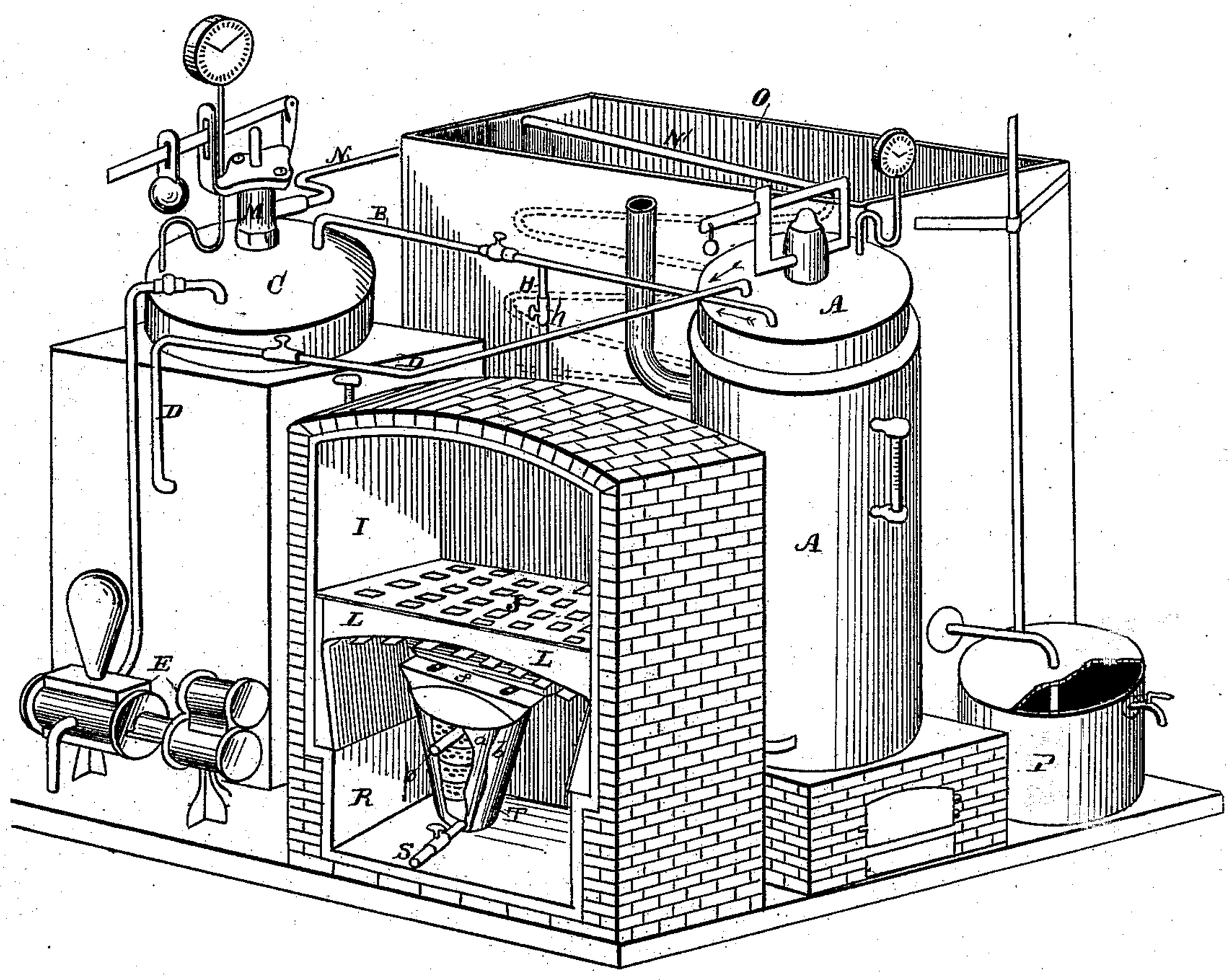
2 Sheets—Sheet 1.

H. H. EAMES.

Apparatus for Burning Hydrocarbons.

No. 224,886. **Patented Feb. 24, 1880.**

Fig. 1.



Witnesses

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Inventor

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2 Sheets—Sheet 2.

H. H. EAMES.

Apparatus for Burning Hydrocarbons.

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Fig. 2.

