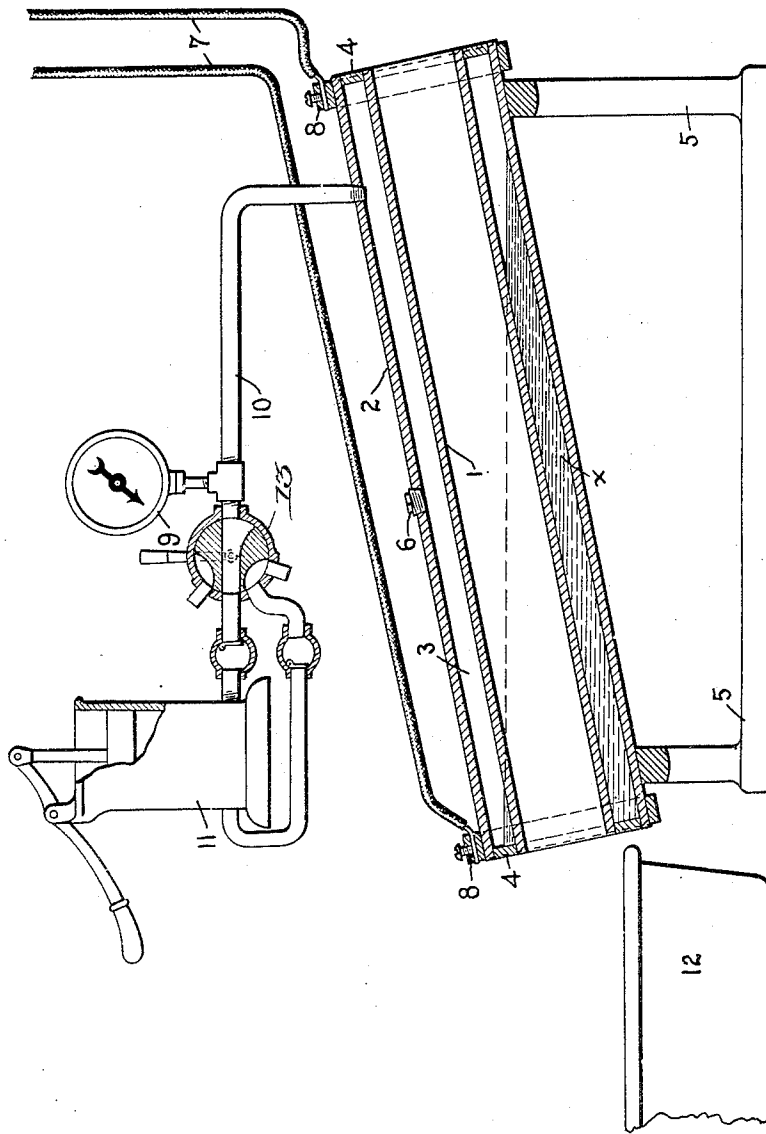


W. R. WHITNEY.  
 MEANS FOR PROVIDING CONSTANT AND KNOWN HIGH TEMPERATURES.  
 APPLICATION FILED AUG. 7, 1907.

1,064,037.

Patented June 10, 1913.



WITNESSES:

*Irving Easters.*  
*J. Ellis Allen*

INVENTOR

WILLIS R. WHITNEY,  
 BY *Wm. H. Davis*  
 ATT'Y.

# UNITED STATES PATENT OFFICE.

WILLIS R. WHITNEY, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MEANS FOR PROVIDING CONSTANT AND KNOWN HIGH TEMPERATURES.

1,064,037.

Specification of Letters Patent.

Patented June 10, 1913.

Application filed August 7, 1907. Serial No. 387,499.

*To all whom it may concern:*

Be it known that I, WILLIS R. WHITNEY, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Means for Providing Constant and Known High Temperatures, of which the following is a specification.

This invention relates to devices for tempering and annealing or drawing steel articles, such as files, drills and the like.

It is well known that the successful hardening and annealing of steel both depend very greatly upon the exact control of the temperature. This temperature may vary from 200 degrees C. to 1000 or more degrees C., but with any given grade of steel, the most perfect product is obtained when the temperatures of hardening, quenching or annealing are carefully selected, and are kept constant for that particular kind of steel.

