamber, a gas-inlet valve, a spindle connecting the valve to the diaphragm upon which the fuel acts to regulate the opening of the valve and maintain constant the pressure of fuel issuing from the burner, and a spring tending to keep the gas-valve open against the fuel-pressure substantially as set forth.

6. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head and means dividing it up into a series of fine conduits or passages comprising a series of very fine tubes as described, arranged to provide air-spaces between them, of a fuel or distributing chamber, an air-chamber within the fuel-chamber and dividing it into two compartments communicating by a series of openings, a diaphragm forming one wall of the air-chamber, a gas-inlet valve, a spindle connecting the valve to the diaphragm upon which the fuel acts to regulate the opening of the valve and maintain constant the pressure of fuel issuing from the burner, means for adjusting the spindle, a spring tending to keep the gas-valve open against the fuel-pressure and means for regulating the spring substantially as set forth.

7. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head or outlet and means dividing the head up into a series of fine conduits or passages of a gas-supply valve, a device operatively connected to the gas-supply valve and arranged to be acted upon by the incoming gas to maintain constant the pressure of the gas entering the conduits, a spring arranged to act upon the gas-

valve to tend to keep it open, and means for supplying air between the streams of gas, substantially as set forth.

8. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head or outlet and means dividing the head up into a series of fine conduits or passages, of a gas-supply valve, an automatic regulator operatively connected to the gas-supply valve and arranged to be acted upon by the incoming gas to maintain constant the pressure of the gas entering the conduits, a spring arranged to act upon the gas-supply valve to tend to keep it open, means for adjusting the power of the spring, and means for supplying air between the streams of gas, substantially as set forth.

9. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head and means dividing it up into a series of fine conduits or passages of a fuel or distributing chamber, an air-chamber within the fuel-chamber and dividing it into two compartments communicating by a series of openings, a diaphragm forming one wall of the air-chamber, a gas-inlet valve, a spindle connecting the valve to the diaphragm upon which the fuel acts to regulate the opening of the valve and maintain constant the pressure of fuel issuing from the burner, a spring tending to keep the gas-valve open against the fuel-pressure, and means for supplying air between the streams of gas, substantially as set forth.

10. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head and means dividing it up into a series of fine conduits or passages of a fuel or distributing chamber, an air-chamber within the fuel-chamber and dividing it into two compartments communicating by a series of openings, a diaphragm forming one wall of the air-chamber, a gas-inlet valve, a spindle connecting the valve to the diaphragm upon which the fuel acts to regulate the opening of the valve and maintain constant the pressure of fuel issuing from the burner, means for adjusting the spindle, a spring tending to keep the gas-valve open against the fuel-pressure, means for regulating the spring, and means for supplying air between the streams of gas, substantially as set forth.

11. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head of a series of tubes constituting passages for the carbureted air or gas and having air-conduits between them, a fuel or distributing chamber or chambers within the fuel-chamber and dividing it into two compartments which communicate with each other by a series of openings, a diaphragm forming one wall of the air-chamber, a gas-valve, a spindle connecting the valve to the diaphragm and a spring tending to keep the gas-valve open, substantially as set forth.

12. In a burner which when used for lighting purposes employs an incandescent mantle and for burning light hydrocarbon vapor or air containing a small percentage of hydrocarbon vapor, the combination with a head, of a series of tubes constituting passages for the gas and having air-conduits between them, an automatic regulator, a gas-inlet valve operatively connected to the regulator and a spring tending to keep the gas-valve open and maintain constant the pressure of the gas which acts upon the regulator tending to close the valve, substantially as set forth.

13. A burner-head for use as described comprising a series of very fine vertically-arranged tubes, said tubes having enlargements at their upper and lower ends and being arranged to provide air-spaces between said tubes, the lower ends of the said spaces being closed for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALEXANDER SHIELS.

Witnesses:
R. WESTACOTT,
WM. J. DOW.