H. NETTGENS.

ART OF CEMENTATION AND HARDENING OF METALLIC OBJECTS.

APPLICATION FILED MAR. 3, 1917.

1,247,863.

Patented Nov. 27, 1917.

2 SHEETS—SHEET 1.

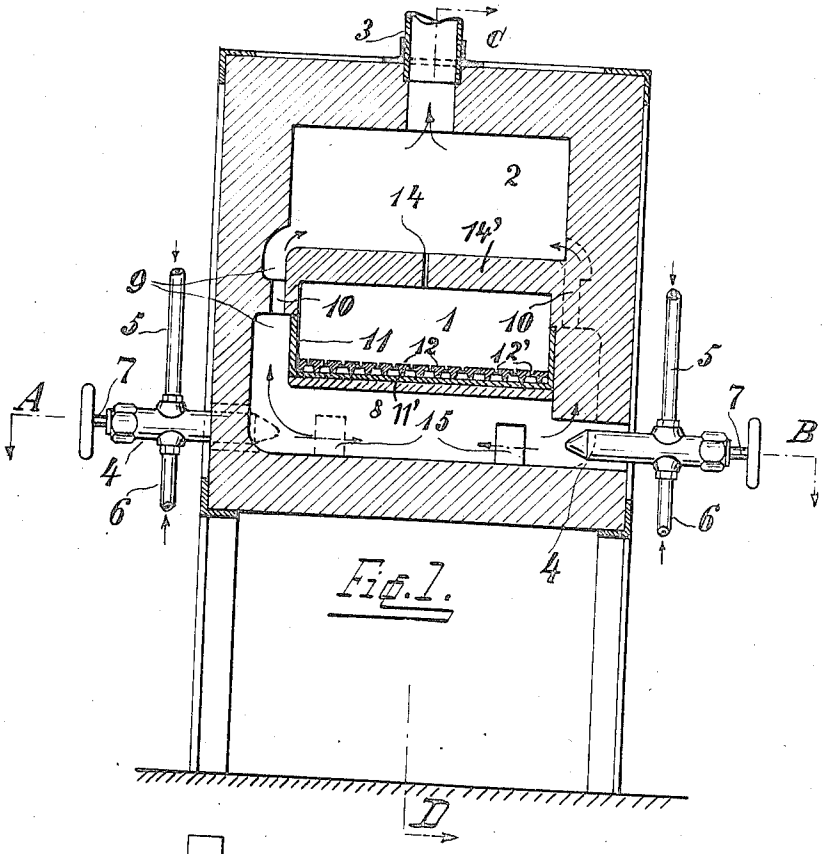


Fig. 1.

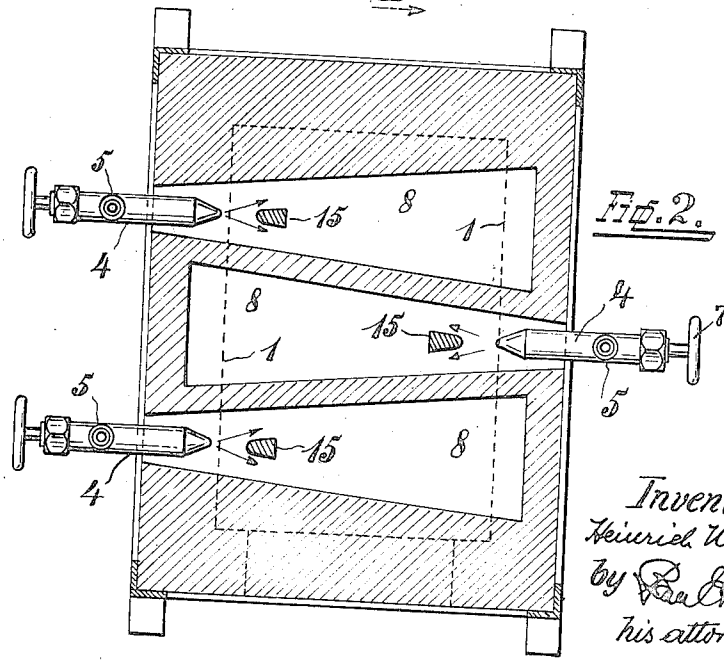


Fig. 2.

