(No Model.)

H. T. LITCHFIELD & D. RENSHAW.

HYDROCARBON FURNACE.

No. 262,236. Patented Aug. 8, 1882.

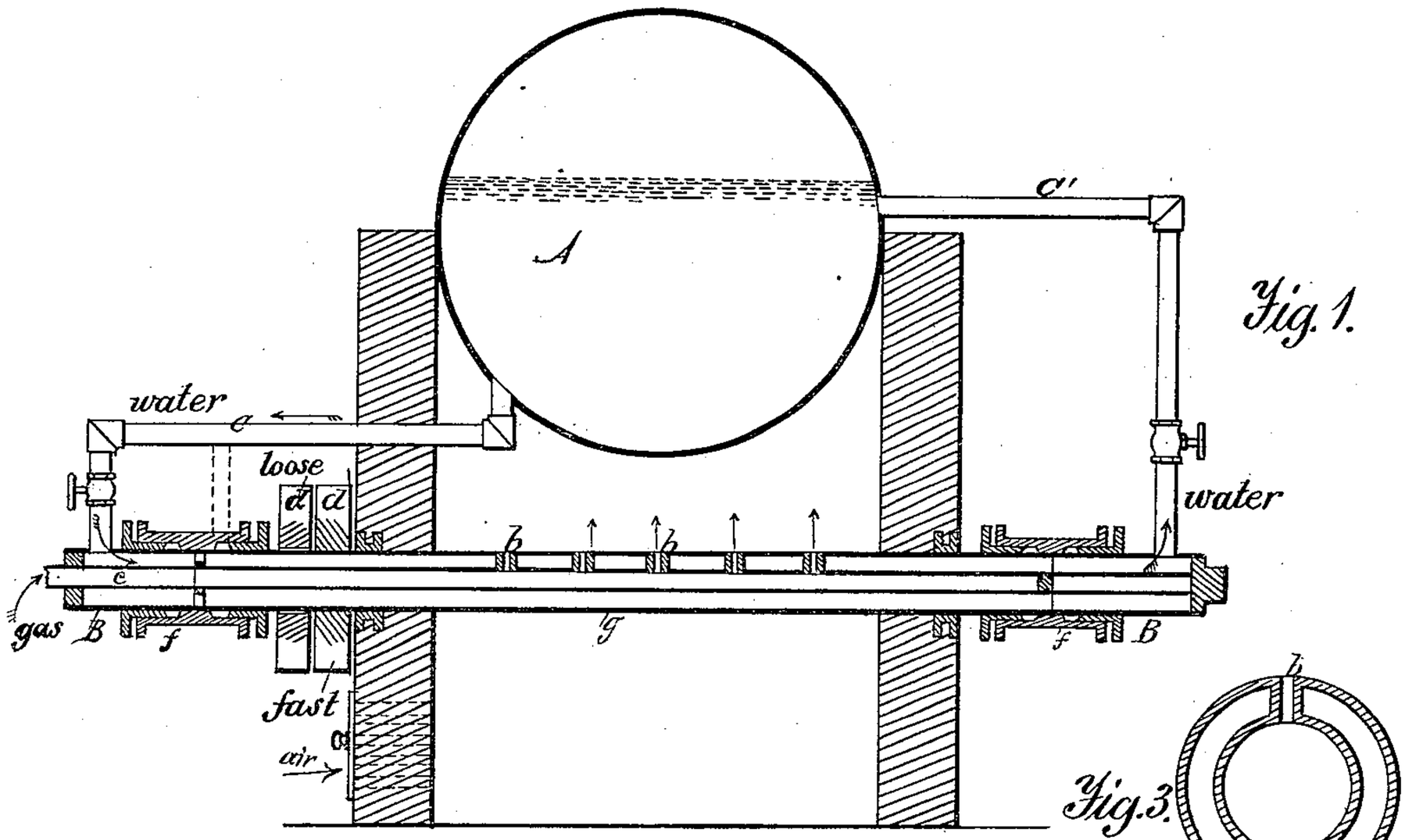

Fig. 1.

