(No Model.)

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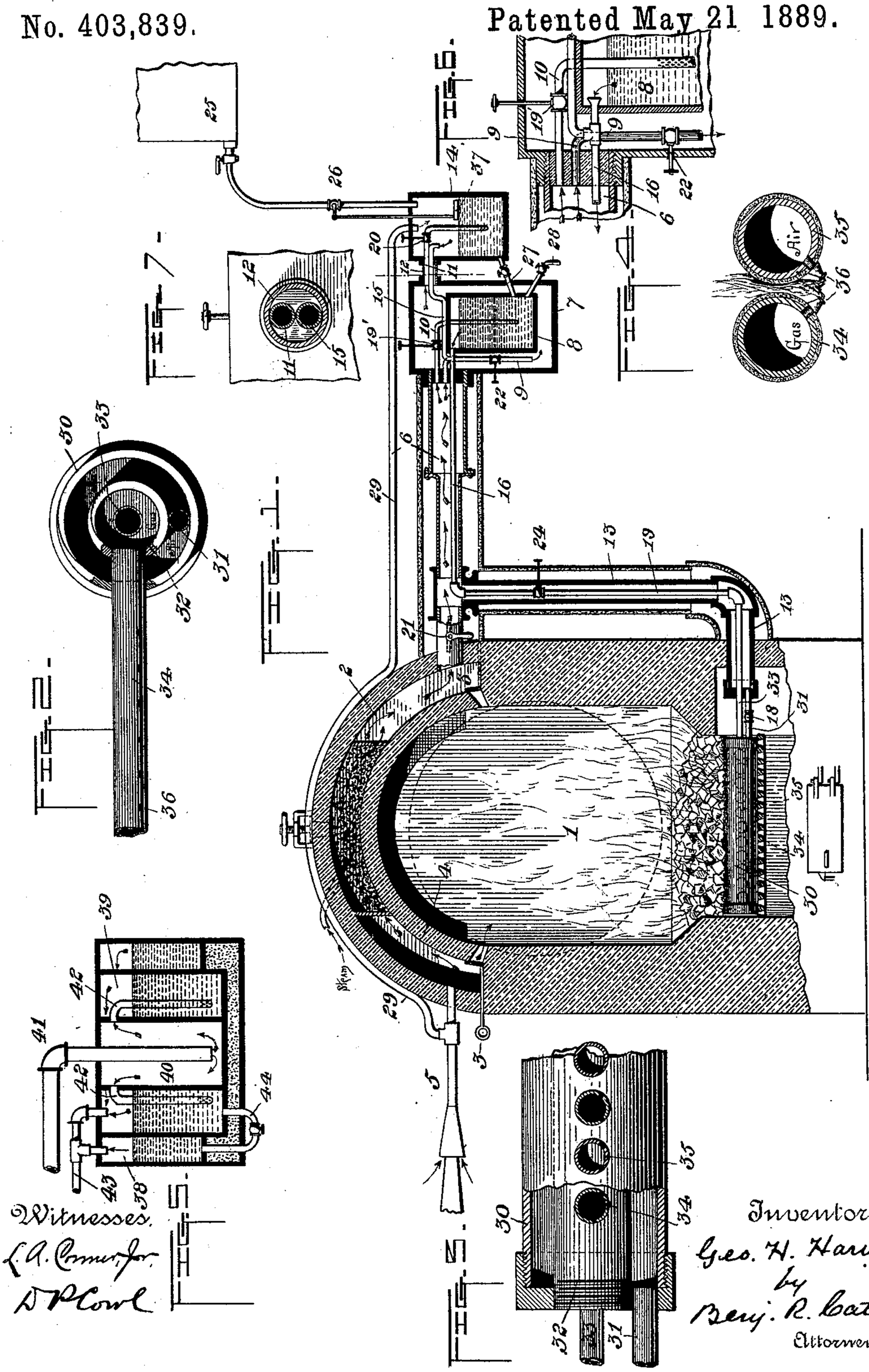
FURNACE AND APPARATUS FOR PRODUCING AND BURNING GASEOUS VAPORS.

No. 403,839. Patented May 21 1889.



