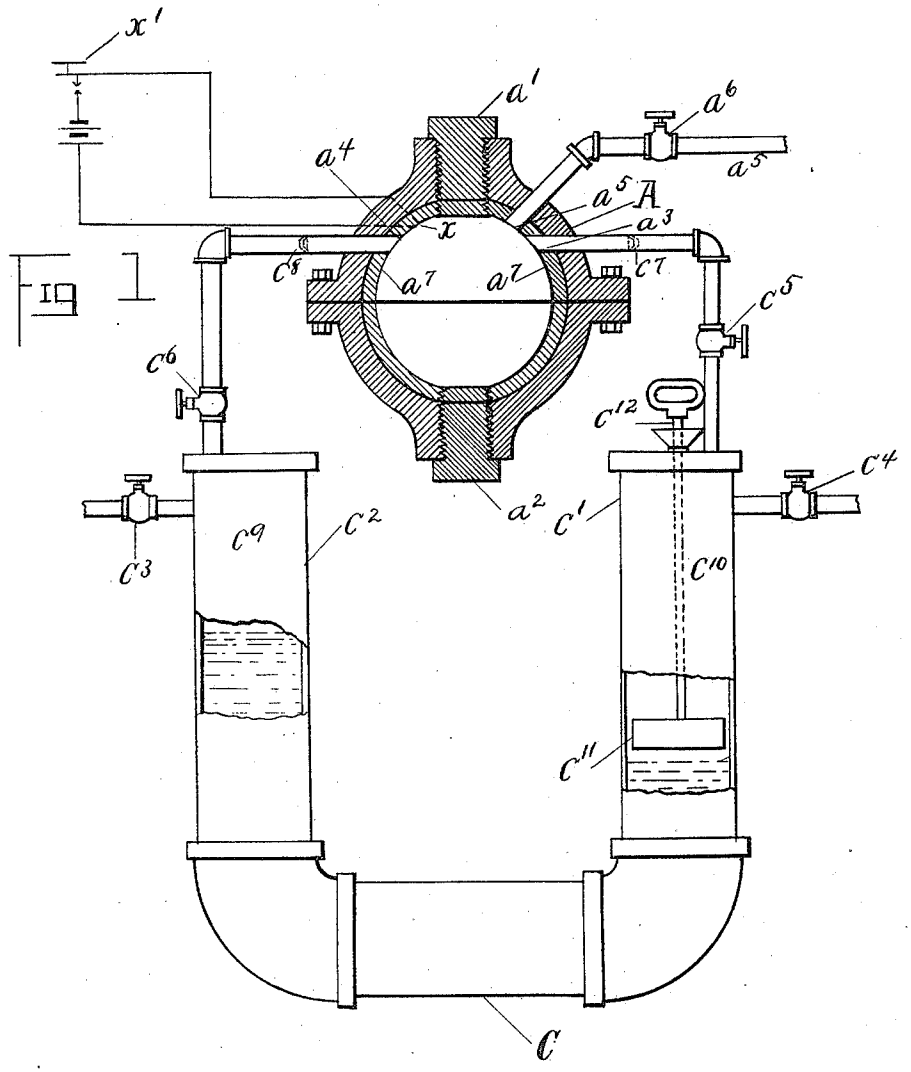
(No Model.) 2 Sheets—Sheet 1.

G. WHITE.

FURNACE FOR GENERATION OF HEAT OR POWER.

No. 576,176. Patented Feb. 2, 1897.



WITNESSES:

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(No Model.) 2 Sheets—Sheet 2.

