

No. 646,558.

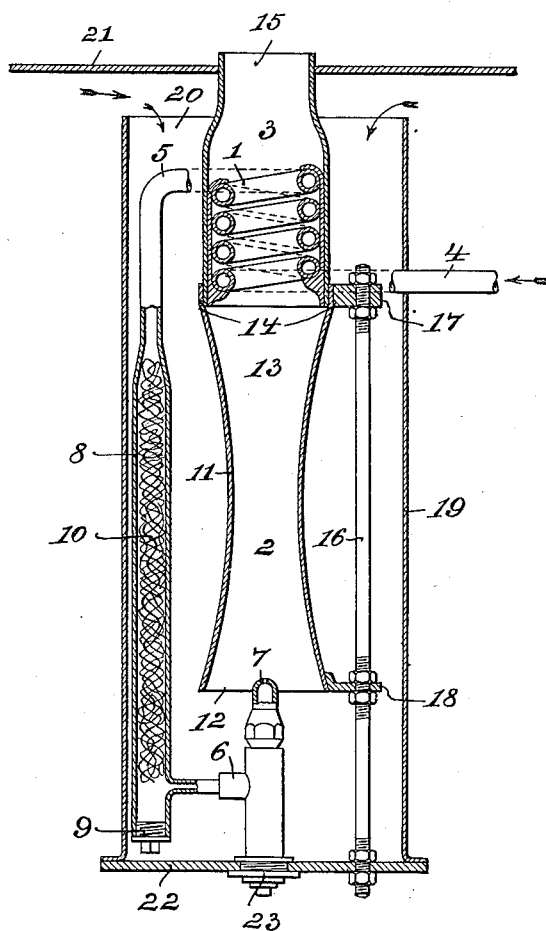
Patented Apr. 3, 1900.

**J. A. & J. M. B. REY.**

FURNACE FOR BURNING HYDROCARBONS, &c.

(Application filed Nov. 1, 1899.)

(No Model.)



Witnesses:  
Thomas M. Smith  
Richard C. Maxwell

Inwitness  
Jean Alexandre Rey and Jean  
M. Barthelémy Rey  
J. Walter Dryden.  
Attorneys.

# UNITED STATES PATENT OFFICE.

JEAN ALEXANDRE REY AND JEAN MARC BARTHELEMY REY, OF PARIS,  
FRANCE.

## FURNACE FOR BURNING HYDROCARBONS, &c.

SPECIFICATION forming part of Letters Patent No. 646,558, dated April 3, 1900.

Application filed November 1, 1899. Serial No. 735,466. (No model.)

*To all whom it may concern:*

Be it known that we, JEAN ALEXANDRE REY and JEAN MARC BARTHELEMY REY, citizens of the Republic of France, residing at Paris, France, have invented a new and useful Improvement in Furnaces for Burning Hydrocarbons, Alcohols, and other Combustible Liquids, which is fully set forth in the following specification.

10 This invention has for its object a furnace for burning hydrocarbons, alcohols, and other combustible liquids in which the vapors are mixed with air.

15 This apparatus is intended to fulfil two conditions necessary to the working of a furnace burning combustible liquids—first, to mix by physical means combustible vapor which has been produced by the flame itself with the air which is to oxidize it, and, second, to heat 20 the mixture to the degree necessary for good oxidation by previously heating the air-supply by means of the flame itself.

The furnace shown in vertical section in the accompanying drawing comprises a worm 25 1 for gasifying a combustible liquid and a diffusion-mixer 2 for causing an intimate mixture of the combustible vapor and the air, this diffusion-mixer having the form of two-cone frusta placed apex to apex, and, lastly, 30 a combustion-chamber 3, in which the flame originates and from which it passes outward.

The parts of this apparatus will now be separately described.

35 The worm 1, of steel, copper, or other suitable metal, receives through one end 4 the combustible liquid expelled by means of a pump or by means of compressed air or otherwise. An expansion apparatus (not shown in the drawing) may be arranged in rear of 40 the inlet 4 of the worm in order to regulate the pressure under which the combustible liquid passes into the worm. The outlet-orifice of the worm 1 is prolonged by a pipe 5, which passes downward to the lower portion 45 of the apparatus and which leads the combustible vapor produced in the worm into a tube 6, which ends in a nozzle 7 of a size which varies according to the power of the apparatus. The pipe 5 has upon it an enlargement 8, terminating at its lower end in a stopper 9. This 50 enlargement is filled with a filling 10, formed

of a wirework or steel or of any other metal, the object of which will be explained later. By unscrewing the stopper 9 the filling 10 can be withdrawn.

