

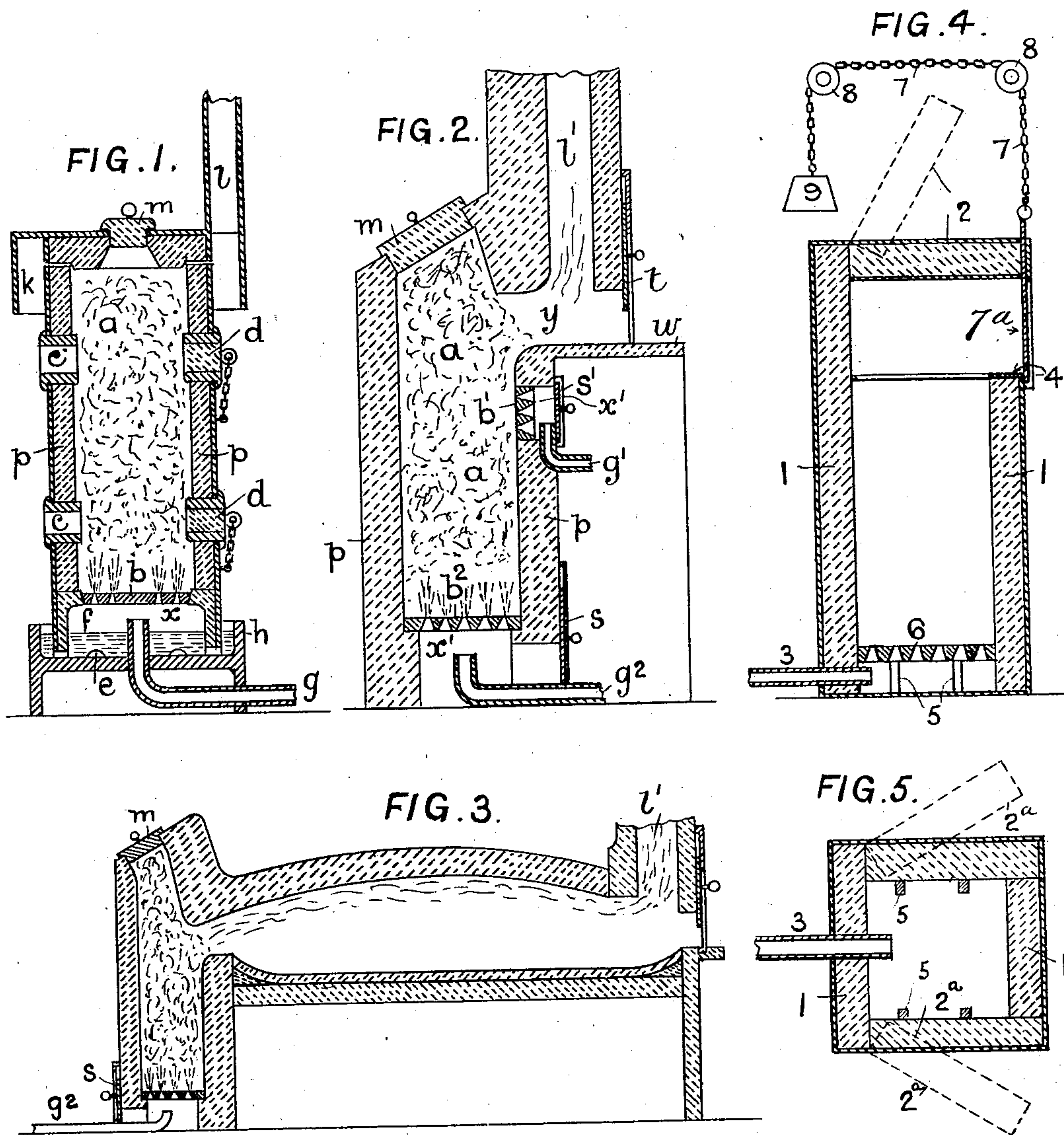
No. 705,312.

Patented July 22, 1902.

J. ARMSTRONG.  
FURNACE OR FORGE.

(Application filed May 28, 1901.)

(No Model.)



Witnesses

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# UNITED STATES PATENT OFFICE.

JOHN ARMSTRONG, OF LONDON, ENGLAND.

## FURNACE OR FORGE.

SPECIFICATION forming part of Letters Patent No. 705,312, dated July 22, 1902.