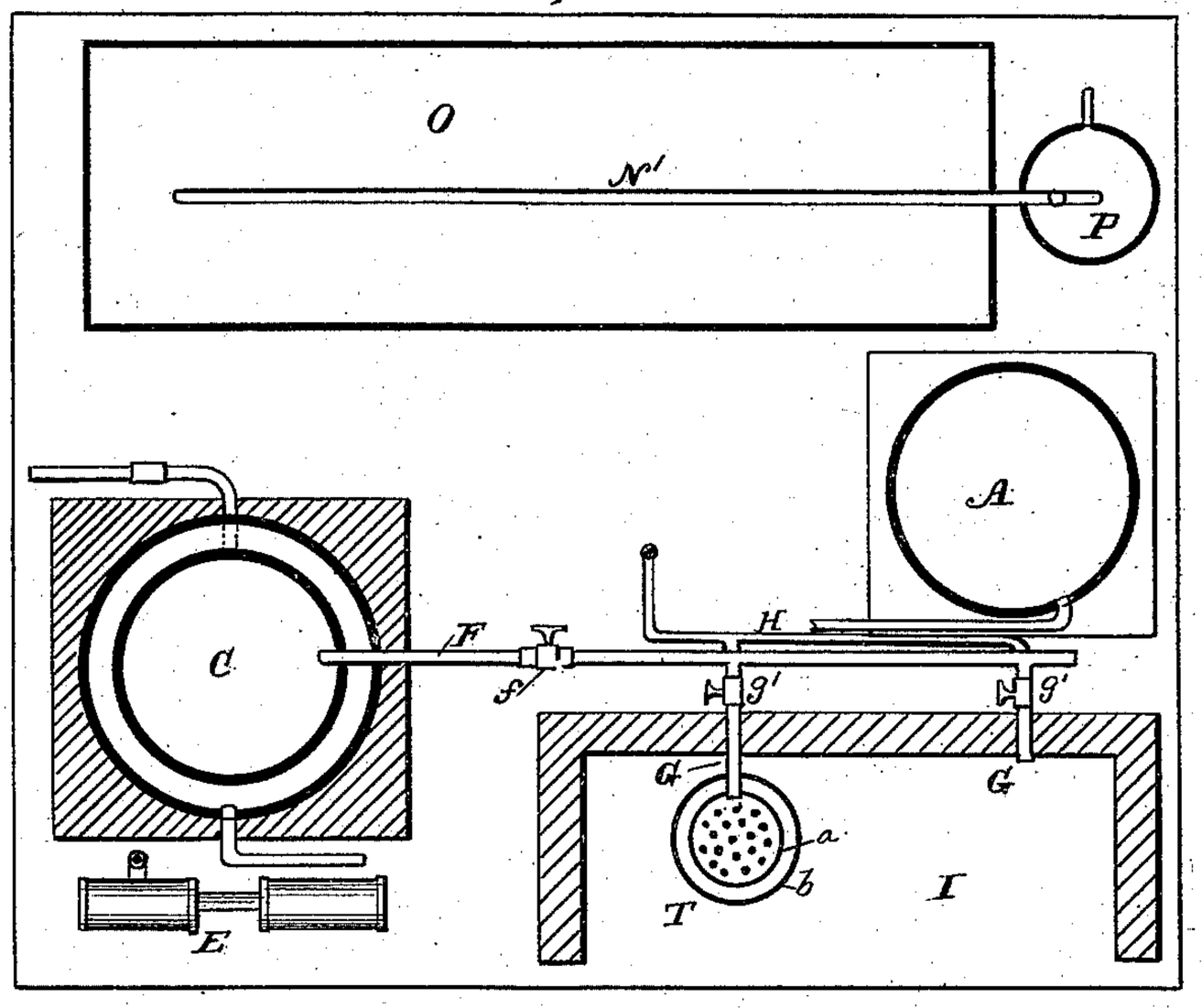


Fig. 3.