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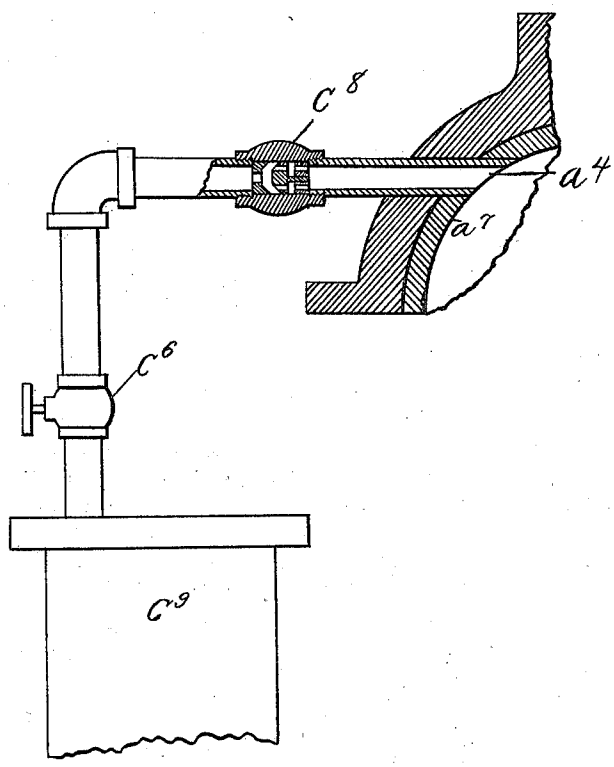
Fig. 2.



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UNITED STATES PATENT OFFICE.

GEORGE WHITE, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO JAMES R. HATMAKER, OF NEW YORK, N. Y.

FURNACE FOR GENERATION OF HEAT OR POWER.

SPECIFICATION forming part of Letters Patent No. 576,176, dated February 2, 1897.

Application filed March 28, 1896. Serial No. 585,210. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WHITE, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Furnaces for the Generation of Heat or Power, of which the following is a specification.

My invention relates to an apparatus adapted to be used as a furnace for the generation of heat or as a retort for the generation of power.

The main feature of my invention consists in apparatus whereby I bring together in a closed retort elements of combustion in the presence of a flame or heat, whereby I occasion combustion within said retort, and by the arrangements hereinafter to be described I am able to control the supply of combustible elements to the retort in such quantities, and according to such a predetermined ratio as to produce within the retort practically perfect combustion, and I am able also, by the construction and nature of my retort, to concentrate the heat or power thus generated and to utilize and control the same, either as heat in the reduction of refractory substance and the like, or I may withdraw the pressure thus generated and employ the same in the operation of an engine or motor, or I may use both together, as the circumstances of the case may require.

I have illustrated my invention in the accompanying drawings and designated the parts by letters, referring to like parts by like letters.

In the drawings, Figure 1 shows the vertical elevation of my device, the retort being in section. Fig. 2 is a detail view showing the automatic valve c^8 interposed in the pipe leading to the retort.

A is a retort made, preferably, in two halves and bolted together. As great strength is required, I prefer to make this retort of heavy metal, and I line the same with some refractory material, such as fire-brick, to resist the effects of the heat generated within the retort. I have indicated this lining as a^7.

For the purpose of introducing into the retort material to be affected by the heat and removing the same therefrom I provide the screw-plugs a' and a^2. I also provide ports leading into the retort for the reception of the gaseous fluids or other material which I may employ as the elements of combustion. In the drawings I have illustrated two ports a^3 and a^4. In practice I prefer to concentrate these in one port, but for the convenience of illustration I have shown the two. I also provide another port a^5, and controlled by the valve a^6, which is intended to be connected with a reservoir or engine, as convenience may require, when I desire to utilize the pressure generated within the reservoir as a source of power or to be used simply as an exhaust. x is intended to represent the poles of an electric circuit; x', a circuit-controller. I also provide valves c^7 and c^8 within the ports a^3 and a^4, arranged according to well-known forms of construction, to prevent an exhaust of pressure from the retort through said ports, and yet to permit the combustible materials to flow from the reservoirs into the retort when the pressure in the retort is less than that within the reservoirs. I prefer to make the surface area of the valve presented to the pressure of the retort greater than the surface presented to the pressure flowing from the reservoirs. It will be understood that, according to the area of the surfaces of the valves thus presented, I may with precision regulate the time at which I will permit gas to be admitted to the retort from the reservoirs, for it will be clear that the valve will not open until the pressure in the retort is exhausted sufficiently to allow the gas flowing from the reservoirs to open the valve. I am thus able to use all or nearly all the pressure generated in the retort after the combustion has taken place.