Inventor:
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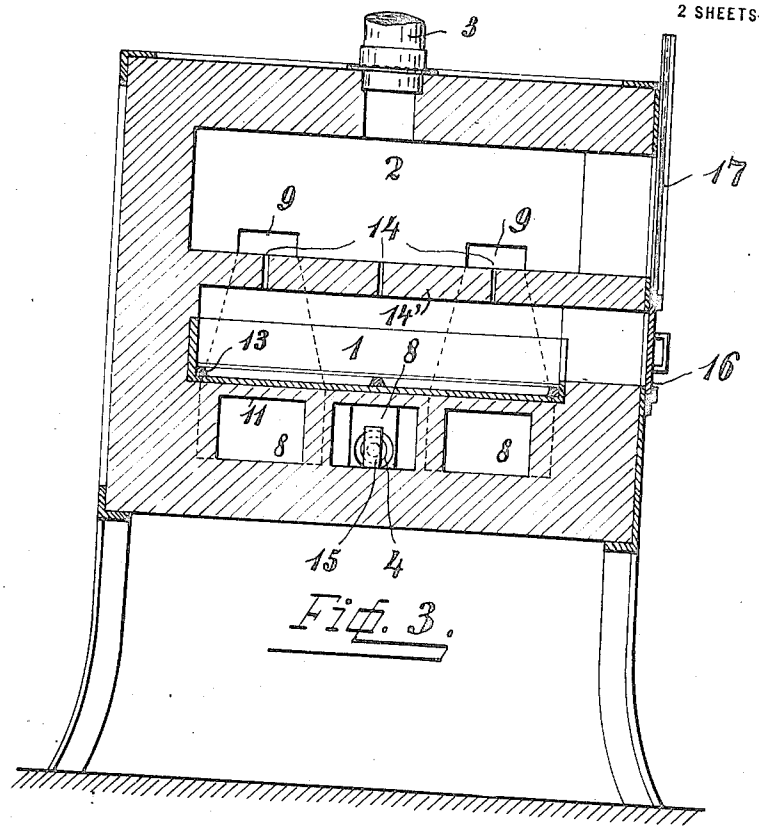


Fig. 3.

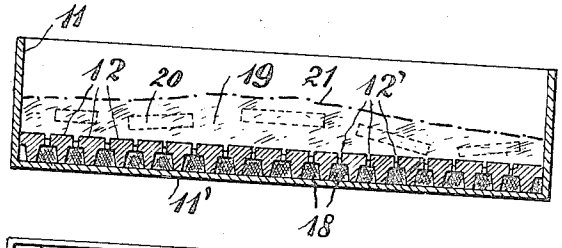


Fig. 4.

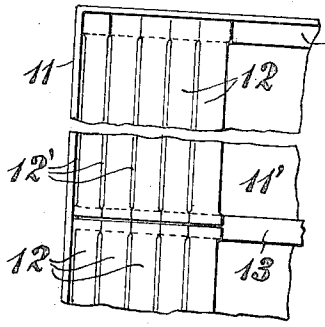


Fig. 5.

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UNITED STATES PATENT OFFICE.

HEINRICH NETTGENS, OF HERRLIBERG, SWITZERLAND.

ART OF CEMENTATION AND HARDENING OF METALLIC OBJECTS.

1,247,863. Specification of Letters Patent. Patented Nov. 27, 1917.

Application filed March 3, 1917. Serial No. 152,314.

To all whom it may concern:

Be it known that I, HEINRICH NETTGENS, a citizen of the Swiss Confederation, and residing at Herrliberg, Switzerland, have invented certain new and useful Improvements in the Art of Cementation and Hardening of Metallic Objects, of which the following is a specification.

The present invention relates to a novel and improved process for cementing and tempering metal objects and to an oven for carrying out this process.

According to this process a layer of substances, which at the required operative temperatures fuse and vaporize, such as for instance common salt, potassium nitrate, barium carbonate, ammoniacal salt, lead and the like, is introduced into the hardening chamber of the oven, and above this layer, but separated therefrom in suitable manner, for instance by a grate, is placed the charge or cement layer of bones, leather, carbon and the like, in which the objects to be treated are embedded. The cement bed is then preferably covered over by a top layer containing iron and silica.

The oven for carrying out this process shows a box surrounded by the heat passages and provided with a grate above its bottom, the relatively limited space below the grate serving to receive the layer of fusible and vaporizable substances, and the grate itself supporting the cement bed containing the articles to be carburized.

In order to make my invention more readily understood, I will now describe it in detail with reference to the accompanying drawings, in which Figure 1 represents a vertical section through an oven well adapted for carrying out my new process; Fig. 2 shows a horizontal section therethrough, on line A—B of Fig. 1, looking downwardly; Fig. 3 represents a vertical section through the oven on line C—D of Fig. 1, looking toward the right; Fig. 4 shows a vertical section through the charge case, and Fig. 5 shows a fragmental plan view thereof.

The oven is constructed in well known manner of refractory material, preferably chamotte brick, and essentially comprises the burner chambers 8, the hardening chamber 1, and the pre-heating chamber 2, vented by chimney 3. Any suitable heating medium may be employed, but I prefer to use crude oil, which is conducted to the spraying nozzles 4 through the feed pipes 5, and into which is forced pressure air through the pipes 6. The several pipes 5 and 6 are provided with the usual controlling devices, not specially shown here, and each spray-nozzle is controlled by a needle valve 7, as well known in the art. Deflectors 15 are arranged in the path of the fuel jet.

The fuel nozzles operate in oppositely disposed, gradually widening chambers 8, two nozzles being arranged for example on one side of the oven, and one between these two on the opposite side. The burner chambers 8 communicate with the pre-heating chamber 2 by the ascending flues or passages 9, which open into the chamber 2 just above its bottom level. The working chamber 1 thus is exposed all around to the action of the heating gases. The heat passages 9 gradually lessen in diameter toward the top and are further provided with an intermediate restricted neck portion 10, which causes a damming-up of the heat gases below the chamber 1.

