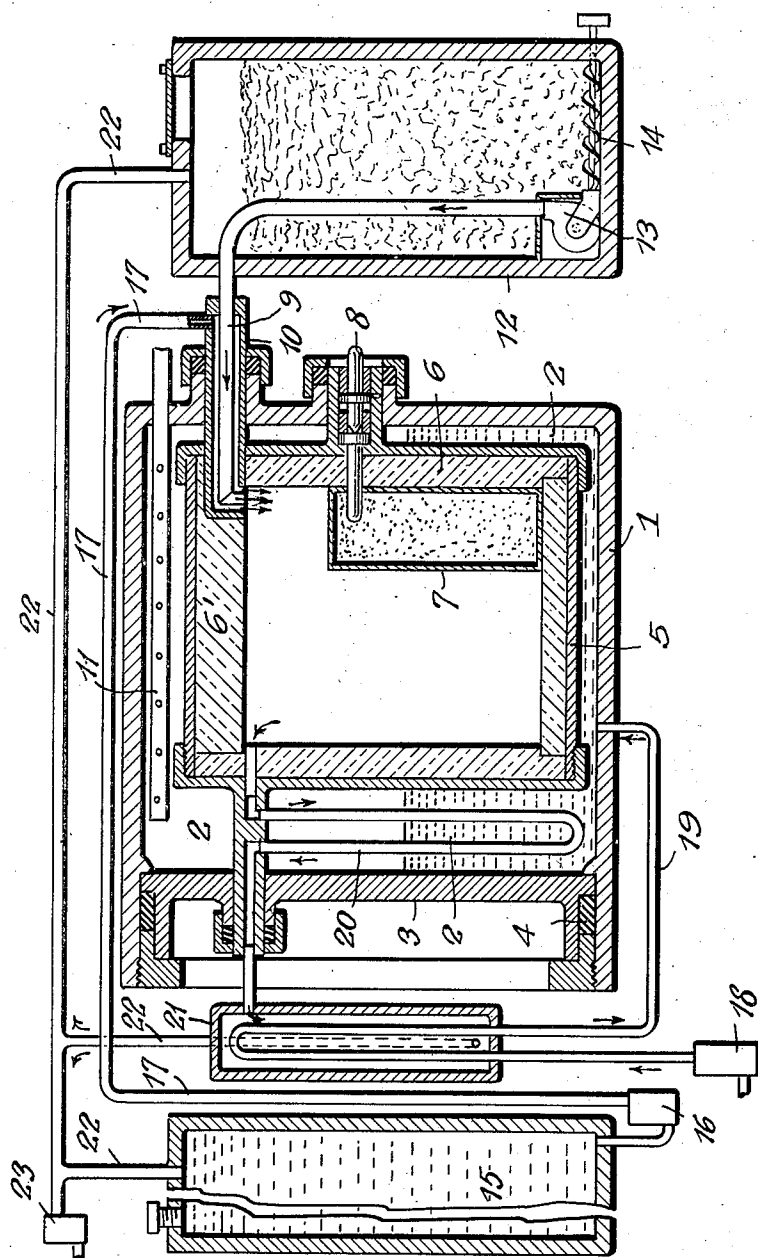


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J. H. O'NEILL
METHOD AND MEANS OF PRODUCING HEAT
Filed Dec. 5, 1919



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UNITED STATES PATENT OFFICE.

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METHOD AND MEANS OF PRODUCING HEAT.

Application filed December 5, 1919. Serial No. 342,834.

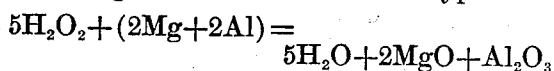
To all whom it may concern:

Be it known that I, JOHN HUGH O'NEILL, a citizen of the United States, residing in Springfield, Missouri, have invented a new and useful Method and Means of Producing Heat, which is fully set forth in the following specification, which is a continuation in part of the method contained in my application No. 269,268, filed January 2, 1919, method and means of generating power, also of two other applications filed herewith, bearing Serial Numbers 342,832 and 342,833.

