





# UNITED STATES PATENT OFFICE.

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## GAS-FURNACE.

SPECIFICATION forming part of Letters Patent No. 733,274, dated July 7, 1903.

Application filed October 11, 1902. Serial No. 126,865. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD P. REICHHELM, a citizen of the United States, residing at Bayonne, in the county of Hudson and State of New Jersey, have invented an Improvement in Gas-Furnaces, of which the following is a specification.

My invention relates to a gas blast-furnace especially adapted for annealing metal in the form of strips, bars, tubes, and articles of manufacture and in which furnace said articles are heated to the desired extent and are annealed by a gradual cooling in the presence of the gaseous products of combustion of the furnace apart from the presence of atmospheric air, with the object of preserving the character and finish of the surface of the metal, so that discoloration or oxidation is prevented.

I provide a furnace which preferably comprises a metal shell with a fire-brick lining. The furnace is made with entrance and exit apertures and a hollow jacketed structure, forming a continuation thereof. There is a valve adjacent to the junction of the jacketed structure and the furnace proper and a tubular extension to the jacketed structure, which forms a regulatable exit for the products of combustion. The furnace is so made that the jacketed structure can be temporarily closed off to retain therein the heated products of combustion with the metal forms to be annealed, or the products of combustion may be allowed to escape or be quickly drawn off. The annealing is effected by a predetermined ratio of cooling by water or air at the desired temperature or by a refrigerating mixture, the fluids flowing through the jacket of the structure.

In the drawings, Figure 1 is a vertical longitudinal section representing my improvement. Fig. 2 is a plan and partial horizontal section.

The furnace proper preferably comprises a metal shell *a* and fire-brick lining *b*, having an entrance-aperture *c* and an exit-aperture *d*, gas blast-burners *e*, and a slab *f*, extending across through the interior of the furnace from the entrance to the exit apertures. The slab forms a way for the passage of metal

articles as the same are heated. This structure is suitably supported, and the gas blast-burners may be regulated in any desired manner. The slab *f*, while extending between the entrance-aperture *c* and exit-aperture *d*, does not in width extend entirely across the interior of the furnace, there being apertures 2 3 at either side for the heated products of combustion from the gas blast-burners below the slab to pass into the chamber above the slab.

The trunk *g*, preferably of metal and of predetermined area and length, is connected to the furnace proper and forms a continuation of the exit-aperture *d* and is suitably supported. This trunk is preferably made with a valve *h*, which may be employed to close off the trunk and extend across the same adjacent to the exit-aperture *d* of the furnace, and at the other end of the trunk there is a removable head 4 to facilitate the removal of the annealed articles from the trunk. Surrounding the trunk *g* is a jacket *i*, provided with an inlet-pipe 5 and an exit-pipe 6. At the end of the trunk *g* adjacent to the removable head 4 is a rising tubular extension *k*. The termination of this extension may be in either one of two forms—that is, as an ejector *l*, shown in full lines, or with a valve 7, as shown in dotted lines. A circulation of water or air at the desired temperature or of a refrigerating mixture may be maintained through the jacket *i* and around the trunk *g*, flowing in at the pipe 5 and out at the pipe 6 for the purpose of maintaining the trunk *g* at a predetermined temperature or cooling the same from a given temperature to a predetermined temperature for reducing the temperature of articles that may be passed into the trunk *g* to be annealed.

In the operation of the furnace the strips, bars, tubes, and articles of manufacture to be annealed are passed into the furnace at the entrance-aperture *c* and upon the slab *f* are brought to the desired degree of heat. This may vary and probably will vary with different metals to be treated. When the metal forms have reached the desired degree of heat, which is probably indicated by the color of the metal, they are advanced from



the slab *f* into the trunk *g*. The heated products of combustion in the operation of the furnace pass from the chamber of the furnace proper through the trunk *g* and away by the tubular extension *k*. Consequently no atmospheric air as such is present in the furnace proper or in the trunk *g*. After each batch of metal forms has been sufficiently heated and passed into the trunk *g* the gas blast-burners *e* may be either reduced or turned off. While the heated forms of metal are in the trunk *g* the valve *h* may be closed and said heated products of combustion retained in the trunk to insure the exclusion of atmospheric air from the trunk during the cooling and annealing of the metal forms. This is effected by the temperature of the water, air, or freezing mixture around the trunk and in the jacket, and the ratio of cooling may be perfectly regulated by the temperature of said fluids passing through the said jacket, and the period of cooling may be short or prolonged, as desired and as found advantageous, according to the character of the metal under treatment and the result desired to be obtained.

