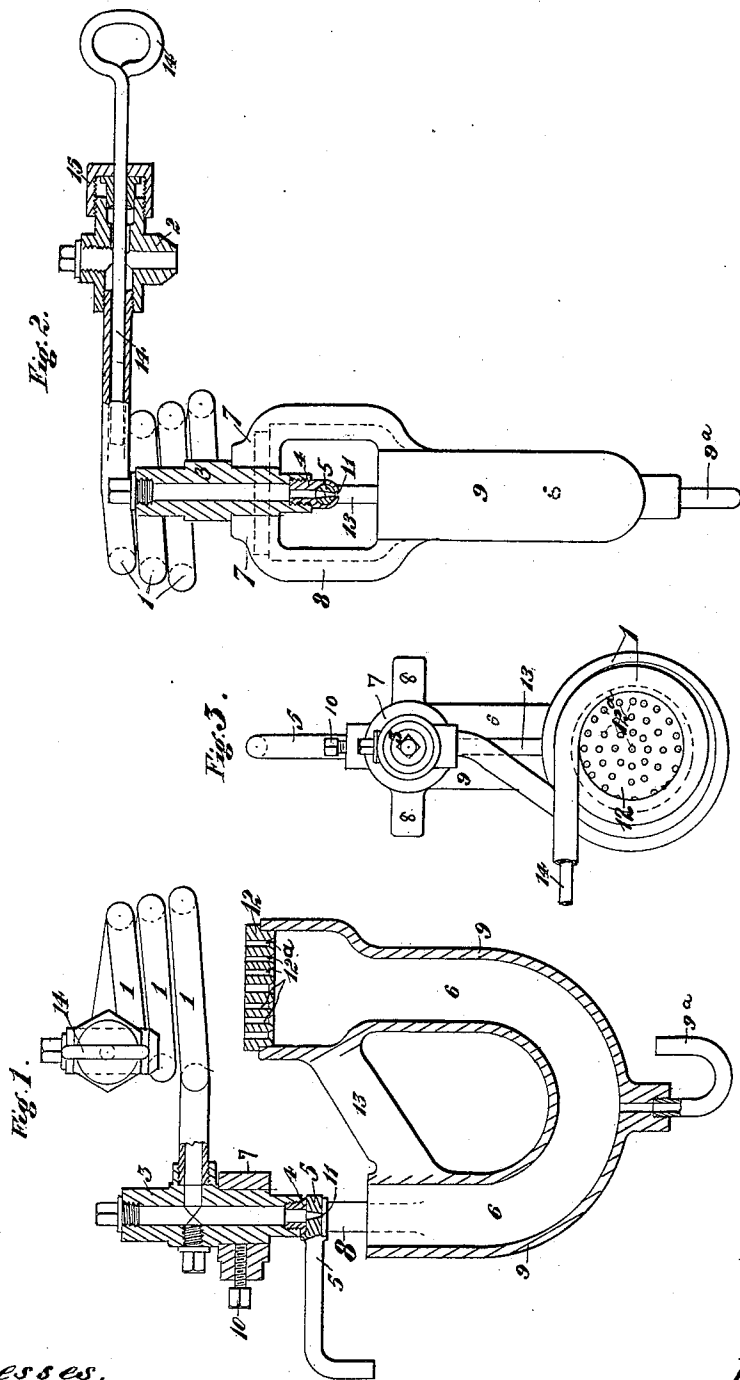


(No Model.)

H. LINDLEY.  
PETROLEUM BURNER.

No. 463,905.

Patented Nov. 24, 1891.



Witnesses.  
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# UNITED STATES PATENT OFFICE.

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## PETROLEUM-BURNER.

SPECIFICATION forming part of Letters Patent No. 463,905, dated November 24, 1891.

Application filed August 25, 1890. Serial No. 363,013. (No model.) Patented in England July 12, 1889, No. 11,226; in France October 30, 1889, No. 201,655; in Belgium October 30, 1889, No. 88,262; in Switzerland September 1, 1890, No. 2,774; in Norway September 1, 1890, No. 1,924; in Victoria September 15, 1890, No. 8,072; in New South Wales September 17, 1890, No. 2,480; in Queensland September 18, 1890, No. 1,146; in South Australia September 19, 1890, No. 1,721; in New Zealand September 26, 1890, No. 4,617; in Italy September 30, 1890, LV, 244; in Cape of Good Hope October 1, 1890, No. 633; in Natal October 1, 1890; in Transvaal October 3, 1890, No. 212; in Brazil October 24, 1890, No. 981; in Spain November 14, 1890, No. 11,204; in Argentine Republic December 29, 1890, No. 975; in Austria-Hungary March 18, 1891, No. 39,151; in Mexico March 31, 1891, No. 93, and in Portugal June 10, 1891, No. 1,591.