The present application differs from the methods described in the above mentioned applications in that the fuel is introduced in the form of powder or grains simultaneously with a jet of combustion sustaining gas or carrier of such gas or gases.

This type of cycle and furnace are particularly adapted for use in submarines and torpedoes, since by the selection and proportion of fuel and gas-carrier it can be operated so that approximately no gaseous waste will be exhausted which would leave a wake when exhausted into the sea.

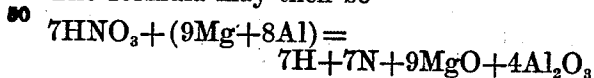
An alloy of aluminum with some one or more of the more reactive metals may be used as fuel, and hydrogen peroxide may be the combustion-sustaining-gas-carrier, the following formula would then be typical:



This gives a heat value of 2896 calories per gram or 5212 B. t. u. per pound of materials. This very high heat value will allow of vaporizing a large amount of water for motive fluid.

The water vapor, and other gas if any, found in the products of this reaction may or may not be mixed with the steam in the steam chamber as desired.

A cycle of great usefulness and also typical of this method of producing heat and applying it to power purposes may be nitric acid as the combustion-sustaining-gas-carrier, and an alloy of reactive metal as fuel. The formula may then be



which reacts with a heat value of 2943 calor-

ies per gram or 5307 B. t. u. per pound of mixture.

When used in a submarine or torpedo the gaseous waste products may be vented to the sea and the steam cycle may be closed. The steam may be exhausted into a condenser which can be conveniently placed on the outside of the torpedo or submarine so as to use the water which flows over the outside skin of the craft as a cooling agent, thus doing away with handling the cooling water by means of pumps. An air pump will be needed to expel non-condensable gases from the condenser if it is decided to run the torpedo or submarine at great depth. Torpedoes with this cycle can be built with moderate weight of walls and yet stand submergence to great depths on account of the internal counter pressure that can be provided and the small volume of non-condensable gas that would have to be expelled against the pressure due to the submergence.

For maintaining the trim of the craft the containers for the elements of combustion can be placed at opposite ends of the combustion chamber so that transferring the material to the central compartment will not seriously disturb the distribution of weight in relation to the length of the craft.

This invention includes a new method of burning powdered fuel with combustion-sustaining-gas or gases which may be obtained from any source or dissociated from a liquid, in which both elements are introduced simultaneously into a combustion chamber where they react away from atmospheric air and produce heat. This heat can be applied to any desired use such as heating a furnace, producing a motive fluid, or manufacturing water gas, or hydrogen, or other gases.

The fuel may be any material or mixture of materials that has a positive heat reaction with a gas or combustion-sustaining-gas-carrier, and that can be powdered, such as carbon, charcoal, coals, coke, solid hydrocarbons, metals, lithium, rubidium, potassium, barium, strontium, sodium, boron, calcium, silicon, magnesium, aluminum, sulphur, etc.

Any liquid may be used which upon dissociation will yield a comburent or combustion sustaining gas or gases. Some such

liquids are water, and solutions in water of compounds which will also yield combustion sustaining gas or gases. Some such compounds are oxids, nitrites, nitrates, chlorates, sulphates, etc. Other suitable liquids are hydrogen peroxide, nitrogen tetroxide, nitric acid, hydrochloric acid, sulphuric acid, etc. Any gas may be used that sustains combustion, and it may be stored or contained in any suitable manner.

For bringing this system into operative condition a calculated amount of thermit may be used and ignited by any of the usual methods such as the electric spark or the percussion cap.

This invention further consists in powdered fuels, in gaseous and liquid combustion-supporting-gas-carriers in the arrangements for introducing the elements of combustion, in the regulation and disposal of the combustion products, in the types of combustion chambers or furnaces, in the means of bringing the system immediately to operating heat and condition, and in the application of these cycles to metallurgical, industrial, scientific and power purposes.

