F. J. NICE.

FURNACE FOR HEATING METAL.

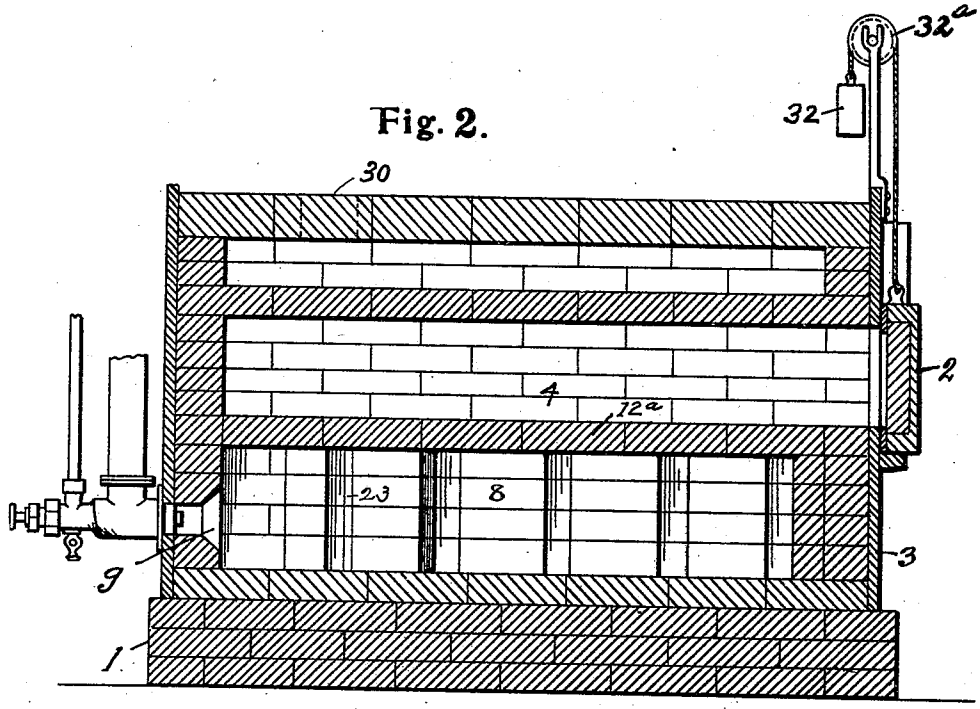
APPLICATION FILED FEB. 14, 1910.

988,019.

Patented Mar. 28, 1911.

2 SHEETS—SHEET 1.

Fig. 2.



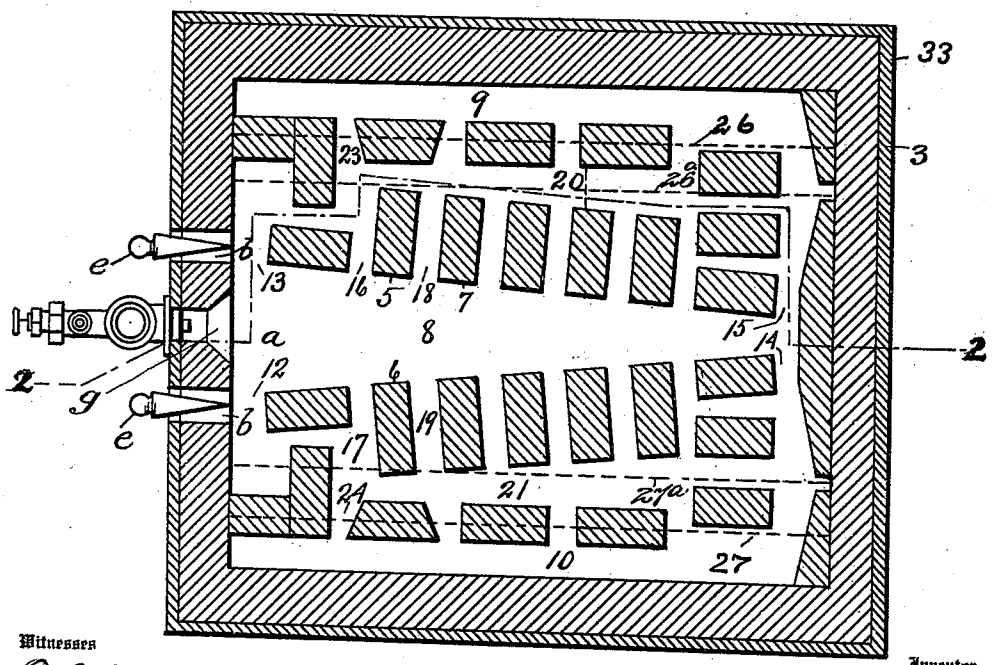




Fig. 1.

Witnesses

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2 SHEETS—SHEET 2.

