(No Model.)

L. D. COPELAND.

HYDROCARBON VAPOR BURNER.

No. 471,465. Patented Mar. 22, 1892.

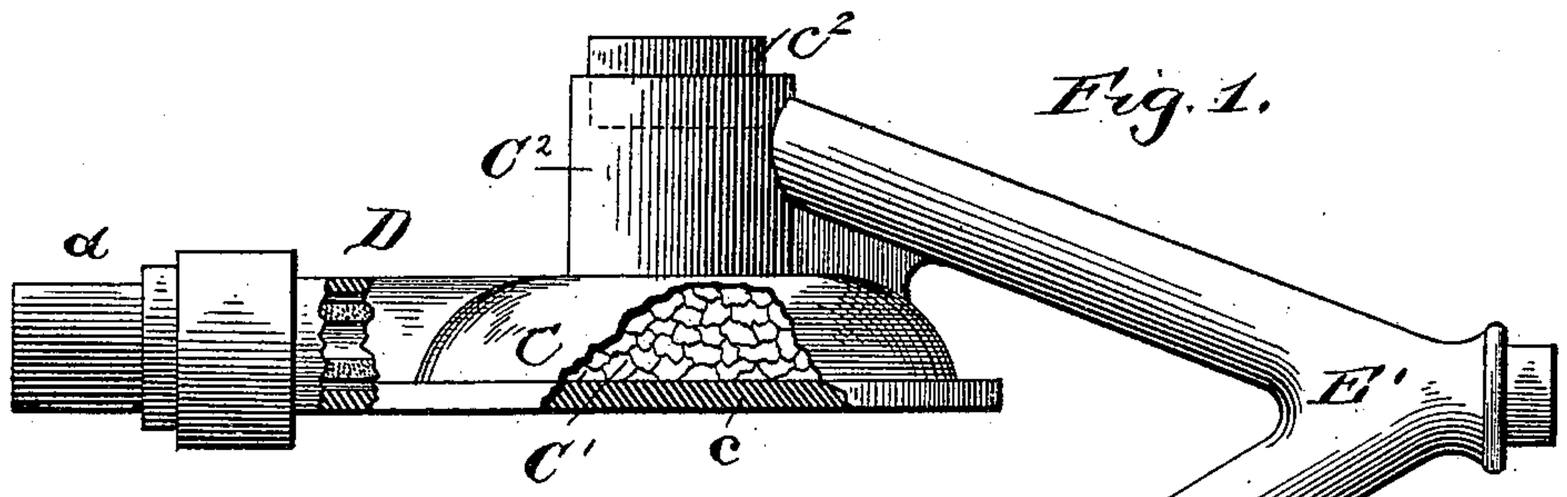


Fig. 1.