55 The diffusion-mixer 2 is formed of two-cone frusta placed apex to apex, having a contracted section 11, of a size less than that of the lower orifice 12, where the gaseous current passes in. The upper portion forms a 60 diverging channel 13, the upper section 14 of which is placed immediately below the worm 1. This diverging channel serves to diffuse the gaseous mixture. The combustion-chamber 3, which forms a continuation of the dif- 65 fusion-mixer 2, incloses the worm 1. It is prolonged by a cylinder 15, which may be smaller or of the same size, as desired, through which the flames escape into the apparatus which utilizes them.

70 In order to support the diffuser, a rod 16, provided with attachments 17 18, fixed by screw-nuts, connects the several parts of the furnace together. Any other arrangement for this object may of course be adopted.

75 The chimney or envelop 19, which incloses the whole apparatus, compels the air-supply to pass into the mixer through the space 20 below the base-plate 21 of the boiler or other apparatus for utilizing the heat of the furnace. 80 This chimney 19 terminates at its lower portion in a foundation-plate 22, upon which the pipe 6 is supported by a threaded stopper 23.

The action of the apparatus is as follows: 85 The combustible liquid which passes into the worm 1 through the orifice 4 is vaporized by the heat derived from the flame in the chamber 3. The vapor thus produced under the influence of the pressure produced in the worm 1 by the injection-pump or by other 90 means passes away by the pipe 5. It thus passes into the tube 6 and passes out in a jet through the burner orifice or nozzle 7. Under the influence of the jet or vapor passing out from the nozzle 7 a vacuum is produced at 95 the orifice 12 of the mixer 2 and air flows in to fill it. This volume of air mixes with the combustible vapor, and the mixture, the speed of which is accelerated on account of the restricted shape of the apparatus, traverses the section 11 of the diffusion-mixer with a maximum speed. After having traversed the re-

stricted section 11 the mixture passes into the diffuser 13, the effect of which, due to the fact of its enlarged section, is to progressively reduce the speed of the gaseous current, the gas at the same time being permitted to expand or diffuse.

The function of the diffuser is important in point of view of the quality of the flame produced. It results from this arrangement that when the mixture passes into the combustion-chamber 3 the air and vapor are intimately mixed and then expanded to facilitate its passage in the form of flame into the apparatus to be heated. The flame originates in the chamber 3 and rises, passing out through the cylinder 15, and the worm 1, through contact with the flame, becomes heated sufficiently to cause the vaporization of the liquid. The air sucked in by the vacuum created by the mixer passes into the apparatus through the circular opening 20 and passes downward into the space which separates the chimney 19 from the mixer 2. It becomes gradually heated by contact with the chamber 3 and the diffuser 2 and enters at the lower orifice 12. The air-supply is thus heated, and while assisting oxidation allows the superheating of the combustible vapor to be proportionately reduced. Should a rise in temperature in the worm 1 cause partial disassociation, the particles of carbon carried along by the gaseous current would be arrested by the metallic filling 10, contained in the tube 8, which thus filters the combustible vapor without cooling it. The vapor thus passes to the tube 6 deprived of all solid particles which would obstruct the orifice of the throttle-valve 7.

The furnace is started by previously heating the worm 1. For this purpose it suffices to provide it at its lower portion with a collar (not shown in the drawing) which is filled with alcohol. On lighting the alcohol the heat developed is sufficient to allow the worm to vaporize the first portions of the combustible

liquid and to cause ignition. Once lighted the furnace continues of itself.

Without limiting ourselves to the details of execution, which may be varied as required, we claim in the present patent—

1. In a furnace for burning combustible liquids under pressure, the combination of a worm wherein the liquid is adapted to be vaporized, a diffusion and mixing chamber having expanded open inlet and outlet ends and a contracted intermediate portion, the outlet from said diffusion and mixing chamber being located below the worm, a burner located below the inlet to said chamber, a pipe leading from the worm to the burner, and a cylinder located above the worm and adapted to conduct the flame from the diffusion and mixing chamber to the point of utilization, substantially as and for the purposes described.

2. In a furnace for burning combustible liquids under pressure, a worm wherein the liquid is adapted to be vaporized, a diffusion and mixing chamber supporting said worm and having its interior in alinement with the inside portion of the worm, said chamber having two expanded open ends and a contracted portion intermediate of its ends, a burner entering the lower or inlet end of said chamber, a pipe leading from the worm to the burner, a filtering material located in said pipe, a cylinder forming a continuation of the diffusion-chamber and arranged concentric with said worm, and a chimney inclosing the worm, diffusion-chamber, burner and burner-pipe, said chimney being open at its upper end and closed at its lower end, substantially as and for the purposes described.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

JEAN ALEXANDRE REY.

JEAN MARC BARTHELEMY REY.

Witnesses:

J. ALLISON BOWEN,

G. DE WESTRAY.