The fuels, the oxygen or other combustion-sustaining-gas-carriers and the cycles may be varied and combined in many ways without departing from the spirit of my invention; one form of which is illustrated in the accompanying drawing to assist in the better description of the process in which the figure is a diagram illustrating in longitudinal section an apparatus for generating heat to produce a motive fluid.

1 is a steam boiler having a steam space 2. The end 3 is shown as a removable drum fitted by means of the gland packing 4. Inside the boiler is the fire pot or combustion chamber 5 lined with refractory material 6. Inside the fire pot is a container 7 filled with thermit and made of any suitable combustible metal such as aluminum. Entering the container 7 is a percussion explosive arranged to be detonated by the firing pin 8. Entering the fire pot is a tube 9 which is surrounded by an annular space formed in the tube 10. A pipe 11 serves as a means for conveying the motive fluid to the prime mover.

Fuel such as pulverized aluminum-magnesium-alloy fuel is supplied from the container 12, a pump 13 serving to force it through the aluminum pipe 9 to the combustion chamber. 14 is a conveyor provided to feed the fuel toward the pump inlet. An aluminum container 15 contains nitric acid or other suitable comburent which is fed by a pump 16 through an aluminum tube 17 into the aluminum tube 10 and thence to the combustion chamber.

Water is fed to the boiler by a pump 18 through the pipe 19. This pump may be driven by the prime mover or otherwise,

and at any predetermined automatically controlled or manually varied speed.

Gaseous products of combustion are led from the combustion chamber through the pipe 20 where the heat is partially transferred to the water or steam in the boiler. Thence the gases are led to a gas chamber or feed water heater 21 where more heat is abstracted from the gases by the feed water. Thence the gases are conveyed through the pipes 22 to the fuel tank 12 and the nitric acid tank 15. The gases may be automatically vented at the valve 23. This valve may be set so that it maintains the same constant balanced pressure in the fuel and acid tanks as the steam in the boiler.

The pump 16 for the comburent and the pump 13 for the fuel may be so arranged that they pump a constantly proportioned amount and they may be operated by any suitable power. Their speed may be regulated automatically by the boiler pressure by the speed of the prime mover, it may be manually varied or it may be altered by any automatic means such as time clock or radio control device.

When the firing pin 8 detonates the percussion charge the thermit ignites and combusts, melting and burning the container 7. The heat generates steam in the chamber 2 which passes through the steam separator 11 and thence to the prime mover. The prime mover operates the pumps 16 and 13 which pump respectively nitric acid and pulverized metal fuel from the containers 15 and 12 into the hot combustion chamber, where they instantly combust and thereby continue the generation of steam and hence power.

What I claim is:

1. The method of producing heat away from atmospheric air for power purposes which consists in initially heating a combustion chamber to a degree sufficient to dissociate a liquid comburent, then feeding from separate sources a liquid comburent and a fuel at a predetermined rate to sustain a continuous combustion.

2. The method of producing heat away from atmospheric air for power purposes which consists in initially heating a combustion chamber to a degree sufficient to dissociate hydrogen peroxide, then feeding from separate sources hydrogen peroxide and metal fuel in the proportions of five gram molecules of hydrogen peroxide with two gram molecules of magnesium and two gram molecules of aluminum, $5H_2O_2 + (2Mg + 2Al)$ to sustain a continuous combustion.

3. The method of producing heat for power purposes which consists in initially igniting a charge sufficient to raise the temperature of a combustion chamber to a point sufficient to dissociate a liquid com-

burent, then feeding a regulated quantity of liquid comburent from one source and a regulated quantity of metallic fuel from another source to said combustion chamber to sustain a continuous combustion. ing introduced simultaneously from separate sources into a previously heated combustion chamber and in such proportions that the products of combustion are water vapor metal oxide and small amounts of non-condensable gas. 10

4. The method of producing heat away from atmospheric air in which hydrogen peroxide is dissociated and used to support the combustion of metal, both elements be-

In witness whereof, I have hereunto signed my name. 15

JOHN HUGH O'NEILL.