Fig. 3.

Fig. 2.

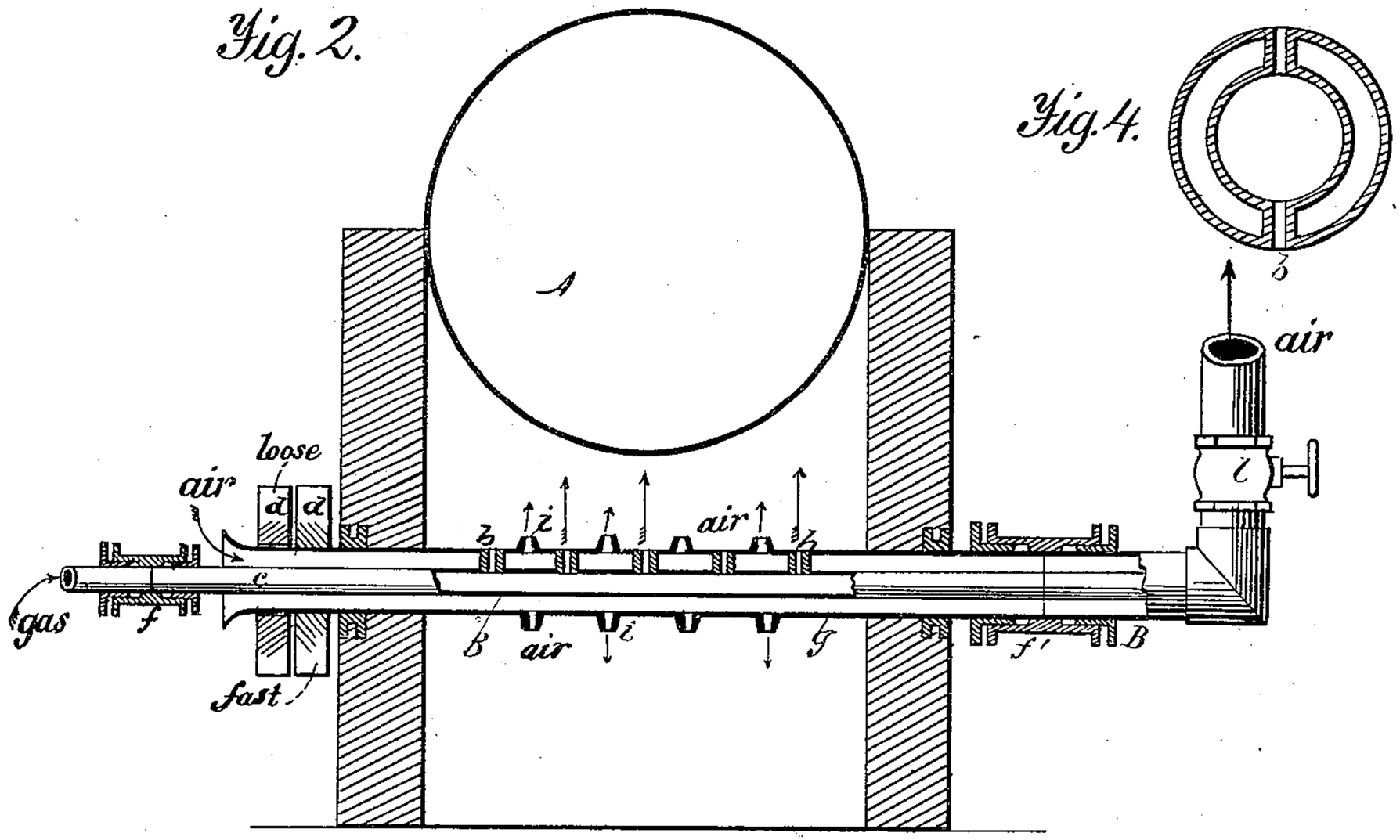

Fig. 4.

Fig. 5.

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HYDROCARBON-FURNACE.

SPECIFICATION forming part of Letters Patent No. 262,236, dated August 8, 1882.