C is a chamber made, preferably, in the form of the letter U set upright, with the ends c' and c^2 closed. I partly fill this chamber with water, (or other liquid having a specific gravity greater than that of air or gas,) thus leaving two chambers c^9 and c^{10}, which will be hereinafter referred to as "reservoirs." c^3 and c^4 are pipes controlled by valves leading into said reservoirs, respectively, and c^5 and c^6 represent pipes and valves leading from the reservoirs c^9 and c^{10} to the retort A, respectively.

c^{11} is a basket suspended within the reservoir c^{10} by the rod c^{12}. The rod c^{12} passes through the head of the chamber c^{10} for the purpose of lowering the basket c^{11} into the water and elevating the same.

As heretofore stated, the object of my invention is to generate heat or power, or both, in a closed retort by the combustion of fluids, gases, or other suitable material within the retort under regulated pressure and the utilization of the products of combustion, as heat or power.

The difficulties which have been encountered heretofore in furnaces has been due largely to the fact that the elements of combustion could not be brought together under such control as to produce perfect combustion.

By the device which I have above described I am able to so regulate the supply of combustible material to my retort as to get the best and most perfect results from combustion. The manner in which I accomplish this is as follows: I establish a balance between the elements of combustion contained in the reservoirs, so that a relatively uniform pressure may be exerted by each upon the other, to the end that I may with precision regulate the delivery of the elements of combustion to the retort according to such predetermined ratio as I may find to be most advantageous and most conducive to perfect combustion.

In the operation of my device I may employ any of the well-known gaseous fluids which when brought into union in the presence of heat and flame will produce combustion. Such elements are acetylene gas and air; but there are many others that might be enumerated.

For the purpose of illustration I will describe the operation of my device as the same may be operated with the use of acetylene gas in association with air.

It is known that when calcium carbid in a solid form or otherwise is brought into contact with water a gas is generated which is known as "acetylene" gas and that this gas has a powerful expansive property. I will describe how I may use calcium carbid in the generation of acetylene gas and how I may use such gas in the operation of my apparatus.

I first partially fill the tubular chamber C, as heretofore stated, with water, which will naturally rise to the same level in both chambers c^9 and c^{10}. I then close the valves c^4, c^5, and c^6 and open the valve c^3 to permit the reservoir c^9 to be filled with air, or I may facilitate this operation by injecting the air into said chamber. I then close the valve c^3. The basket c^{11} having been previously filled with calcium carbid, I lower said basket into the water in the chamber c^{10}. Immediately acetylene gas will be generated within the reservoir c^{10} with such pressure as to depress the column of water lying beneath the same and in the cylindrical chamber C and elevate the column of water in the reservoir c^9 correspondingly, thus compressing the air within said chamber to a pressure equal to the pressure of the gas in the reservoir c^{10}. I have illustrated this form of bringing the calcium carbid in contact with the water by simple and convenient means, but I do not intend to limit myself to this form. I may introduce the calcium carbid through the pipe and valve c^4, and where I employ illuminating-gas or other fluids they may be generated in a separate reservoir. I may inject them into the reservoir c^{10} through the pipe and valve c^4.

As heretofore stated, I may utilize my device for the reduction of refractory substance by the application of heat, as a smelting-furnace, or I may employ the heat and power generated within the retort for power alone; or I may utilize both the heat and power concurrently. I will describe the operation as I utilize the same concurrently.