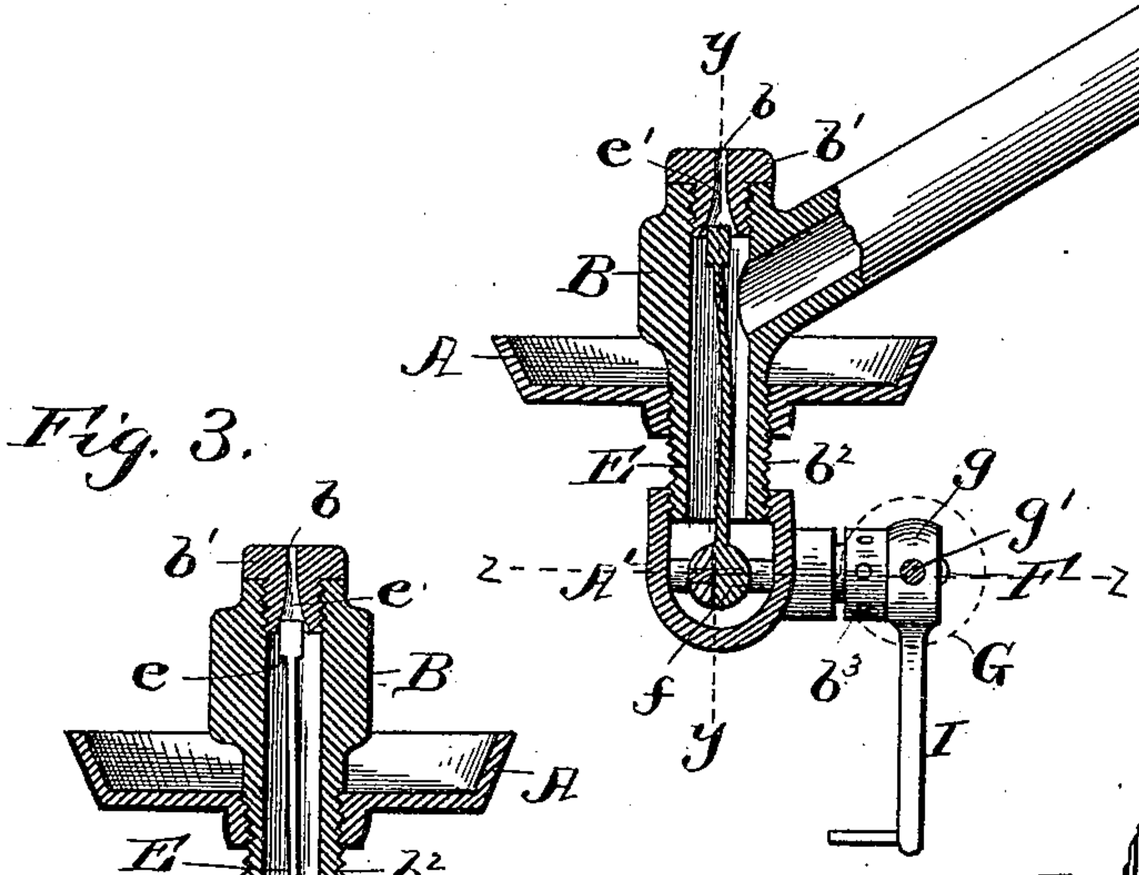


Fig. 3.

Fig. 2.

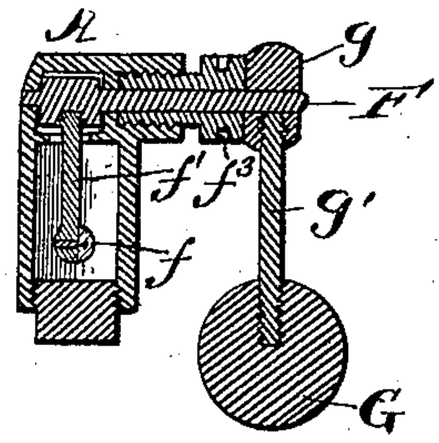


Fig. 4

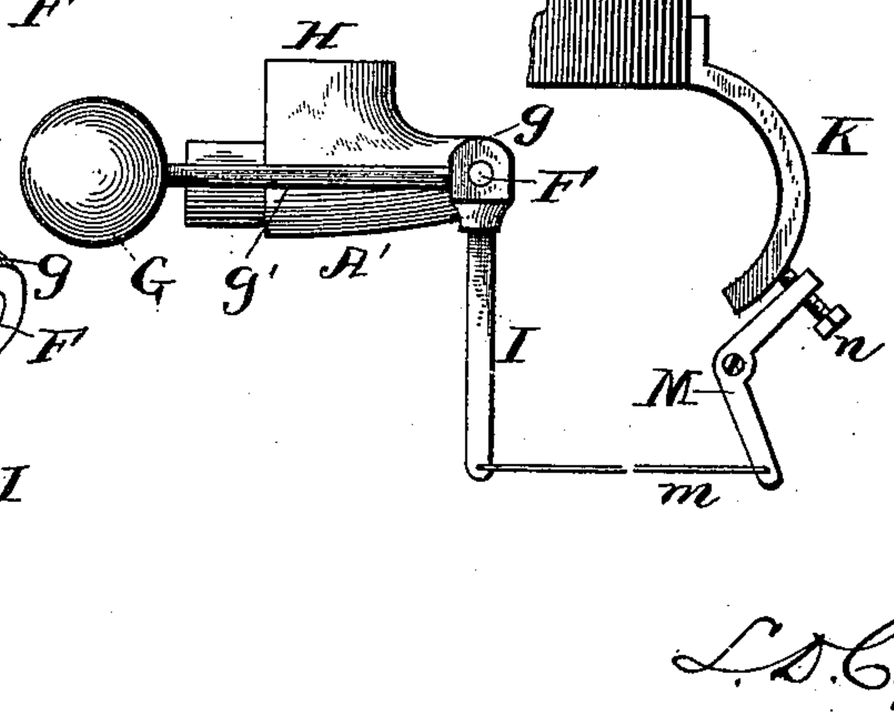
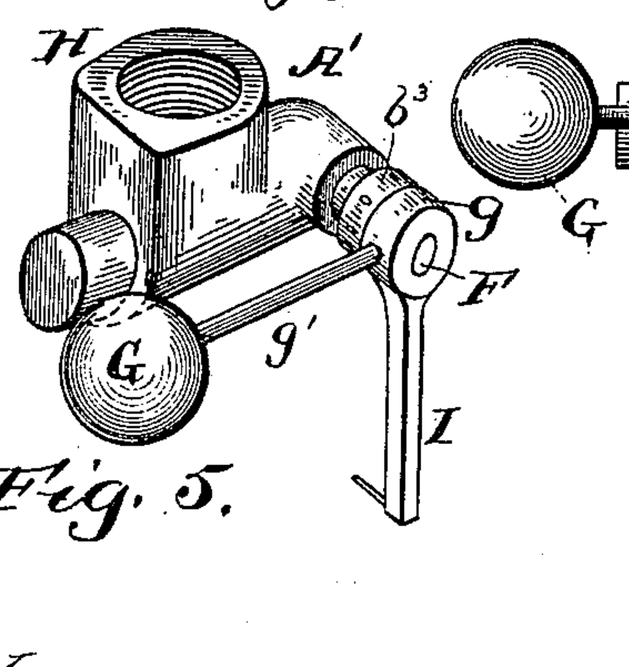


