

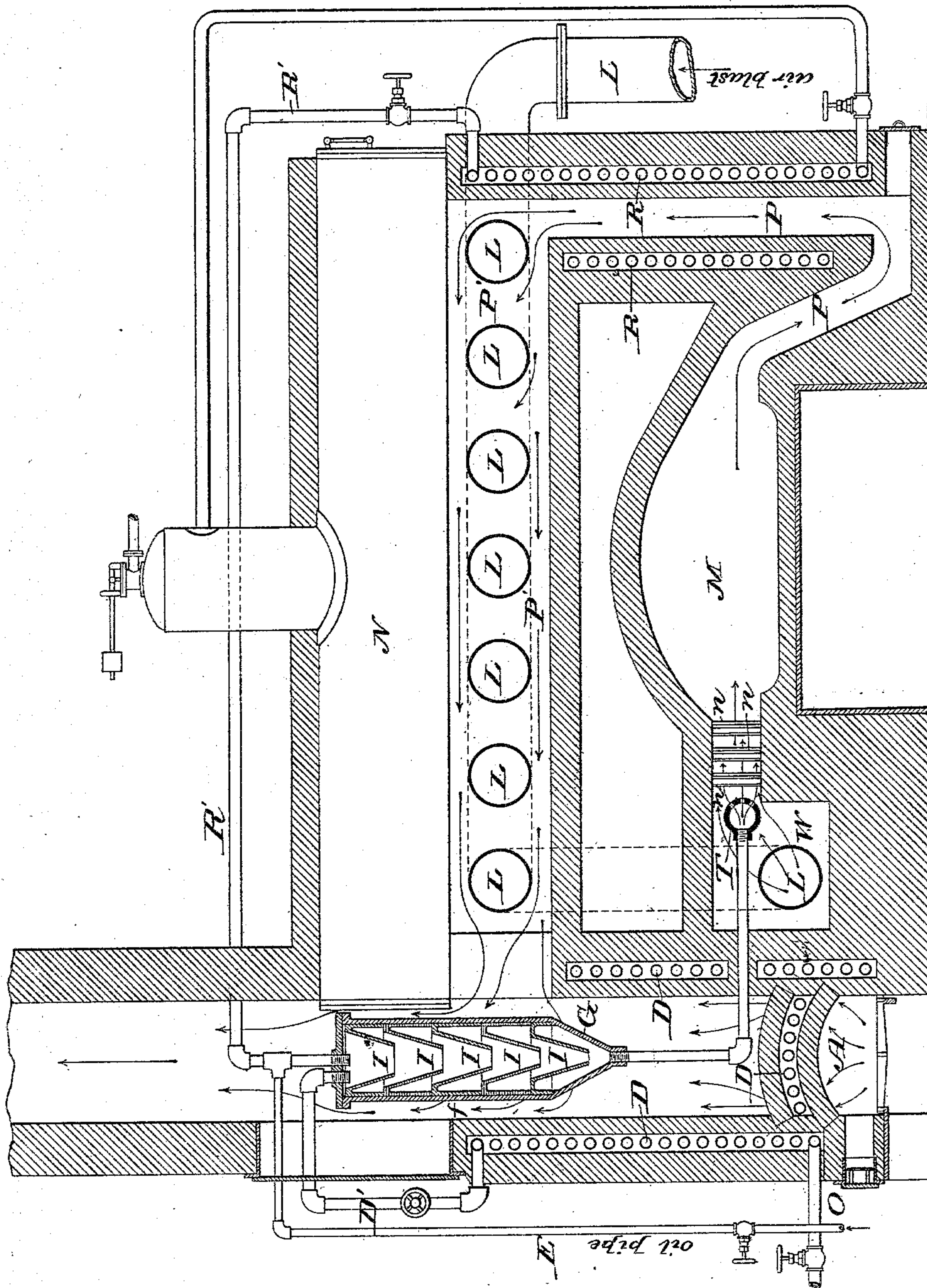
(No Model.)

H. F. HAYDEN.

APPARATUS FOR GENERATING AND UTILIZING VAPOR OR GAS.

No. 274,595.

Patented Mar. 27, 1883.



Witnesses:

John A. Svedberg  
Jas. E. Duhamel

Inventor:

H. F. Hayden



# UNITED STATES PATENT OFFICE.

HENRY F. HAYDEN, OF WASHINGTON, DISTRICT OF COLUMBIA.

## APPARATUS FOR GENERATING AND UTILIZING VAPOR OR GAS.

SPECIFICATION forming part of Letters Patent No. 274,595, dated March 27, 1883.

Application filed January 26, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, H. F. HAYDEN, of Washington, in the District of Columbia, have invented certain Improvements in Apparatus for  
5 Generating Gas or Vapor from Hydrocarbon and Utilizing the Same, of which the following is a specification.

This invention relates to furnaces for the generation and utilization of hydrocarbon vapors; and the invention consists in a novel  
10 combination and arrangement of the several devices or parts, as hereinafter more fully set forth.