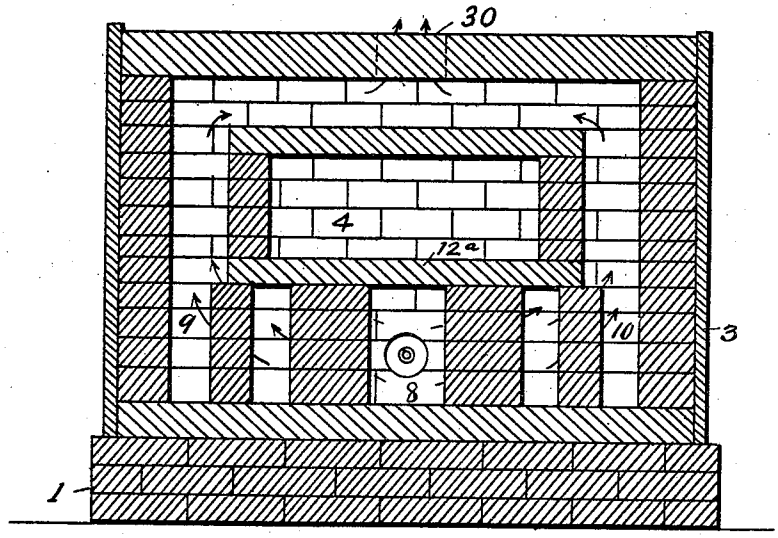


Fig. 3.

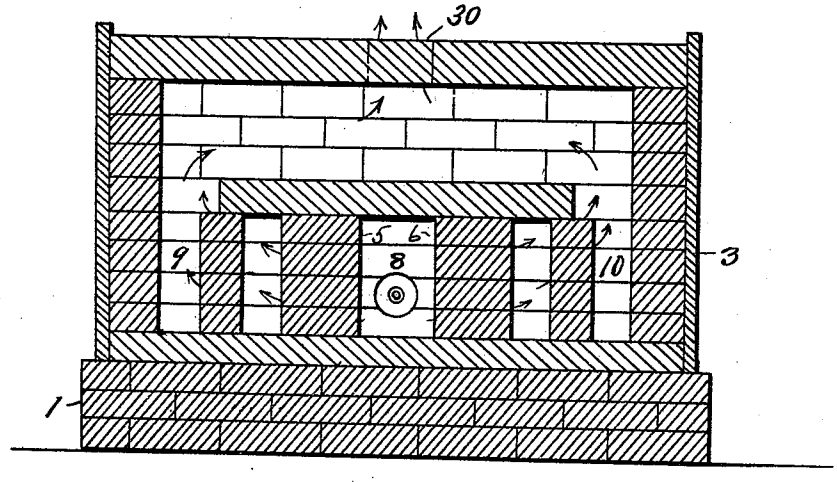


Fig. 4.

Witnesses

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# UNITED STATES PATENT OFFICE.

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## FURNACE FOR HEATING METAL.

988,019. Specification of Letters Patent. Patented Mar. 28, 1911.

Application filed February 14, 1910. Serial No. 543,367.

*To all whom it may concern.*

Be it known that I, FREDRICH J. NICE, a citizen of the United States, residing at Pontiac, county of Oakland, State of Michigan, have invented a certain new and useful Improvement in Furnaces for Heating Metal, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to furnaces.

It has for its object an improved furnace adapted for maintaining a regular uniform and constant heat for long periods of time, a heat so constant that it can be controlled within a range limited to almost a single degree of Fahrenheit, for any length of time, limited only to the durability of the furnace.

In a furnace constructed in accordance with the invention material may be heated as desired. For example, in a furnace heated to the tempering heat of steel, steel prepared for springs may be heated to the desired amount, withdrawn and plunged into the tempering bath, and subsequently heated in a second furnace heated to the proper annealing point, and if the steel itself is homogeneous and without flaw, the resulting tempered masses of steel will be almost absolutely uniform, uniform to such an extent that in several months' use I have had not a single piece that failed under the usual tests given to determine the quality of the result.

With a furnace constructed according to this invention I have been able to maintain a temperature in the tempering furnace of 1560 degrees F. (the proper temperature for tempering vanadium steel) all day and I could maintain it for many days at a time.

In the drawings:—Figure 1, is a horizontal cross section through the fire chamber of a furnace on the line 2—2, Fig. 1. Fig. 2, is a vertical section through the fire chamber and heating chamber. Fig. 3, is a vertical section through the fire chamber and an annealing chamber. Fig. 4, is an elevation, largely in section, of a type of furnace from which the muffle portion of the heating chamber is omitted.