### *To all whom it may concern:*

Be it known that I, HERBERT LINDLEY, a subject of the Queen of Great Britain and Ireland, residing at Salford, in the county of Lancaster, Kingdom of Great Britain and Ireland, have invented Improvements in Burners or Apparatus for Burning Petroleum or other Oils or Volatile Fluids, (for which I have obtained Letters Patent in the following countries: Great Britain, dated July 12, 1889, No. 11,226; France, dated October 30, 1889, No. 201,655; Belgium, dated October 30, 1889, No. 88,262; Austria-Hungary, dated March 18, 1891, No. 39,151; Switzerland, dated September 1, 1890, No. 2,774; Italy, Reg. Att., Vol. LV, dated September 30, 1890, No. 244; Norway, dated September 1, 1890, No. 1,924; Spain, dated November 14, 1890, No. 11,204; Portugal, dated June 10, 1891, No. 1,591; Mexico, dated March 31, 1891, No. 93; Victoria, dated September 15, 1890, No. 8,072; South Australia, dated September 19, 1890, No. 1,721; Queensland, dated September 18, 1890, No. 1,146; New Zealand, dated September 26, 1890, No. 4,617; New South Wales, dated September 17, 1890, No. 2,480; Cape of Good Hope, dated October 1, 1890, register folio No. 633; Natal, dated October 1, 1890; Brazil, dated October 24, 1890, No. 981; Argentine Republic, dated December 29, 1890, No. 975; Transvaal, dated October 3, 1890, No. 212,) of which the following is a specification.

This invention relates to burners or apparatus for burning petroleum or other oils or volatile fluids; and the object of the invention is to provide improvements whereby the heavier oils may be consumed without the use of wicks and with a smokeless or Bunsen flame.

This invention consists in certain novel features of construction and in combinations of parts more fully described hereinafter, and particularly pointed out in the claims.

In the accompanying drawings, Figures 1, 2, and 3 are respectively a vertical section, partly in elevation, a side elevation, partly in vertical section, at right angles to Fig. 1,

and a plan of a burner according to this invention.

1 is a vapor-generating coil.

2 is a portion of a coupling that serves to connect the upper end of the coil to an oil-supply pipe. (Not shown.)

The lower end of the coil 1 is in communication with a tubular heat-conducting part 3, that carries a holder 4, which supports a jet-piece 5, arranged centrally over the open end of the mixing tube or channel 6. This mixing-channel, which I usually make of circular cross-section, can be made in various forms according to the purpose for which the burner is required. Thus it can be made as a tube bent back on itself, as shown, the return-limb being under or parallel to the first portion. The arrangement in every case should be such that when combustion takes place the resulting heat will be utilized to keep the mixing tube or channel as well as the vapor-generating tube or tubes hot. To the ring 7, carried by the arms 8, that extend upward from the casting 9, in which the tube or channel 6 is formed, the part 3 is secured by a set-screw 10. The jet-piece 5 consists in the example shown of a piece of round wire, one end of which fits closely into the holder 4, which has at its holding or gripping part the form of a spring-clip, as clearly shown in Fig. 2. There is a hole through 4 and a conical hole 11 in the jet-piece 5, these holes being arranged in line with the hole in 3 and centrally over the open end of the channel 6. The smaller end of the conical hole 11 is toward the channel 6, and the size thereof is determined by the quantity of vapor that is to issue therefrom with the head of oil employed. With a channel 6 of one inch diameter and a head of oil of six feet the smaller end of the conical hole 11 can advantageously be about 0.02 inch in diameter.

12 is a combustion-plate fixed at the outlet end of the channel 6. It is in the example shown of circular form, and is made of considerable thickness and perforated with nu-

merous small holes 12<sup>a</sup>. These holes in the combustion-plate are of small diameter in proportion to their length, the object of so making them being to lessen the tendency to light back.

In a burner such as represented, which is half the actual size, I find a suitable diameter for the holes in the combustion-plate is from one-eighth of an inch to three-sixteenths of an inch; but the diameter will depend to some extent upon the number of holes within a given area of combustion-plate. The fewer the holes the larger they should be, but care being taken not to make them so large as to seriously reduce the velocity of the combustible mixture passing through them. Instead of round holes, narrow, straight, or curved holes might in some cases be used, the width and number being such that the mixture of vapor and air should issue through them at a considerable velocity. Otherwise the flame would be liable to strike back. The holes may, as shown, be countersunk or widened out at their inner ends, where they communicate with the mixing-channel. 13 is a web connecting the two limbs of the tube 9.