UNITED STATES PATENT OFFICE.

GEORGE H. HARVEY, OF PITTSBURG, PENNSYLVANIA.

FURNACE AND APPARATUS FOR PRODUCING AND BURNING GASEOUS VAPORS.

SPECIFICATION forming part of Letters Patent No. 403,839, dated May 21, 1889.

Application filed June 6, 1888. Serial No. 276,285. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. HARVEY, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces and Apparatus for Producing and Burning Gaseous Vapors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

The object of the invention is to secure greater uniformity in the character and production of the enriching vapors evolved from the liquid hydrocarbon used in carbureting, to prevent subsequent condensation of such vapors between the carburetor and furnace, and to thoroughly mix them with air for combustion before their temperature has been lowered; and the invention consists in the construction and combinations of parts, hereinafter described and pointed out.

In the accompanying drawings, Figure 1 represents a section of a furnace combined with air-heating and carbureting devices, shown partly in section. Fig. 2 is a section, on an enlarged scale, of concentric gas and air conduits, being a portion of the furnace-burner. Fig. 3 is a side view of the same, the air-pipe being represented in section. Fig. 4 is a detail view, in section, on a still larger scale, of burner-pipes provided with exits for air and gas. Fig. 5 represents a modified form of the carburetor, and Figs. 6 and 7 are views of details on an enlarged scale.

The furnace 1 may be of any approved form, according to the use for which it is designed, a steam-boiler furnace being indicated in the present instance. An air-heating chamber, as 2, is arranged upon or in the furnace in such manner that it will receive heat from the same. In the illustration this chamber is shown as exposed to the direct action of the fire, valves 3 being provided in an arch, 4, for the purpose of supplying a portion of air to the combustion-chamber when found desirable. The construction and location of the air-chamber, however, may be considerably varied. It may either be formed in the masonry or located on its exterior, and obviously it could be formed in a furnace made mainly or wholly of metal. An air-chamber formed in the brick-work of the furnace is preferably protected by a metal casing or otherwise to prevent the leakage of air under the influence of the blast which is admitted to be heated. It can be provided with baffle-plates in usual manner, if desired. I also contemplate the use of a compartment adapted to receive iron filings or their equivalent, and having connecting-pipes by which steam could be introduced into the presence of the filings and be thereby decomposed and the resulting gas conveyed to the carburetor to be enriched and then conducted to the burner. Such carbureted hydrogen could be independently burned or be mingled with carbureted air before burning; but as a mixture of about two parts of hydrogen with five of common air is highly explosive, great care should be taken to avoid these proportions or to prevent the ignition of such mixed gases in the carburetors or elsewhere, and none but those skilled in such matters should undertake to burn carbureted hydrogen. In the drawings is indicated a chamber for filings and a steam-pipe communicating therewith; but this feature is not essential to my invention and may be omitted. An air-inlet is indicated at 5 and an exit-pipe, 6, the course of the air being around the chamber containing filings, which latter is of limited extent when compared with the air in chamber. A blower, air-pump, or steam-injector can be employed to force air into inlet 5. The air-pipe 6 extends to a casing, 7, which surrounds an oil-receptacle, 8.

9 and 10 are continuations of the air-pipe. 11 is also an air-pipe, receiving its air from coupling 12, which communicates with the interior of casing 7.

13 is a branch of the main air-pipe and leads to the combustion-chamber of the furnace.

Inside of the main air-conduit is arranged a gas or vapor pipe, 16. It communicates at its outer end with an oil tank or receptacle, 8, and by a branch, 15, with tank 14, both tanks serving as carburetors, and said pipe communicates with the furnace through its vertical and horizontal continuation 13 and

32, the latter leading to a gas-burner pipe, 33, having the branches 34 34, which branches alternate with the branches 35 35 of the air-pipe. As represented, these pipes are passed through the side wall of the ash-pit, adjacent to the ash-pit door, a recess being formed in the wall, to which access can be had through said door to allow access to the pipes and their couplings. The pipes might be arranged in the doorway, and being made in sections would be easily removable.