Application filed January 7, 1882. (No model.)

To all whom it may concern:

Be it known that we, HARVEY T. LITCHFIELD, of Hull, in the county of Plymouth, and State of Massachusetts, and DAVID RENSHAW, of Cohasset, in the county of Norfolk, and State of Massachusetts, have invented certain new and useful Improvements in Hydrocarbon-Furnaces; and we do hereby declare that the following is a full, clear, and exact description of the invention, which 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 of reference marked thereon, which form a part of this specification.

This invention has relation to a general system of burning air, steam, or the mixture of steam, air, and hydrocarbon oils or the vapors thereof, for which applications have been filed in the United States Patent Office, and others that will be filed bearing nearly even date herewith.

Before proceeding to describe our invention it may be said that although it is customary to regard the act of combustion as one in which the principal fuel burned is that which we have perceptibly before our eyes in the form of coals, wood, petroleum, oils, &c., the truth is that combustion is maintained by comparatively small quantities of carbon and hydrogen derived from visible fuel. These are combined with a far larger quantity of diluted oxygen supplied to the fire by the air, which, only because it is in a form invisible to our eyes and apparently costs nothing, is often too little considered when treating questions connected with the economy of fuel. If we were to say that we burn air instead of saying we burn wood or coal, it would be equally accurate. Hence it may be asked what is the best form in which to utilize, prepare, and apply the air, whereby it may be economically carbureted and introduced and burned in a furnace for any of the various heating purposes. Therefore we have shown in the annexed drawings the method preferable to us, while, as is obvious, many modifications of our method may be adapted without departing from the principles of our invention.

To the end therefore that our invention may be more fully understood and carried into effect, we will briefly state that it consists in the method or process, hereinafter shown, for the prevention of carbon deposits in rotating or stationary pipes or chambers used for petroleum or other furnaces by means of what may be called an inner and outer pipe or pipes or chambers, the inner area of which is for the reception of such gases and the outer area for the reception of currents of water or air, by means of which the temperature of the inner pipe is under control, and hence can be maintained at such temperature as to prevent the deposit of carbon, at the same time forming a hydrocarbon-furnace. We wish it understood that this system may be extended, and, if desired, three or more pipes may in such manner encircle each other, delivering into the furnace or not, as desired.

Referring to the drawings, Figure 1 shows a transverse sectional elevation of our invention applied to a steam-boiler furnace in which the temperature of the inner pipe is controlled by means of a circulation of water through the outer pipe, said water being taken from the lower part of the boiler and returned into the same at a higher point. Fig. 2 also shows a transverse sectional elevation of the application of the invention to a boiler-furnace in which the temperature of the inner pipe is controlled by means of a current of air. Figs. 3 and 4 are detached views of concentric pipes, and Fig. 5 is an end view of the pipe B at its connection.

Referring more particularly to Fig. 1, A is the boiler; B, the inner and outer pipes or chambers; C C′, the pipes connecting the outer area of said pipe B with the boiler A. *c* is the inner pipe for the reception of the hydrocarbon gases. *f f′* are double stuffing-boxes, by means of which the double pipe is allowed to rotate while the connections to it at the ends are stationary. *d d* are fast and loose pulley wheels, attached in the usual manner to said double pipe. *b* are hollow studs for the allowance of the passage of the gases through the outer area, *g*, to the furnace.