With the construction described oil entering the upper end of the heated coil 1 and passing downward therethrough is converted into vapor, which, passing through the part 3, issues through the hole 11 in a jet-like form and enters the open end of the mixing-channel 6, drawing air in with it. The vapor and air in passing through 6 become intimately mixed and heated, and the mixture ultimately meets the perforated combustion-plate 12, through the holes in which it passes with sufficient velocity to prevent lighting back, and is then burned, the resulting flame passing through the space inclosed by the coil 1 and heating that coil. The plate 12 by the action of the flame becomes heated and imparts heat by conduction to the wall 9 of the tube or channel 6, the web 13 also serving to carry some of this heat to that end of 9 to which the heat-conducting part 3 is secured. Heat is also conducted to the part 3 by the lower portion of the heating-coil 1, so that the vapor produced will not condense on issuing through the small hole 11. The ring 7 and arms 8 also serve as a heat-conducting support between the part 3 and the casting 9.

Care should be taken to make the coil 1 of such a diameter that the part 3 does not become too hot. Otherwise the jet-opening 11 may become obstructed by a burned residue. The mixing tube or channel 6 also should not be allowed to become too hot.

Satisfactory results have been obtained with the parts proportioned as in the example shown, which is drawn to a scale of half the actual size. At a suitable temperature for correct working it is found that some of the heavier constituents of petroleum-oil will not remain entirely in a state of vapor during their passage through the mixing-channel 6, but will slowly condense and would in time

accumulate in the lower bent portion thereof. To prevent this accumulation a small bent tube 9<sup>a</sup> is provided that serves to carry off any oil so condensed. This tube is kept sealed by the oil that remains pocketed or trapped in the bent portion thereof.

To prevent pulsations of the flame, such as might occur with a burner constructed as described and shown, I employ a wire 14, arranged, as shown, in the upper portion of the coil 1, which is made straight for some distance for its reception. The wire passes through a small gland 15 in the coupling 2 and extends along the straight portion of the coil 1 about as far as the commencement of the first convolution. This wire, by spreading out the oil into a thin film, allows the same to become more gradually heated and effectually prevents pulsation. Two or more wires placed side by side may be used instead of one wire only.

As will be obvious, the forms and details of various parts of a burner or apparatus according to this invention might be variously modified from those shown to suit particular applications without departure from the nature of this invention.

In the above arrangement of burner it is necessary to apply heat at starting in order to generate the vapor requisite to form the jet, as hereinbefore described.

I am aware that burners of various kinds have been heretofore constructed to obtain Bunsen flames from the lighter oils, such as benzoline and gasoline, and also to obtain white or illuminating flames from the heavier oils, such as petroleum; also that jets have been used in burners giving Bunsen flames from the lighter oils—such as benzoline—for drawing in air and mixing it with the vapor formed or generated by the heat of their flames for the purpose of producing Bunsen flames. Therefore I lay no broad general claim to such known arrangements.

What I claim is—

1. In a burner, the combination of a coil 1, a bent mixing-tube 6, having an air-inlet at one end and a perforated combustion-plate at the other end, a tubular heat-conducting part, such as 3, connected to said coil, a jet-piece 5, carried by said heat-conducting part 3 and arranged to deliver vapor into said mixing-tube, and a heat-conducting support carried by said tube and connected to said part 3, substantially as shown and set forth.

2. A burner comprising the vaporizing pipe or coil formed at one end for connection to an oil-supply, a vertical heating-tube connected and into which it discharges, said heating-tube having a discharge-jet at its lower end, the open bent heating and mixing tube having one open end beneath said jet and its other end provided with a burner beneath said vaporizing-pipe, and conducting-supports between said mixing-tube and heating-tube, combined substantially as described.

3. A burner consisting of the vaporizing-coil, a vertical heating-tube having a discharge-jet at its lower end and into which said coil discharges, and the bent vertical heating and mixing tube having the two parallel upwardly-extending ends, one of said open ends being beneath said discharge-jet and the other end having a burner beneath said coil, combined substantially as described.

10 4. In combination, in a burner, the vaporizing-coil having a straight portion, a mixing-chamber and burner to receive vapor from such coil, and a single straight wire 14 in said straight portion and extending to the exterior thereof, the wire being of such size as to spread the oil in a thin layer, substantially as described.

15 5. In combination, the vaporizing coil or pipe, a vertical tubular heating portion into which the said vaporizing-pipe discharges, having nipple 4, rotary wire 5, perforated to form jet 11, and the mixing-tube having one

open end beneath said jet and its outer end provided with a burner beneath said vaporizing-pipe, substantially as described.

25 6. In combination, the vaporizing pipe or coil, the tubular portion into which said pipe discharges, having the discharge-jet, and the bent vertical mixing-tube having one open end beneath said jet and its other open end having a burner beneath the vaporizing-pipe, said mixing-tube having conducting-rib 13, connecting its ends, and conducting-support 8 to the upper tubular heating portion, all arranged substantially as described.

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

HERBERT LINDLEY.

Witnesses:

S. B. BOARDLEY,

FRED. A. CLIFFE,

*Both Clerks Sandon Works, Salford.*