Into the hardening chamber 1 is horizontally built-in a lidless case or tray 11 which supports on its bottom 11′ a grate made up of a plurality of adjacently disposed parallel bars 12, which rest loosely on cross-members 13 and form between one another narrow interspaces 12′, as shown in Figs. 4 and 5.

The horizontal partition wall 14′ between the chambers 1 and 2 is provided with vapor vents 14, and the two chambers are closable respectively by doors 16 and 17.

For the cementation of iron and steel objects the operation of the oven is the following:—The oven is preheated by partly opening the fuel nozzles. Upon the grate is then placed a layer of substances such as above indicated, which will readily melt under the pre-heat and then flow downwardly through

the grate interspaces 12′ onto the case bottom where they form a heat-storing layer 18 (Fig. 4). Next a layer 19 of carbonaceous and nitrogenous substances, such as bone, leather scraps, carbon and the like, is placed on the grate, into which then the articles 20 to be treated are embedded. Finally, a thin cover layer 21 containing iron and silicate is superimposed upon the cement bed, which cover layer may, for instance, consist of a mixture of iron filings, glass in powder form, and sand.

The doors 16 and 17 are now closed and the fuel atomizers are fully opened. The heating gases pass through the passages 8, 9 and 10 into the chamber 2 and finally out through the vent 3. In their course, especially by their being dammed-up, as described, the gases heat the tempering chamber to such an extent that the lowermost layer below the grate is brought up to a temperature of, say, 1100° celsius, while above the grate the temperature registers only between 800–900° celsius. Above the grate, thus, nothing but the silicates will melt. The substances below the grate generate vapors which will partly drive out the air and with it the oxygen, and partly absorb it, depending upon the choice of the substances used, so that oxidation of the articles under treatment is prevented. The bone and leather carbonize and the thus freed nitrogen facilitates the penetration of the carbon molecules. The vapors passing up between the grate bars favorably influence the tempering process and tend to keep the carbon loosened-up. The glass and the sand cake with the iron filings and together form an elastic covering, below which no oxygen remains, so that decarburization cannot take place.

The mass below the grate serves as heat accumulator and distributer and imparts as such an even heat to all parts of the grate.

After the first charge has thus been cemented, it is readily exchanged for a fresh one, which has preferably been pre-heated in the chamber 2. The entire operation requires considerably less time and fuel than heretofore; for instance, heating-up the chamber 1 for 3 hours at a temperature of between 800 and 900° celsius shows on the articles under treatment a hardened layer or skin of 1–1½ millimeter in thickness, which in prior methods and ovens was obtained only after 10 and more hours, under otherwise equal conditions.

For the reason that the treated articles are in immediate contact with the carbon and the vapors, while they do not come in contact with the substances below the grate, they remain clean; they suffer no deformation by contraction or warping during the cementation process, and the cemented articles can readily be hammered without scaling-off.

The described process can also be used for hardening iron, as substitute for hardening by means of a special tempering powder. For this purpose the articles to be tempered are embedded in the cement mass on the grate and are left therein for a less extended period of time than for cementation purposes. And also in this case in relatively shorter time a favorable result, that is a thicker hardened skin, is obtained, than can be obtained by the use of a hardening powder or other means, such as lead, salt baths and the like.

Neither the cement nor the articles embedded therein come into direct contact with the heating medium. The lower layer could also be poured-in in pre-liquefied state. Obviously, also any other suitable heating medium may be used in place of the liquid fuel here described.

Over the now used cementing processes with their hermetically sealed cases, the present process has the advantage that any article may be removed by itself at any time during the full operation of the oven, since no undesirable oxidation by air-oxygen can occur. The other articles, on the soft yielding cover layer being broken through, remain absolutely undisturbed and wholly covered, and the extracted article at once becomes covered by vapor deposit with an extremely thin oxidation-preventing protective cover.

The oven is well adapted for continuous operation.

What I claim is:—

1. The described cementing and hardening process, which consists in introducing into the hardening chamber of the oven a layer of substances adapted to fuse and vaporize at the operative temperatures, and arranging above this said layer, but not in direct contact therewith, the cementing layer which is to receive the articles to be treated.

2. The described cementing and hardening process, which consists in introducing into the hardening chamber a layer of substances adapted to fuse and vaporize at the operative temperatures, arranging above this said layer the cementing layer which is to receive the articles to be treated, and contactingly superimpose upon said cementing layer a cover layer containing iron and silicate.

3. In an oven for cementing and hardening, including a housing and heating means therefor, a case arranged within said housing and adapted to receive a layer of substances fusible and vaporizable at the operative temperatures and the cementing bed containing the articles to be treated, and

means in said case for preventing the said fusible and vaporizable layer from coming into direct contact with said cementing bed.

4. In an oven for cementing and hardening, including a housing and heating means therefor, a case arranged within said housing and adapted to receive a layer of fusible and vaporizable substances and the cementing bed for the articles to be treated, and means in said case for preventing said fusible and vaporizable layer from coming into direct contact with said cementing bed consisting of a perforated grate in the bottom of said case.

HEINRICH NETTGENS.