A convenient arrangement of the burner-pipes is illustrated in Figs. 2 and 3, in which 30 indicates the main air-pipe of the burner; 31, a pipe connecting it with conduit 13; 32, the main gas-pipe; 33, a pipe connecting it with conduit 19, and 34 and 35 the air and gas pipe branches, respectively.

In Fig. 4 exit-nipples 36 are represented; but they are not essential. It is, however, important that the exits be so arranged as to permit a thorough mingling of the air and gas. This can be secured by so forming the exits as to direct the jets of air and gas against each other. As represented, they are constructed to project the fluids downwardly. This arrangement is very favorable to admixture, and results in a partial combustion in contact with the pipes, by which the fluids are highly preheated. These exits, however, can be arranged to direct the jets obliquely upward against each other, and that whether nipples are used or not.

18, 19′, 20, 21, and 22 indicate valves or cocks in the air-pipes. These valves should be of such character that they can be fixed in any desired position.

24 is a cock or valve in the main gas or vapor pipe.

25 is an oil-supply tank communicating with reservoir 14 by a pipe having a cock, 26, regulated by a float. Pipe 27, provided with a cock, allows oil to be drawn into reservoir 8, and pipe 28 permits withdrawal from 8 of its contents, if desired.

The hot-air pipes are preferably provided with a non-conducting covering to prevent loss by radiation. The gas and air pipes immediately below the combustion-chamber may be provided with asbestus wrappings to protect them from the fire. Preferably, a body of broken refractory material is placed in the combustion-chamber, and a layer of loose asbestus may be interposed between the same and the burner-pipes for the purpose of causing a thorough intermixture of the air and gas. Conduit 16 is placed inside the hot-air conduits 6, and its continuation 19 in air-conduit 13, by which means the temperature of the oil-vapors is maintained or slightly increased and condensation entirely obviated. Considerable loss of heat is also saved by this arrangement and by the use of non-conducting coverings.

Instead of placing conduit 16 within conduit 6, the latter, its size being reduced, may be wrapped, together with conduit 10, by a non-conducting covering, and then, if desired, incased with wood or other material without departing from the invention. Valves are provided to regulate the relative amounts of the fluids and maintain suitable proportions, whereby perfect combustion can be insured; and to further aid this result ample means are provided for suitably supplying air and bringing it in intimate contact with the fuel, so as to obviate the passage through the furnace of any excess of air and at the same time furnish enough to consume every particle of fuel. For this purpose the mingling of air and gas as they issue from the burner-pipes and their passage through asbestus or other refractory material, which checks their current and breaks it up in a manner to distribute and mingle them, are desirable; but devices for effecting these ends are not broadly of my invention.

In operating the apparatus the initial heat may be generated in any approved manner, either by burning gas or carbureted gas or air, or oil or oil-vapor upon or among the refractory blocks, if such are provided in the combustion-chamber. Oil having been supplied to receptacles 14 and 8 from tank 25, a blast of air or gas is driven through conduit 5 and through the chamber 2 and conduit 6, branches 9 and 10, and pipe 11, and also through conduit 13 and pipes 31 and 35, to the burner-exits. The air that passes through pipes 10 and 11 will carry oil-vapor through conduit 16 to the burner-pipes 34. The hot air blown through branch air-pipe 9 will fill casing 7, impart some of its heat to the oil in receptacle 8, and then pass through pipe 11, which latter forms, in effect, an extension of the main air-pipe, being connected with the hot-air space in casing 7, supplied with hot air by branch air-pipe 9. By this arrangement the oil in receptacle 8 is raised to a higher temperature than that in 14, and the air which is passed through it has also a higher temperature. The purpose of this construction and arrangement is that the fresh charge of oil, containing a large amount of easily-vaporizable hydrocarbons, may be used more nearly at a normal temperature than the less vaporizable oil.

Preferably oil from which the more volatile portions have been eliminated by use in receptacle 14 is drawn through pipe 27 into receptacle 8. The air, carbureted with the heavier vapors in the latter, is mingled with that carbureted in the former and passed to the furnace through the common conduit 16, and by this means a more uniform quality of fuel is produced than is possible where the carbureting-liquid is all subjected to a constant temperature.