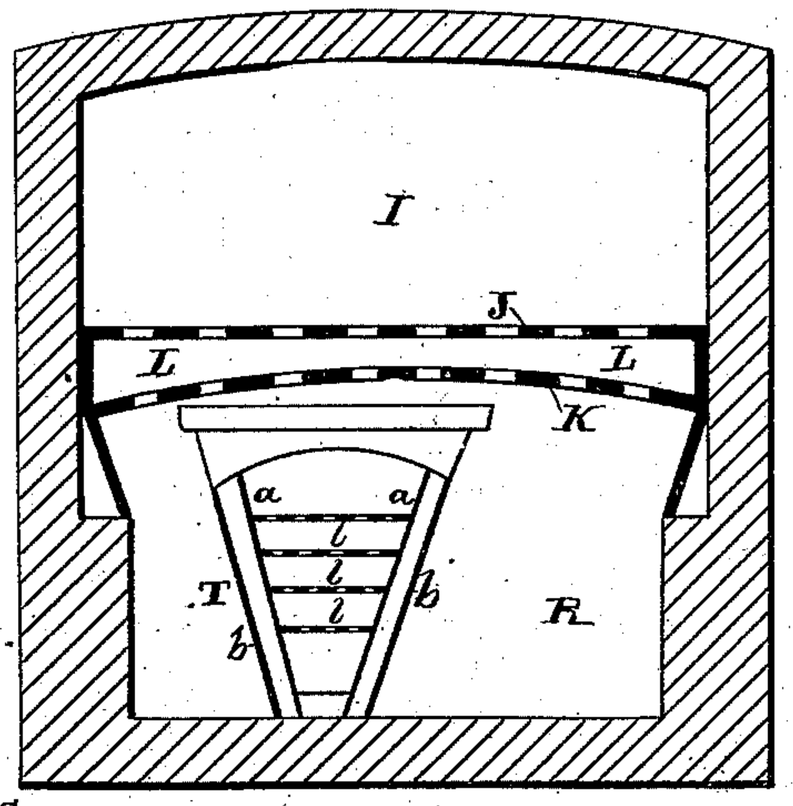
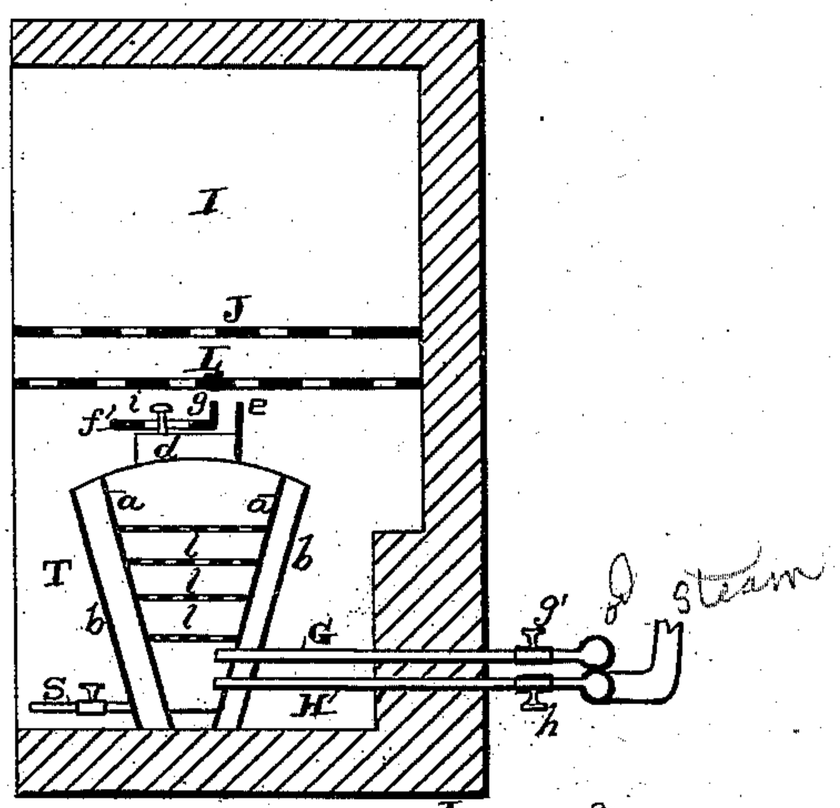


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

HENRY H. EAMES, OF SAN FRANCISCO, CALIFORNIA.

APPARATUS FOR BURNING HYDROCARBONS.

SPECIFICATION forming part of Letters Patent No. 224,886, dated February 24, 1880.

Application filed November 18, 1879.