The valve *7* where employed assists in holding the heated products of combustion in the trunk *g* or permitting the same when opened to slowly escape and be replaced by the air, or the ejector *l* may be employed to rapidly force out the products of combustion and permit their place to be taken by the atmospheric air.

The precise operation herein set forth is to be effected by an apparatus capable of bringing the metal forms to the desired temperature and thereafter reducing the temperature for the annealing of said metal forms in the presence of the products of combustion with atmospheric air excluded, but not necessarily in an apparatus of the form shown and described herein, as the same may be changed or its details appreciably modified without departing from the spirit of the invention.

I claim as my invention—

1. In a gas blast or other furnace, the combination with a chamber for heating forms of metal having supports therefor, and means for supplying the heat, of a structure forming a continuation of the furnace proper adapted to receive the heated forms of metal and through which the products of combustion pass, means connected therewith for regulating and controlling the presence of the heated products of combustion therein and excluding atmospheric air, and means for cooling and so annealing the heated forms of metal.

2. The combination with a furnace for heating forms of metal having entrance and exit apertures, of a structure forming a continuation of the furnace at the exit-aperture and receiving the heated products of combustion and adapted to receive articles previously heated in the furnace and from which the atmospheric air is excluded by the presence of

the heated products of combustion, means for closing off said structure from the furnace and retaining therein the heated products of combustion simultaneously with the forms of metal, and means for cooling the contents of said structure as desired.

3. The combination with a furnace for heating forms of metal having entrance and exit apertures, of a structure forming a continuation of the furnace at the exit-aperture and receiving the heated products of combustion, and adapted to receive articles previously heated in the furnace and from which the atmospheric air is excluded by the presence of the heated products of combustion, means for closing off said structure from the furnace and retaining therein the heated products of combustion simultaneously with the forms of metal, means for cooling the contents of said structure as desired, and means for removing the forms of metal from said structure and other means for quickly exhausting therefrom the products of combustion.

4. The combination with a furnace for heating forms of metal having entrance and exit apertures, of a structure forming a continuation of the furnace at the exit-aperture and receiving the heated products of combustion and adapted to receive articles previously heated in the furnace and from which the atmospheric air is excluded by the presence of the heated products of combustion, a valve in said structure adjacent to the exit-aperture of the furnace for closing off one end of said structure, means for closing off the other end of said structure, means adjacent to the said end of said structure for removing the annealed forms of metal, a jacket surrounding said structure, and entrance and exit pipes to said jacket, substantially as set forth.

5. The combination with a furnace for heating forms of metal having entrance and exit apertures, of a trunk preferably of metal hollow and of predetermined length connected at one end to said furnace and forming a continuation thereof at the exit-aperture, a removable portion at the distant and free end of said trunk, a valve or equivalent structure in said trunk adjacent to said furnace for closing off said trunk at one end, a tubular extension from the opposite end of said trunk, and a device connected therewith for regulating the discharge of the products of combustion in said trunk, a jacket surrounding the major portion of said trunk, inlet and exit pipes connected with said jacket for introducing therein and removing therefrom a cooling fluid.

6. A furnace comprising a metal shell, a fire-brick lining within which is a chamber for heated products of combustion, entrance and exit apertures at opposite sides, gas blast-burners entering said furnace, a slab extending across within the furnace connecting the entrance and exit apertures and between the sides of which and the inner surfaces of the fire-brick lining there are apertures for the



passage of the heated products of combustion, and a structure forming a continuation of the furnace at the exit-aperture and adapted to receive the heated products of combustion  
5 and the heated forms of metal to be annealed, devices for retaining, regulating and discharging the heated products of combustion from said structure and other devices for cooling the structure and the contents thereof, substantially as set forth. 10  
Signed by me this 9th day of October, 1902.  
EDWARD P. REICHHELM.  
Witnesses:  
GEO. T. PINCKNEY,  
S. T. HAVILAND.