Fig. 5.



Witnesses:
J. B. McGirr.
A. C. Evers

L. D. Copeland
Inventor.
by Connolly Bros.
Atty

UNITED STATES PATENT OFFICE.

LUCIUS D. COPELAND, OF CAMDEN, NEW JERSEY, ASSIGNOR TO THE NORTHROP MANUFACTURING COMPANY.

HYDROCARBON-VAPOR BURNER.

SPECIFICATION forming part of Letters Patent No. 471,465, dated March 22, 1892.

Application filed July 9, 1888. Renewed September 24, 1890. Again renewed January 7, 1892. Serial No. 417,263. (No model.)

To all whom it may concern:

Be it known that I, LUCIUS D. COPELAND, a citizen of the United States, residing at Camden, in the State of New Jersey, have invented certain new and useful Improvements in Hydrocarbon-Vapor Burners; and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification.

This invention has relation to hydrocarbon-vapor burners for steam-generators, and has for its object the provision of certain improvements in the type of vapor-burner constituting the subject of my application for Letters Patent filed January 2, 1888, Serial No. 260,469.

These improvements consist in the novel construction, combination, and arrangement of devices for automatically regulating the supply of vapor to the burner and consequent size of flame, according to the pressure of the steam in the boiler.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of a vapor-burner embodying my invention. Fig. 2 is a horizontal sectional view on line *z z* of Fig. 1 and line *x x* of Fig. 3. Fig. 3 is a vertical central sectional view on line *y y* of Fig. 1. Fig. 4 is a side view showing a portion of the burner-casing, its attachments, and a portion of a steam-generator with expansion-tube and connections between same and the burner. Fig. 5 is a perspective view of the lower portion of the burner.

C designates the vaporizing-retort, consisting of a casting enlarged at its base so as to form a wide and shallow vaporizing-chamber C′, the bottom *c* of which is disk-shaped and of a size sufficient to afford a large heating-surface. The retort is arranged with its bottom *c* in a horizontal position, so as to be directly above the burner.

D designates the inlet-pipe leading to the retort for the supply thereto of oil, and E′ is a bent pipe leading from the upper part of the retort to the burner. The supply-pipe D is coupled to an extension or section *d*, leading to the oil-reservoir. The retort, as shown, is filled with fine particles of asbestus or other refractory porous material, while the supply-pipe and, if necessary, a portion of section *d* are lined with asbestus cloth or felt for the purpose of preventing the oil from becoming heated and vaporized before reaching the retort. The retort is lined with asbestus to prevent the oil from coming in contact with the hot disk *c*. The heat within the retort becomes intense and immediately vaporizes the oil upon its admission thereto. The upper part of the retort is formed with a neck C^2, closed by a screw-cap c^2, and adapted to serve as a means of access to the interior of the retort and for the admission and removal of the asbestus.