To all whom it may concern:

Be it known that I, HENRY H. EAMES, of the city and county of San Francisco, and State of California, have invented an Apparatus for Burning Hydrocarbons; and I hereby declare the following to be a full, clear, and exact description thereof.

The object of my invention is to provide certain improvements in burning hydrocarbons in such a way that the heat therefrom may be utilized for reducing ores and generating steam.

To accomplish this I connect a steam-boiler with a peculiarly-constructed hydrocarbon-pressure generator in which the hydrocarbons are subjected to both heat and pressure to render them limpid, and from which the oils are led, still under pressure, to peculiarly-constructed burners, where a jet of steam divides and vaporizes them. Issuing from this burner through a regulatable opening, the flame, mingled with a blast of air, enters a chamber in which is placed a mass of asbestus or similar incombustible substance, where it is thoroughly mixed with the said air, so that as it issues through a suitably-perforated plate into the furnace a perfect combustion will ensue. The lighter oils from the generator are condensed and utilized in starting the fires under the boiler at a time when there is no pressure in said generator to force the heavier oils to the burner.

The boiler, generator, condenser, furnace, and burners are so arranged and combined as to enable the operator to have full control of the different appliances separately and as a whole, as is more fully described in the accompanying drawings, in which—

Figure 1 is a perspective view. Fig. 2 is a horizontal section and plan of the same. Fig. 3 is a longitudinal vertical section of the furnace. Fig. 4 is a transverse vertical section of the furnace.

The boiler A is furnished with a suitable fire-box for consuming hydrocarbon oils, by which the steam is generated in said boiler. A pipe, B, leads from the boiler to the interior of the hydrocarbon-pressure generator C, and another pipe, D, leads also to the jacket of said generator, so that steam may be applied to the interior and to the exterior of the generator. This hydrocarbon-pressure generator is an apparatus in which hydrocarbons are subjected to heat and pressure in order that they may be fed direct to suitable burners under pressure, so that perfect combustion and a steady flow may be insured. It consists of a receiver surrounded by a steam-jacket, the hydrocarbon being forced into said receiver by the pump E, and there subjected to the heating action and pressure of the steam led in by the pipe B from the boiler A.

Application for Letters Patent on this peculiar hydrocarbon-pressure generator was filed December 18, 1878, and has been allowed to me, and reference is hereby especially made to the specification accompanying said application for a full and complete description of the operation of said device.

The steam admitted into the generator or receiver and into the jacket surrounding it has the effect of rendering the hydrocarbon oils limpid, so that they will flow easily and steadily through the tube F to the burner. A valve, *f*, in said pipe F controls the flow of oil from the generator, and smaller cocks *g'* regulate the flow from said pipe F to the burners through the pipes G, so as to control the flame. From the steam-pipe B another pipe, H, having suitable valves *h*, leads the steam from the boiler or pipe to the burners, as hereinafter described.

I represents a furnace, of any ordinary form of construction, in which ores are to be reduced by means of heat supplied by the combustion of hydrocarbon oils. A perforated hearth or diaphragm, J, is formed across this furnace, and under this is a supporting-arch, K, also perforated, a space or chamber, L, being left between said hearth and arch, which it is designed to fill with loose pieces of asbestus or other incombustible substance, as shown. This asbestus, when once heated by the flame of the burner, becomes incandescent and supplies additional heat to the vapor passing through it, so as to more thoroughly vaporize it, and when the vapor issues above, mixed with air, as hereinafter described, a perfect

combustion will ensue. Under the arch is placed the burner T, for consuming the hydrocarbon oil. There may be one or more burners, as desired.

An inverted cone, *a*, is surrounded by a jacket, *b*, leaving a space between the two for steam, to be introduced by a suitable pipe, *p*, to keep the burner itself warm and prevent it from being cooled by the blast of air. Inside and across the interior cone is a series of perforated diaphragms, *l*, gradually enlarging in diameter as the inverted cone increases in diameter. Under the lowermost of these diaphragms opens the pipe G, which leads in the hydrocarbon oils, and under this again opens the pipe H, which introduces the steam. This steam may be superheated or not, as desired.

The oil being brought in over the jet of steam, this jet of steam blows the oil up through the perforated plates, dividing it up and mixing with it, so as to put it in a properly-vaporized condition to allow of its combustion.

