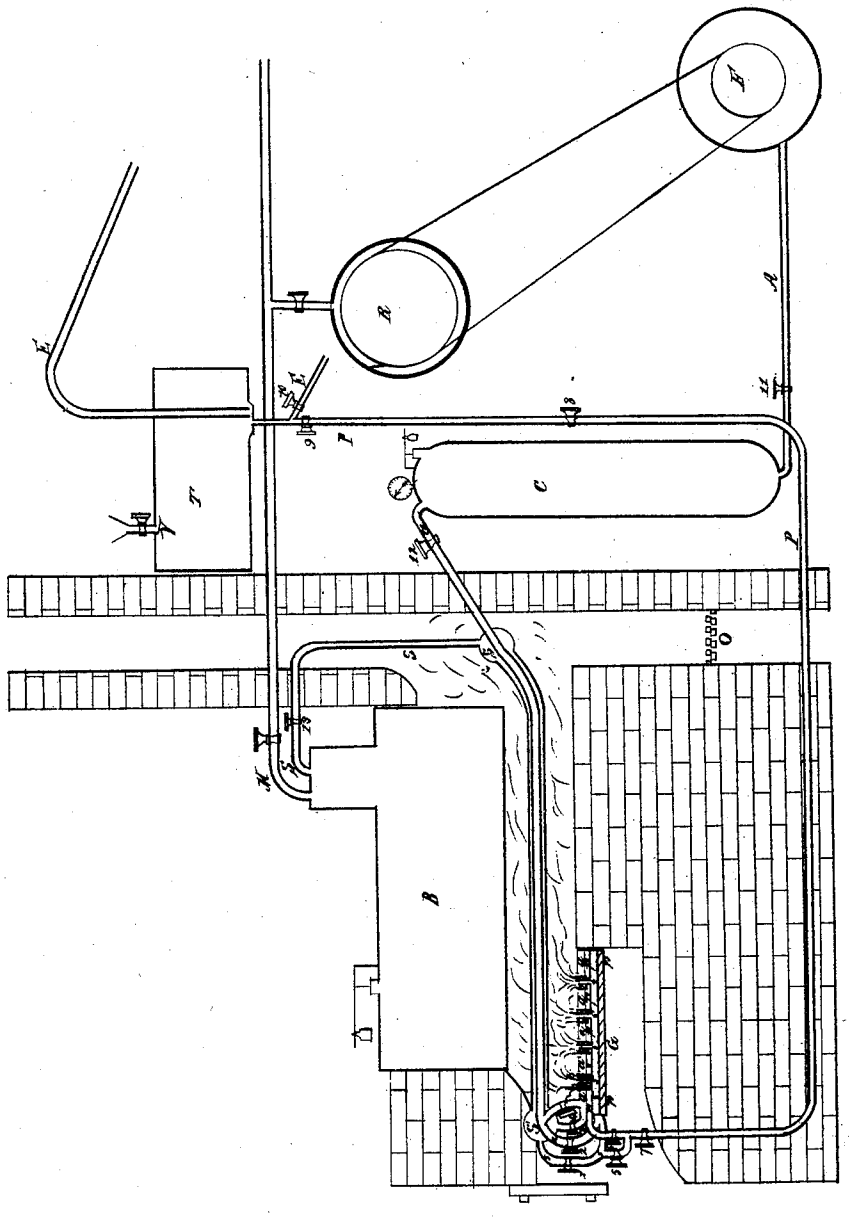
C. SAFFRAY.

APPARATUS FOR BURNING CRUDE PETROLEUM.

No. 69,253. Patented Sept. 24, 1867.



Witnesses:

John A. Wampham
John D Blunt

Inventor:

C. Saffray

# UNITED STATES PATENT OFFICE.

CHARLES SAFFRAY, M. D., OF NEW YORK, N. Y.

## APPARATUS FOR BURNING CRUDE PETROLEUM.

Specification forming part of Letters Patent No. **69,253**, dated September 24, 1867.