The object of my present invention is to provide means for generating vapor or gas from liquid hydrocarbons and steam and utilizing the same as fuel for heating furnaces and similar purposes in an economical manner; and to  
15 that end I make use of a generator of novel construction, for a more full description of which reference is made to another application filed by me on the 15th day of February, 1883.

In the figure I have shown what I consider as the best and most economical plan of applying my invention to a furnace for treating  
25 metals.

In this, G represents the generator or retort for producing the vapor or gas, this generator being located in the uptake or chimney at the  
30 point where the return-flue P' from the main furnace M enters the uptake or vertical chimney. Underneath the generator is located an auxiliary furnace, A, in the walls of which is arranged a coil of pipe to form a superheater,  
35 D, which is connected by a pipe, D', with the top of the generator, as shown, or in any similar manner, the object of which will be hereinafter more fully explained.

M represents a furnace for the treatment of iron or other metallic substances, and which, for convenience, I denominate the "main" furnace. From the rear end of this furnace M the flue P inclines downward, and then rises vertically and returns horizontally over the  
40 top of the furnace, entering the uptake or shaft at the point where the generator G is located, as shown clearly in Fig. 1. In the walls surrounding the vertical portion of the flue P, in rear of the main furnace, I locate another superheater, R, which is connected by a pipe, V,  
50 with a steam-boiler, N, set over the return-flue P', as shown, another pipe, R', serving to

convey the steam from this superheater R to the generator.

An air-tube or large pipe, L, enters the return-flue P' from the outside, and is arranged to pass  
55 back and forth transversely across said flue, terminating, as shown, in a mixing-chamber, W, located in front of the throat of the main furnace M, the object of this arrangement being to  
60 heat the air supplied through the tube L to a higher degree than usual before it is mixed with the vapor which is supplied from the generator. The air will be forced through the  
65 tube L by a blower or any appliance suitable for the purpose, and which, being common, I have not shown. The liquid hydrocarbon, which may consist of crude petroleum, is fed through a pipe, E, into the pipe R', which conveys the superheated steam from the boiler N  
70 to the generator, the connection of these pipes E and R' being made at any point between the superheater and the generator, but preferably as far from the generator as possible, so that the steam may act as much as possible  
75 upon the oil to vaporize it before reaching the generator. The oil may be fed in by a force-pump or by gravity, as may be most convenient; or, if preferred, an injector may be used for the purpose, these various plans all being  
80 well known, and therefore not necessary to describe. The vapor or gas from the generator is conveyed, as usual, by a pipe to the burner T, which is located at the throat of the furnace M, as shown in Fig. 1, the hot-air blast from  
85 tube L mingling with the vapor or gas as they enter the throat of the furnace; and in order to more thoroughly mix and intermingle the same, I arrange in the throat of the furnace a series of small columns, n, of fire-brick or similar material set in a zigzag form, against which the mingled hot air and vapor or gas impinge as they enter the mouth of the furnace in the form of a flame.

The operation of the apparatus when thus  
95 arranged is as follows: A fire is first started in the auxiliary furnace A, when steam is furnished, through pipe O, from a boiler (not shown) to the superheater D, and as soon as the generator has become sufficiently heated  
100 the superheated steam and oil are fed into the generator. As soon as this has continued long enough to produce an inflammable vapor or gas the latter is ignited as it issues from the



burner T and soon heats up the furnace M. When the heat has become sufficient to generate steam in the boiler N and superheat it in the superheater R, the steam is shut off from the superheater D, and that from the other superheater R is let on instead, the fire in the auxiliary furnace A being hauled or allowed to die out. In the meantime, the air-blast having been started, the air, passing through tube L, will be delivered into the mixing-chamber W, heated to a high degree, and will there be mingled with the vapor or gas as the latter issues from the burner, when the whole will pass into and through the furnace M in the form of an intense white flame. By this arrangement it will be seen that the generator, the boiler, the superheater, and the air-blast are all heated by the heat after it has passed through the furnace M, thus utilizing the heat to the fullest possible extent and producing a most economical arrangement. In order to produce the best results it is desirable that the superheated steam and the air should be heated to as high a degree as possible by the escaping heat, the superheated steam being raised to a temperature of 800° to 1200° and the air from 400° to 800°. So, too, the hotter

the generator is kept the better, as the more the vapor will partake of the nature of a fixed gas.

From the foregoing description and illustration engineers and others skilled in such matters will readily see how to apply my invention to any and all styles of furnaces. So, too, it is obvious that the form or construction of the superheaters may be varied as desired, and that the air-tube L, instead of being arranged in the return-flue P' only, may be made to pass up the vertical flue P also, if desired or found necessary.

Having thus described my invention, what I claim is—

The combination of an auxiliary furnace, A, provided with a superheater, D, with a main furnace, M, provided with a superheater, R, a steam-boiler, N, an air-tube, L, and generator G, said air-tube, boiler, and generator being arranged to be heated by the heat escaping from the main furnace, substantially as and for the purpose set forth.

HENRY F. HAYDEN.

Witnesses:

H. B. ZEVELY,  
CHAS. E. SHOBER.