It is obvious that other oil-receptacles, with or without casings, might be interposed between receptacles 8 and 14, and similarly connected with them and with each other without material change in operation; and, further, air at a normal temperature might be

passed over or through the oil in one or more of the receptacles, and particularly through that in which the fresh charge is introduced. By-pass pipe 29 (shown in Fig. 1) may be used for that purpose. Preferably the oil-supply pipe is provided with a cock controlled by a float, 37, or similar device, in such manner that the depth of oil in receptacle 14 is automatically regulated. A similar device can be used between receptacles 14 and 8. After the oil has been partially vaporized in receptacle 14 it is passed into receptacle 8, and used at a higher temperature, as stated.

In Fig. 5 is shown a modification of the carburetor, in which an annular chamber, 38, is intended to receive the fresh supply of oil, and a similar chamber, 39, to receive heavy oil. 40 is a hot-air chamber; 41, a hot-air conduit; 42, branches entering the oil; 43, a vapor-conduit, and 44 a pipe for transferring oil from the outer to the inner oil-chamber.

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

1. In combination, a blower connected by an air-conduit with an air-heating chamber, a burner adjacent to said chamber, an oil-receptacle of a carburetor, an air-conduit connected to convey air from the heating-chamber to the interior of the oil-receptacle, and a conduit connected to convey carbureted air to the burner, the conduit for carbureted air being inclosed to maintain its heat, substantially as specified.

2. In combination, a blower connected by an air-conduit with an air-heating chamber, a burner adjacent to said chamber, two carbureting oil-receptacles, an air-conduit provided with branches or extensions connecting the air-heating chamber with each receptacle, and a conduit connected with the burner and provided with branches or extensions connecting the same with the upper part of each carburetor, whereby two bodies of oil may be used to carburet air and the carbureted air from both may be mingled and conveyed to the burner, substantially as specified.

3. The combination of a blower connected by an air-conduit with an air-heating chamber, a burner adjacent to said chamber, a carbureting oil-receptacle, a conduit for heated air connecting the heating-chamber and carburetor, and a conduit for carbureted air connecting the carbureting oil receptacle and burner, the conduit for carbureted air being inclosed in the hot-air conduit, substantially as and for the purpose set forth.

4. The combination of a blower connected by an air-conduit with an air-heating chamber, a burner adjacent to said chamber, an air-conduit connecting the air-heating chamber and a carbureting oil-receptacle, and a by-pass pipe connecting the blower and the carbureting oil-receptacle, substantially as specified.

5. The combination of a blower connected by an air-conduit with an air-heating chamber, a burner adjacent to said chamber, two carbureting oil-receptacles, one of which is incased, a hot-air conduit connecting the heating-chamber with the space between the casing and its inclosed oil-receptacle, and also connecting said chamber by the medium of branch or extension pipes with both oil-receptacles, a pipe connecting the oil-receptacles for transferring oil, and a conduit for carbureted air connecting the receptacles with the burner, substantially as specified.

6. The combination of a blower connected by a conduit with a heating-chamber, a burner adjacent to said chamber, two carbureting oil-receptacles, one of which is incased and on a lower level than the other, a hot-air conduit connecting the heating-chamber with the space between the casing and its inclosed oil-receptacle and also, by the medium of branch or extension pipes, with both oil-receptacles, a pipe connecting the oil-receptacles for transferring oil, and a conduit for carbureted air connecting the receptacles with the burner, substantially as specified.

7. The combination of a blower connected by an air-conduit with a heating-chamber, a burner adjacent to said chamber, two carbureting oil-receptacles, one of which is incased and on a lower level than the other, which latter is provided with devices for automatically regulating the height of the liquid fed into the same, a hot-air conduit connecting an air-heating chamber with a space between the casing and its inclosed oil-receptacle, and also connecting said chamber by the medium of branch or extension pipes with both oil-receptacles, a pipe connecting the oil-receptacles for transferring oil, and a conduit for carbureted air connecting the receptacles with the burner, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE H. HARVEY.

Witnesses:
A. C. JOHNSTON,
JOSIAH W. ELLS.