*To all whom it may concern:*

Be it known that I, Dr. CHARLES SAFFRAY, of the city, county, and State of New York, have invented a new and Improved Mode of Burning Crude Petroleum; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in making crude petroleum pass into hollow grate-bars formed of three compartments, and perforated in such a manner as to admit, either inside or outside of the flame arising in each burner, through annular wicks made of wire-cloth, a draft of hot air, either pure or mixed with superheated steam, or a jet of superheated steam alone.

To carry out that plan, I use the following apparatus: G is a grate, formed of several hollow bars, having each three compartments, and arranged so as to have a free communication between the corresponding compartments of the bars. B is an ordinary boiler; T, a tank or reservoir of petroleum; C, a condenser or reservoir for condensed air; R, a rotary engine; F, a fan.

The apparatus works as follows: The tank is filled with petroleum, which runs through the pipe P P, and opens in the middle compartment of the grate-bars $p'$ $p'$. The tank is provided with a funnel and a valve, V, opening from outside inside. It is also provided with a safety-pipe, E. In connection with the pipe P P is another exit-pipe, E'. The valve V and safety-pipe E are destined to protect the tank from conflagration in case of fire, and in such occurrence they would act automatically as follows: The vapors of petroleum acquiring tension inside of the tank, the valve would close the orifice of the funnel, and the pressure on the surface of the liquid would make it escape through the safety-pipe with a rapidity proportional to the increase of temperature around the tank. The pipe E' could be used for the same purpose. The rotary engine R receives steam from the main pipe M, and gives motion to the fan F, which may receive motion in any other way. Air is forced by the fan through the pipe A in the condenser or reservoir C, and passes through the pipe $a$ $a$, which opens into the upper compartment of the grate-bars $a'$ $a'$. A forcing-pump may be advantageously substituted for a fan, thus allowing to condense air in the reservoir toward evening, and to use it the next morning to start the fire. Steam is introduced through the pipe S S into the outside envelope of the air-tube S' S', and thence into the tube $s$ $s$, which opens into the lower compartment of the grate-bars $s'$ $s'$.

Combustion on the grate takes place as follows: The petroleum is forced in minute jets (by hydrostatic pressure arising from the elevated position of the tank) through the fine openings of coiled wire-cloth, which forms to each burner an annular wick. Inside of the annular flame comes, through a rose, a fine spray of steam which has become superheated while traversing the tube S' S'. This steam is decomposed in the flame in hydrogen and oxygen, which unite with the products of the decomposition of the hydrocarbon and increase the heat produced by their combustion. Outside the flame rises a draft of hot air that has become hot by traversing the tube $a$ $a$. This new supply of oxygen increases the combustion and prevents the smoke. In order to prevent the escape of unburnt gases through the chimney, a supplementary draft is established and regulated by two perforated plates, O, which revolve at will, so as to control the entrance of fresh air.

By means of the arrangement of pipes and stop-cocks seen in front of the grate, steam alone, or air alone, or a mixture of air and steam, can be introduced either inside or outside of the flame of each burner. For example, supposing all the stop-cocks to be closed, if I want to introduce steam in place of air in $a'$ $a'$, and air in place of steam in $s'$ $s'$, I open 2 and 3; if I want to introduce inside of the flame a mixture of air and steam, I open 1 and 2.

By means of the stop-cocks 5 6 7 8 9 the middle compartment of the grate-bars, the wicks, the pipe P P, the tank, and the exit and safety pipes can be cleaned by steam.

The inferior surface of the grate-bars is pro-

fected by a covering of fire-clay or other suitable material, to prevent their being cooled by the draft.

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

1. The use of hollow grate-bars divided in three superposed compartments, the middle compartment containing petroleum, and the two others receiving, by means of the arrangement of stop-cocks above described, either steam alone, or hot air alone, or a mixture of both, said grate-bars being perforated, as represented in the drawing, so as to allow either steam alone, or hot air alone, or a mixture of both, to escape inside or outside of the flame.

2. The use of the safety-pipe above described.

CHARLES SAFFRAY, M. D.

Witnesses:

ALEXR. A. C. KLAUCKE,
A. MOORE.