The object of my invention is to provide an oven or heating furnace in which any desired temperature can be obtained, and maintained constant for any length of time. With this end in view, I avail myself of the fact that the boiling point of a fusible substance varies with the atmospheric pressure to which it is subjected, and is always the same for any given pressure. Moreover, when a substance passes from the gaseous to the liquid condition by condensation, its temperature remains stationary at the boiling point, corresponding to the vapor pressure. In order to obtain a given temperature, I select a substance which boils at that temperature, heat it in a confined space until it boils, and conduct the distilling vapor to a condenser, from which it is returned to the bath of boiling material. The gas pressure in the condenser is maintained at a constant value, and this determines the boiling point of the bath. By varying the pressure, this boiling point, and the corresponding temperature of the condensing vapor, can be varied over quite a wide range; but will be constant for any given pressure.

The accompanying drawing illustrates diagrammatically a furnace or oven which I have devised for producing constant and known high temperature.

In its simpler form the oven comprises an iron tube 1, surrounded by a metallic

jacket, 2, of larger diameter, the space 3 between them being closed at the ends by rings 4. The jacketed tube is supported on a suitable frame 5, preferably in an inclined position, as shown.

A filling orifice closed by a screw plug 6, enables one to introduce into the chamber 3 a quantity of the material to be fused, such for instance as cadmium or chlorid of zinc. The oven can be heated in any suitable manner. If the fused material is not a good conductor of electricity, the heating can be effected by an electric current passed through the tube 1, and jacket 2, the terminals of the conductor 7 being connected to clamps 8 at the ends of the oven. The fused material *x* collects at the lower end of the chamber, while its vapor rises toward the upper end thereof, where it condenses and runs back.

The pressure of the vapor in the chamber is indicated by a gage 9 connected with the chamber by a pipe 10. A pump 11 is also connected to said pipe, so that the vapor tension can be varied at will, by turning the valve 13 to the proper position above or below atmospheric pressure to alter the boiling point of the substances in the chamber, and consequently the temperature of the oven. Air, being a fixed gas, will maintain the boiling point constant. Cadmium at atmospheric pressure gives a temperature of about 770 degrees C.

The articles to be heated either for tempering or annealing are fed into the receptacle. If a tube is used, its inclined position facilitates the passage of the articles through. If desired, two or more ovens can be arranged in series to give different heating effects. A quenching bath 12, may be arranged to receive the articles as they emerge from the oven.

By means of this apparatus, I am able to heat to any predetermined temperature all articles to be heated, and to maintain this heat at a constant value without fluctuation.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. A heating device, consisting of the combination of a closed chamber, a vaporizable substance therein, means for heating said substance, and a pump for establishing at any desired value the gaseous pressure in said chamber and thereby fixing at will the vaporizing point of said substance.

2. The combination of a closed chamber surrounding an open heating space and containing a vaporizable substance, means for heating said substance and mechanically  
5 actuated means for establishing the gaseous pressure in said chamber at a substantially constant value corresponding to the boiling point desired for said substance.
3. In a tempering furnace, a closed double  
10 walled jacket surrounding an open space, a fusible solid partially filling said jacket, means for heating said solid to the boiling point, and a pump for varying at will the gaseous pressure in said jacket above or be-  
15 low atmospheric pressure.
4. An oven for heating articles of steel and the like, consisting of an inclined iron tube, an iron jacket surrounding it, a fusible substance in the closed chamber between  
20 said tube and jacket, means for heating said oven to the boiling point of said substance, and a pump for varying the vapor tension in said chamber.
5. The process which consists in supplying enough heat to a vaporizable material  
25 to boil the same, exhausting or compressing a fixed gas in contact with said material in an inclosed space to a desired constant value to fix the boiling point, condensing the dis-  
30 tilled vapor as fast as it is formed, and subjecting an accessible zone to heat radiation from said substance, to maintain a constant predetermined temperature in said zone.

In witness whereof, I have hereunto set my hand this 3rd day of August, 1907.

WILLIS R. WHITNEY.

Witnesses:

BENJAMIN B. HULL,  
HELEN ORFORD.