Application filed May 28, 1901. Serial No. 62,271. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ARMSTRONG, engineer, a subject of the King of Great Britain, residing in the city of London, England, (whose full postal address is 46 Lombard street, London, aforesaid,) have invented certain new and useful Improvements in or Relating to Furnaces or Forges, (for which application for patent has been made in England, where provisional protection has been obtained under No. 1,910, dated January 28, 1901,) of which the following is a specification.

This invention has for its object a heating-furnace so arranged that metals of all kinds, more especially iron and steel, but also brass, copper, tin, lead, antimony, and the like can be heated, softened, annealed, or otherwise manipulated while hot, and, in case of iron, even welded without oxidation. When an easily-oxidizable metal is placed in an ordinary fire, furnace, or forge for the purpose of heating, melting, or softening the metal, the latter is very liable to be oxidized or burned by the action of the fire and sometimes may be completely destroyed. By the present invention such metals can be safely kept at a red heat for a considerable length of time without suffering any apparent injury or oxidation, and I have even brought iron up to a welding heat by this means without any appreciable scale being formed thereon.

The invention is based upon the fact that when carbon is burned on a grate it is converted into carbon dioxid, and if this gas be passed through a further layer of incandescent carbon it takes up a further quantity of carbon and becomes carbon monoxid. Carbon dioxid and the oxygen which almost always invariably accompanies it have a very deleterious and oxidizing effect upon these metals when heated, but carbon monoxid is practically inert, and iron and other like metals can be kept in it at a red heat for a long period without sensible damage. For the purpose of manipulating iron or steel, as in the manufacture or reheating or welding of rivets, bolts or horseshoes, or the like, I construct a furnace or forge in the following manner: It is preferably made with a fire-brick lining and bound with iron bands and bolts on the outside.

Referring to the drawings, Figure 1 shows a vertical section of an iron-bound furnace with a closed grate and a forced draft; Fig. 2, a

similar view of a furnace with open grate and ordinary draft caused by a chimney; Fig. 3, a small diagrammatic section of Fig. 2, formed into a reverberatory furnace; Fig. 4, a vertical section of furnace as used for a smith's forge; Fig. 5, a sectional plan view of same.

Like characters relate to like parts in the various drawings, though in some instances when slightly modified one or more dashes are placed against the character.

*a* is the chamber where the carbonaceous fuel is placed. It is constructed so that the air for the purposes of combustion is completely under control.

*b* or *b'* are grates or plates full of holes.

*c c*, Fig. 1, are exits for gases or openings into the furnace. *d d* are plugs covering these openings when they are not required.

*e*, Fig. 1, is a shallow-tank foundation for the furnace filled with water, so as to form a lute, there being openings in the downwardly-projecting wall of the furnace to allow the water to freely pass; *f*, Fig. 1, a chamber inclosed by the water-lute, and *g* a pipe bringing compressed air from any convenient source into the chamber *f*.

*h* represents the walls of the tray *e*, kept sufficiently high to insure a satisfactory water-lute; *k*, Fig. 1, a cap surrounding the furnace of any required size attached to chimney *l* to carry off the vapors; *l'*, Fig. 2, a chimney or passage to carry off the carbonic oxid from the furnace, and *w* a hearth below bathed by the effluent gases, so that it can be utilized for heating metallic articles.

*g' g'*, Fig. 2, are pipes, also bringing compressed air to the grate.

The place *x'* under grate *b* can be closed, if desired, by the damper *s*, in which case forced draft can be used, as in Fig. 1. Similarly the space *x'* above can be closed in like manner by the damper *s'*. When these dampers are closed and a considerable draft is used, articles placed at *y* will not be oxidized even when the door *t* is opened, as the products of combustion, being at a greater pressure than the atmosphere, burn out at chamber *t*, and thus keep the articles in a constant deoxidizing atmosphere.

With regard to the remaining characters, *m* is a lid closing an opening for supplying the furnace with fuel.

*p p* are walls of the furnace.



The furnace or forge for heating rivets or pieces of iron or steel, as set forth in Fig. 1, is made with fire-brick bound with iron on the outside, as shown. The rivets are placed in or through the apertures *c c*. The rods can be placed right through the furnace, in which case the plugs *d* are removed. The damper *t* can have a spy-hole in it closed with mica or otherwise for inspecting the interior. It will be found that when iron has attained a welding heat it scintillates, thus warning the operator that it is time to withdraw it from the furnace.