B designates the burner-tube, consisting of a casting or section of pipe bored out vertically and communicating near its upper end with the tube E′. In practice the retort C, tubes E and E′, and the burner-tube may be all cast in one piece, as shown in the drawings, Fig. 1. The upper end of the burner-tube is threaded interiorly for the reception of the flanged and threaded tip *b′*, formed with a small central orifice which is expanded or funnel-shaped toward its lower end. The object of this tip or vent piece is to provide for the adjustment of the burner-orifice, so as to regulate the normal size of the flame, and, as constructed, it serves as a valve for this purpose, being adjustable by turning it on its thread and in its socket, so as to diminish or increase the capacity of the space between its inner surface and the head of the valve-rod. The outer surface of the burner-tube is threaded, as at b^2, and supports a shallow pan A, formed with a correspondingly-threaded central opening and adjustable upon the tube.

To the lower end of the burner-tube a hollow casting A′ is screwed.

E is a rod formed with a head *e* on its upper end, which enters the funnel-shaped opening in the burner-tip, and by the vertical movement of the rod regulates the size or capacity of the vapor-channel. The lower end of the rod E is screwed into a ball or boss *f*, to which is secured at right angles to the rod E a rod *f′*, which in turn is screwed into a boss on a horizontal rock-shaft F, arranged at right angles to the rod *f′*, and having its bearings in the side of casting A′ and in a stuffing-box f^3 in the end of one of the branches of the casting A′. (Shown clearly in Fig. 2.)

On the outer end of the rock-shaft F is fitted a knob *g*, into which is screwed an arm or lever *g'*, carrying a weight G on its outer end. To the shaft F is also connected a crank-arm I, which is coupled to a lever arranged so as to be moved by the expansion and contraction of a curved tube connected to the steam-tubes of a generator.

In Fig. 4, K designates the expansion-tube attached to a steam-generator, partly indicated by the letter L. M designates a bell crank or lever, which is coupled by means of a rod *m* to the lever I, and *n* is an adjusting-screw fitted in one end of the lever I with its end impinging against the convex side of the expansion-tube.

The operation is as follows: The burner being open a small quantity of oil is poured into the pan A and ignited. The heat from the flame reaches the retort and heats the same until the oil contained therein vaporizes and passes off to the burner. The vapor issuing from the tip is now ignited and the heat allowed to expend itself in generating steam and further vaporizing the oil. The flames pass around the disk *c* and upward toward the water-legs of the boiler. As soon as the steam reaches a high temperature, the expansion-tube elongates, and through its connections turns the rock-shaft F, thus raising the rod E and diminishing the side of the vapor-orifice in the burner. As the terperature lowers, a contrary result takes place, the burner-orifice being enlarged to increase the size of the flame. By adjusting the weight G the pressure of steam may be kept practically uniform, the heat-generator being exactly regulated according to the condition of the steam. The weight G is primarily employed as a counterbalance and retracting device to open the valve and maintain it open when not closed by the expansion-tube, the effect of the expansion being solely to raise the valve toward the closing point in proportion to the increase of the temperature and steam-pressure. As these decrease and the expansion-tube contracts, the weight exerts its influence, and, by falling, opens the valve more or less, and thus increases the flame.

Having described my invention, I claim as new and desire to secure by Letters Patent—

1. In a hydrocarbon-vapor burner for steam-engines, the combination, with the burner-tube and vertically-adjustable valve-rod, of the rod *f'*, ball or boss *f*, rock-shaft F, rod *g'*, and weight G, substantially as described.

2. In a hydrocarbon-vapor burner for steam-engines, the combination, with the burner B, valve-rod E, rod *f'*, ball or boss *f*, rock-shaft F, rod *g'*, and weight G, of an expansion-tube connected to the generator and intermediate connections, whereby the valve-rod will be automatically adjusted, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 18th day of June, 1888.

LUCIUS D. COPELAND.

Witnesses:
WILL H. POWELL,
RICHARD T. MILLER.