The furnace consists of a base 1, that is without function except that it raises the furnace oven to its proper height for convenient use, bringing the door 2 breast high to the workman. Upon the base, which is built of suitable material, preferably brick work, is a fire chamber or combustion chamber 3, and above the combustion chamber is a heating chamber 4. This heating chamber is an interior chamber inclosed within an outer chamber for annealing purposes, but is itself the main chamber when the furnace is constructed to employ higher degrees of heat, as for tempering purposes. The combustion chamber is divided into passages by posts of very high heat resisting material, such as fire brick or fire clay. These posts, 5, 6 and 7 are spaced to provide numerous passageways, and the posts are so located and shaped that passageways are not continuous from the middle chamber 8 of the side passages 9 and 10, but the posts are so arranged that short passages leading directly out from the middle chamber 8 are baffled or partially baffled by other posts that are erected to produce such devious passageways. As shown in the drawing the chamber 8 is comparatively wide at the point *a* and where the fuel begins to burn. From the mouth, between 12 and 13, of the chamber 8, the chamber narrows to a comparatively narrow exit 14 and 15 at the rear end of this chamber. At intervals along the chamber 8 are effluent passages 16, 17, 18 and 19 which lead toward side passages 9 and 10. Within a short distance these effluent passages empty into longitudinal passages or chambers 20 and 21, which extend lengthwise or substantially parallel with the main chamber 8, and from these chambers 20 and 21 are other effluent passages 23, 24, etc. which connect the chambers 20 and 21 with the chambers or passages 9 and 10, the various side passages resulting as a whole in producing tortuous passage ways which connect the main combustion chamber 8 with side chambers or passages 9 and 10; these passages 9 and 10 rise above the floor $12^a$ of the heating chamber and form communicating passages between the lower or fire chamber and the upper or heating chamber. The boundaries of the floor $12^a$ are indicated in Fig. 1 by dotted lines $26^a$ and $27^a$, and the outer boundaries of the side walls of the annealing chamber of Fig. 3 are indicated by dotted lines 26 and 27 shown in Fig. 1.

The dotted cross lines of Fig. 1 indicate

the junction of the slabs which form the floor of the upper chamber. Through the cover or roof 29 of the furnace are a few vent holes 30 for the escape of gases produced by combustion, but no other flue is required, as under proper treatment the escaping gases are only those gases produced by perfect combustion; occasionally at the starting of a fire before the furnace has become thoroughly heated, there may be some small carbonaceous or smoky emanations, or if the admission of fuel and air is not properly regulated there may be smoky emanations, or even flame emanations through these vent holes, but with proper treatment the flame does not rise out of the combustion chamber in the lower compartment, and the heating chamber above the combustion chamber will be maintained at the regular appropriate temperature with no visible flame within the chamber.

The fuel, which is preferably a fluid fuel, either liquid or gaseous, is admitted into the chamber and burned at the fire inlet opening *g*. Preferably in close proximity to the opening through which the fuel enters is a small adjustable opening *b* for the admission of a secondary supply of air or oxygen to produce the perfect combustion of the fuel that is desired. The opening for the secondary supply of air is controlled usually by partially stopping it with a wedge shaped brick *e* that varies the size of the opening, as may be desired. A door 2 which is preferably a cast iron frame lined with fire resisting material is arranged at one end of the heating chamber, and this is generally and preferably counterbalanced and uncovers the opening by rising, and is, of course, provided with a suitable counterweight and balanced lever, all of which counterweight 32 and its attached cord and the sheave $32^a$ over which the cord runs are external to the chambers of the furnace. The walls of the furnace are preferably bound together by iron bands or an iron shell 33 which surrounds the brick which forms the main part of the furnace, and serves to hold the brick in place.

What I claim is:—

1. In a furnace for heating metal, in combination with a casing provided with suitable openings for the introduction of fuel and air, a plurality of vertical posts arranged to produce a central passage and a plurality of side passages substantially parallel to said central passage, and cross passages uniting the central passage and the side passages, the said central passage tapering from one end to the other, substantially as described.

2. In a furnace for heating metal, in combination with a chamber adapted to receive the metal to be heated and provided with suitable openings for the introduction of said metal thereinto, a combustion chamber separated from said heating chamber, divided by vertical posts into a central longitudinal passage and a plurality of longitudinal passages at each side of the said central passage, cross passages connecting the several passages, the dividing posts being arranged to obstruct the continuous direct travel of flame from the central passage to the extreme side passage, the said central passage narrowing from the end where the fuel is introduced thereinto to its opposite end, substantially as described.

3. In a furnace for heating metal, in combination with a chamber to be heated a combustion chamber located in proximity thereto and communicating therewith, said combustion chamber being divided by vertical posts into a central passage into one end of which fuel is delivered and a plurality of side passages at each side of said central passage extending in parallel relation thereto, and cross passages leading between the central longitudinal passage and the first of said side passages and other cross passages leading from the first of said side passages to the second side passage, the posts between the second and third of said passages being arranged to obstruct the direct travel from the central passage to the extreme side passage, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

FREDRICH J. NICE.

Witnesses:

CHARLES F. BURTON,

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