One advantage of this furnace is that the iron being heated can be seen from the outside, and it need not be pushed under the coal or fuel, as in the case of ordinary rivet-heating or ordinary smiths' forges. When it is required to heat up to a bright red or yellow heat only, then the carbonic acid formed in the region immediately above or against the grate or grates is carried through a sufficient quantity of carbon or fuel heated to incandescence to change the carbonic acid into carbon monoxid. For this purpose a very gentle blast—say from half to two inches—of water is sufficient, as with this the region *y* in Fig. 2 and the opening *c c* in Fig. 1 are always kept filled with an atmosphere of carbon-monoxid gas. As the products of combustion in this furnace are carbon monoxid, they can be carried off to any convenient position and be utilized for burning, and the whole furnace can be used as a gas-generator pure and simple when required.

I have only described two forms of furnace; but it is obvious that the furnace can be of any shape, and the space *y* can be extended out, if necessary, so as to form the hearth of a reverberatory furnace, as depicted in diagrammatic form in Fig. 3. It can also be adapted as an ordinary smith's hearth or forge, as shown in Figs. 4 and 5. In these, 1 represents the walls of the furnace, and 2 2<sup>a</sup> parts hinged so that they can be thrown out, as set forth in dotted lines. 3 is the ordinary twyer under the grate 6. For many purposes it is convenient to hinge the top 2 of the hearth-chamber, as indicated in dotted lines in Fig. 4, and the two side cheeks 2<sup>a</sup> of the same chamber, as indicated in dotted lines in Fig. 5. In order to enable the two side cheeks to easily slide out, I arrange an iron plate 4, as shown, forming the sill of the hearth and the top of the fixed parts of the sides of the furnace. The top and the sides above the plate 4 can be made to open even to the extent of falling back to an angle of one hundred and eighty degrees, so as to manipulate various-shaped articles. The grate can also be made to be supported on lugs 5. The front above the hearth or plate 4 can be closed with a door or damper when not in use. A damper 7<sup>a</sup> for this purpose is shown in Fig. 4, suspended by chain 7 over pulleys 8 and counterweighted by a weight 9. One or two

doors can be used, however, in place of this damper, which forms no part of my invention.

I declare that what I claim is—

1. The apparatus for heating metallic objects, consisting of a deep fire-box having a grate; a closed chamber below the grate; a device for passing a blast of air into said chamber below said grate; working or heating hearths very considerably above the grate having openings thereto just big enough to comfortably admit the articles to be heated; and means for supplying fuel to the fuel-chamber without admitting air to the working chamber, whereby a deep layer of fuel can be used and there is always a pressure above that of the atmosphere in the furnace and thus the products of combustion pass out through the working holes when they are opened, instead of allowing air to enter thereat.

2. The combination of a deep combustion-chamber for fuel, a grate below same, means below the grate for supplying a strong draft through the grate, but at no other point, exit-passages from the combustion-chamber from the upper portion thereof into which articles to be heated can be inserted, means for dampering or plugging these passages, and means for supplying fuel to the fuel-chamber without admitting air to the working chamber, substantially as described, whereby a current of reducing-gas containing no free oxygen passes around the article to be heated.

3. The combination in a reheating-furnace, of a grate, a closed chamber below the grate, a device for supplying air under pressure into this closed chamber, with no escape therefrom but up through the fuel; a working chamber in the upper part; openings for admitting articles to be reheated and for drawing off the fumes at such openings; and means for supplying fuel to the fuel-chamber without admitting air to the working chamber and for maintaining a great depth of fuel above the grate, substantially as described, whereby a current of reducing-gas containing no free oxygen passes around the articles to be heated.

4. The combination with a portable reheating-furnace of downwardly-projecting flanges all around the furnace, and a tray with deep sides below and surrounding said flanges, the said flanges having parts cut away near the bottom for water to pass, and a blast-tube passing through said tray, whereby a water seal can be produced, and a blast admitted between the water and the grate, and thus the grate is kept cool and the complete furnace can be lifted out of the water seal when ashes are to be cleaned out.

In witness whereof I have hereunto signed my name, this 17th day of May, 1901, in the presence of two subscribing witnesses.

JOHN ARMSTRONG.

Witnesses:

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ALBERT C. B. HENRI.