In Fig. 2, A is the boiler. B is the double

pipe; *c*, the gas-supply pipe of said double pipe B, which does not extend longitudinally beyond the furnace-wall farthest from the entrance for the gases. *f f'* are double stuffing-boxes, by means of which the double pipe is allowed to rotate while the connections to it at the ends are stationary. *d* are fast and loose pulleys attached to said pipe B. *b* are hollow studs for the passage of the gases through the outer area, *g*, to the furnace, and *i* are air-outlets. *l* is a valve for controlling the amount of air passing through the outer area of pipe B. These (as before stated) double pipes or chambers may be made in so many ways that it would be impossible to show them all in detail; but we desire to mention some of the modifications now most prominently before us. The hollow studs might be formed by one continuous rib drilled at proper intervals to allow of the passage of the gases to the furnace through the outer area, *g*. By inserting two continuous ribs instead of one, and stopping off the inner area, *e*, in Fig. 1, so as to allow the water a passage round the end of it, the connections for the circulation of water from the boiler through the outer area of pipe B could all be made at one end, so allowing the water to traverse the length of the pipe B twice instead of once, as shown in Fig. 1. The outer water-way through the pipe B might be used for a feed-water heater for a boiler, the water passing once through the pipe or twice according as it may be arranged with hollow studs or two continuous ribs. The water may be supplied to this pipe B by a pump, by gravity, or other means in such quantities in proportion to the furnace-heat as to render the heat of the inner pipe whatever may be desired for the purpose required.

In Fig. 2, as before mentioned, in the conduit or flue extending from the end of the double pipe B, is shown a valve, *l*, by means of which the flow of air through the outer area can be controlled, and hence the heat to the inner pipe may be increased or decreased, as desired.

It will also be evident that air may be forced into said outer area by mechanical means, and by said means the degree of temperature could be still further varied.

It will also be evident that in some cases we may dispense with the air-outlets *i*, allowing all the air entering the pipe B to escape by its connection through the valve *l*.

It will also be evident that the form as well as construction of this apparatus may be greatly varied to suit the varied purposes for which it is fitted, and, further, that it may be constructed of any suitable material or combination of materials—as, for example, in case of the use of air, the inner pipe may be of iron and the outer one of fire-clay.

We have not shown an arrangement of stationary pipes, as supposing it unnecessary.

The greatest difficulty met in the burning of oil-gases in furnaces arises from the deposition of carbon in the pipes, rendering them inoperative. It has been perfectly ascertained that when olefiant gas, &c., is passed through a nearly white-hot porcelain tube it is entirely decomposed, depositing the whole of its carbon and giving off pure hydrogen. Further, the affinity between carbon and hydrogen seems to diminish with the increase of temperature. The best authorities on the chemistry of combustion of gases agree that there is a temperature at which, in the process of decomposition, olefiant gas, &c., should be formed, and which temperature continued should be unable to decompose such compounds. Hence will be seen the reason that we control the heat of our pipes in the furnace.

What we desire to secure by Letters Patent is—

1. The combination, in hydrocarbon-furnaces, of a rotating hydrocarbon vapor or gas pipe with a rotating pipe through which water flows, said pipe being concentrically arranged and adapted to supply gas from the inner pipe through periphery of the outer pipe, in the manner shown and described.

2. The combination, in a hydrocarbon-furnace, of an inner and outer pipe having lateral passages concentrically arranged, and adapted to rotate together, said pipes being jointed to the stationary supply-pipes in the manner shown and described.

3. The combination, in hydrocarbon-furnaces, of double rotating pipes, one of which is concentrically arranged within the other, the outer one adapted to have passed through it a cooling medium by which the gases passing through the inner pipe are prevented from depositing their carbon substances on the surface of said inner pipe, in the manner shown.

4. In furnaces for burning hydrocarbon or the vapor thereof, or other gases, as fuel, the double concentric rotating pipes, in combination with stationary ends, said pipes being adapted to circulate water from the boiler through them in the manner set forth.

5. The combination, in furnaces for burning gases as fuel, of the rotating pipes, the stationary end pipes, the double stuffing-boxes, and the circulating water or air pipes, substantially in the manner set forth and described.

6. The combination, in hydrocarbon-furnaces, of double rotating pipes, one of which is arranged concentrically within the other, the outer one being perforated and adapted to have air forced into and through it and into the furnace, by which means the gases passing through the inner pipe are prevented from depositing carbon, and the combustion in said furnace is greatly improved, in the manner set forth.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

HARVEY T. LITCHFIELD.
DAVID RENSHAW.

Witnesses:
S. D. WILLIAMS,
WILLIAM BRECK.