To introduce the material to be smelted into the retort, I remove the screw-threaded plug a' and replace the same when the material is introduced. I then open the valves c^5 and c^6 to permit the gas and air to flow into the retort A.

It will be understood that, the pressure in the reservoirs c^9 and c^{10} being equal, the flow will be equal where the resistance to such flow is the same, and that where the relative resistance to such flow is varied the relative proportion of the flow will be varied. For this reason and by this arrangement of balance of pressure between the reservoirs I am able to control the supply of combustible fluids to the retort according to a definite and predetermined ratio, that is to say, if I open the valve c^6 to its full capacity and c^5 to its half-capacity the relative proportion of gas and air delivered to the retort will be and continue as one is to two, and so I may vary the relative proportion of the supply of each accordingly, as circumstances may require. If, for instance, I should know as a scientific fact that perfect combustion was produced by the union of gas and air in given proportions, I should regulate the supply accordingly. If, on the other hand, I was ignorant of this fact, I could regulate this supply by experiment, adjusting the valves c^5 and c^6 with reference to each other until I arrived at that point where perfect combustion was produced within the retort A.

When the retort A is supplied with combustible fluids or gases, as heretofore stated, I close the circuit x' and produce within the reservoir a spark. I may resort to other means to produce a flame or spark within the retort, such as siphoning the flame into the retort through a small aperture or otherwise. The spark will ignite the gaseous fluids within the retort and an explosion will ensue, as a result of which heat will be generated within the retort and a high degree of pressure. I may then conduct this pressure into a receiver or engine through the valve and pipe a^6, or I may exhaust the same to the atmosphere. The pressure being thus exhausted

from the retort A, the gas and air will immediately be fed into the retort by their own pressure and a second explosion will be had by the generation of a spark between the poles x, and so the operation may be continued.

It will be understood that when the combustion takes place within the retort a pressure will be generated therein, which will be greater than the pressure within the reservoirs. Hence the valves c^7 and c^8 will be closed by such excess of pressure and so remain closed until the pressure within the retort is exhausted to a degree less than the pressure within the reservoirs.

I may adjust the valve a^6, in connection with the operative parts of an engine, so that the valve a^6 may be closed when the explosion takes place and opened immediately thereafter to deliver the pressure generated to an engine in operative position. I may also substitute a mechanical balance between the reservoirs c^9 and c^{10}, instead of the hydraulic balance which I have described. Such a balance would be an ordinary cylinder and piston or the equivalent, but I prefer to use the hydraulic balance.

What I claim is—

1. In a furnace for the generation of heat and power, the combination of a closed retort adapted to sustain pressure and heat, and provided with suitable ports, and an exhaust, and means to generate a spark or flame within the retort, with reservoirs adapted to contain gaseous fluids, provided with suitable valves, and means to introduce calcium carbid or other similar compound into one of said reservoirs, and to bring the same into contact with water, and means to introduce air into the other of said reservoirs, with a tubular connection between said reservoirs to contain a liquid, such as water to act as a balance between the pressures in the reservoirs, also a tubular connection between each reservoir and the retort, and valves interposed in said connection to control the introduction of combustible fluids into the retort, substantially as described.

2. In a furnace for the generation of heat and power, the combination of a closed retort, provided with suitable ports to admit elements of combustion, and valves interposed in said ports arranged to permit such pressure to be admitted, but prevent such pressure from escaping from the retort; with reservoirs for the storage of combustible fluids under pressure, and a tubular connection between said reservoirs to contain a liquid, such as water to act as a balance between the pressure in the reservoirs, and means to supply the combustible material from the reservoirs to the retort, and to control said supplies, and means to ignite the elements of combustion within the retort; an exhaust-port leading from the retort to a gas-receiver, and means to control said exhaust, substantially as described.

Signed at New York, in the county of New York and State of New York, this 12th day of March, A. D. 1896.

GEORGE WHITE.

Witnesses:
WILLIAM M. SEÜFERT,
EDWARD J. MCGUIRE.