The inverted double cone has a cap or cover, across which is a chamber, *d*. One edge of this chamber has a flange or lip, *e*, formed upon it, and a sliding plate or regulator, *f'*, having a lip or flange, *g*, upon one edge, fits on the cap or cover. These two lips or flanges *e g* form the burner or point of ignition for the hydrocarbon oils fed to it under pressure from the pressure-generator, as described.

The orifice or longitudinal opening between the flanges or lips *e g* may be increased or decreased in size by sliding the said plate *f'* back or forth, so as to bring its flange or lip *g* nearer to or farther from the flange or lip *e*.

The plate *f'* is slotted, and bolts *i* pass through these slots, so as to admit of the plate being moved back and forth, as described.

A pipe, S, provided with a cock or valve, is placed at the bottom of the cone, to draw off any material that may collect in the cone.

The flame coming from the regulatable burner formed by the flanges or lips *e g* passes through the perforted arch into the mass of asbestus or other incombustible material between the arch and hearth, and, by passing through the passages and interstices, mingles with the air, receiving a plentiful addition of air to assist in its perfect combustion as it issues from the perforations in the hearth.

A blast of air is forced into the lower chamber, R, of the furnace, and this can only escape by passing up through the perforated arch, where it is mingled with the flame of the hydrocarbon oils, as described.

In some furnaces it might be better to place the perforated plate or hearth and arch with the interposed incombustible material vertically like a fire-wall, and place the burner horizontally, so that the flame should issue horizontally through the perforated plate. I do not, therefore, wish to confine myself to constructing the perforated plates in one position, the position depending on the class of furnace to which it is to be applied.

As the pressure of steam is applied in the pressure-generator C, certain volatile or light products, which are evolved by the heat and pressure, will rise to the top. A safety-valve, M, is placed on top of the generator, and a pipe, N, connecting with it conveys these volatile products off to the condenser O, in which is the condensing-coil N'. These volatile products are here condensed into light inflammable oils, and are discharged into a tub or tank, P, near the boiler. From this tub they may be removed and utilized in firing up under the boiler before pressure of steam is raised in said boiler. When steam-pressure is once raised a suitable burner placed under said boiler will consume the hydrocarbon oils fed to it from the pressure-generator; but until steam is raised, of course this burner could not be used, and therefore the light oils formed in the generator, caught as described, are utilized in starting up the boiler. No coal or wood is then needed to start up work in the mornings, these light products generating steam, which is used for giving the pressure required for forcing the heavier residue to the burners both of boilers and furnaces, as herein described.

By having the boiler or steam-generator, the hydrocarbon-pressure generator, with its pump, pipes, and condenser, and the furnace with its peculiar regulatable burner and device for mixing the air with the burning vapor, all connected and combined in the manner described, I provide a simple and easily-managed apparatus for burning hydrocarbon oils and utilizing the heat therefrom both in generating steam and in reducing ores.

I am aware of the well-known injection or atomizing method for feeding hydrocarbon oils to furnaces by means of a commingling blast of steam or air, or steam and air combined, and hence I do not claim such method.

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

1. The hydrocarbon-pressure generator C and boiler A, with a fire-box for the combustion of hydrocarbon oils, and connecting-pipes, in combination with the ore-reducing furnace I and pipes F H, said furnace being provided with the burner T and air-chamber R, above which is the perforated arch K and hearth J, with the interposed chambers L, containing asbestus or similar incombustible material, substantially as herein described.

2. The burner for consuming hydrocarbon oils, consisting of the inverted jacketed cone *a*, with its perforated diaphragms *l*, chamber *d*, and lip *e*, said chamber being provided with a regulating-cup or sliding plate, *f'*, with its flange *g*, in combination with a pipe to inject the hydrocarbon oils under pressure and a

steam-jet to vaporize the oil and burn with it, substantially as herein described.

3. In combination with the furnace I, having an air-chamber, R, and apparatus or burner for burning hydrocarbon oils, the perforated arch K and hearth J, having the interposed chamber L, filled with asbestus or other incombustible substance, whereby the hydrocarbon is thoroughly vaporized and mingled with air under pressure, so as to insure a perfect combustion above the hearth, substantially as herein described.

In witness whereof I have hereunto set my hand.

HENRY H. EAMES.

Witnesses:
CHAS. G. YALE,
FRANK A. BROOKS.