

Oct. 22, 1935.

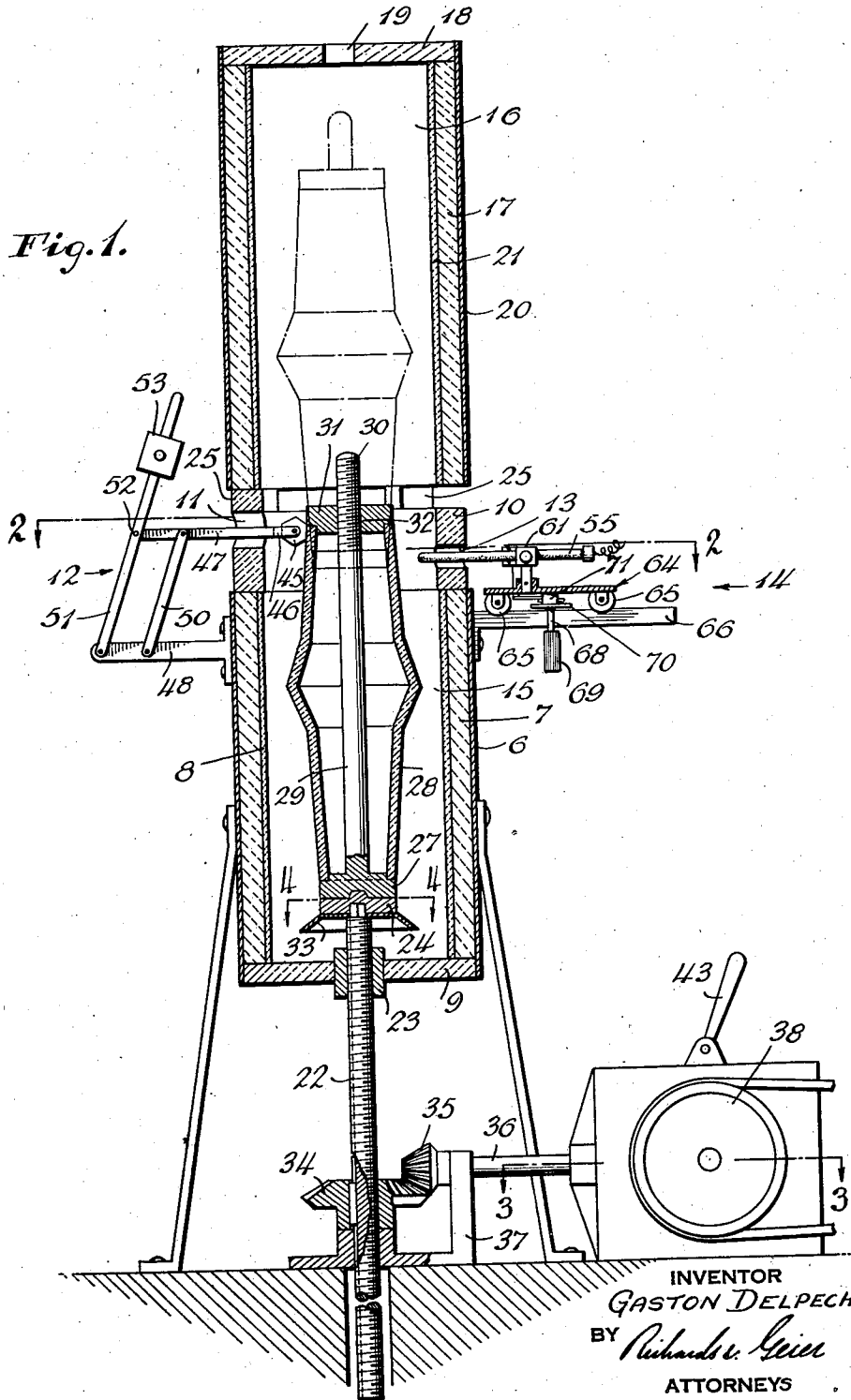
G. DELPECH

2,018,056

METHOD AND MEANS FOR FINISHING SILICEOUS ARTICLES

Filed July 6, 1933

2 Sheets-Sheet 1



Oct. 22, 1935.

G. DELPECH

2,018,056

METHOD AND MEANS FOR FINISHING SILICEOUS ARTICLES

Filed July 6, 1933

2 Sheets-Sheet 2

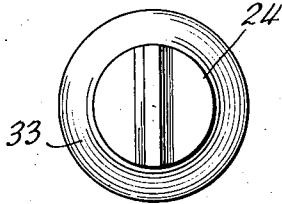
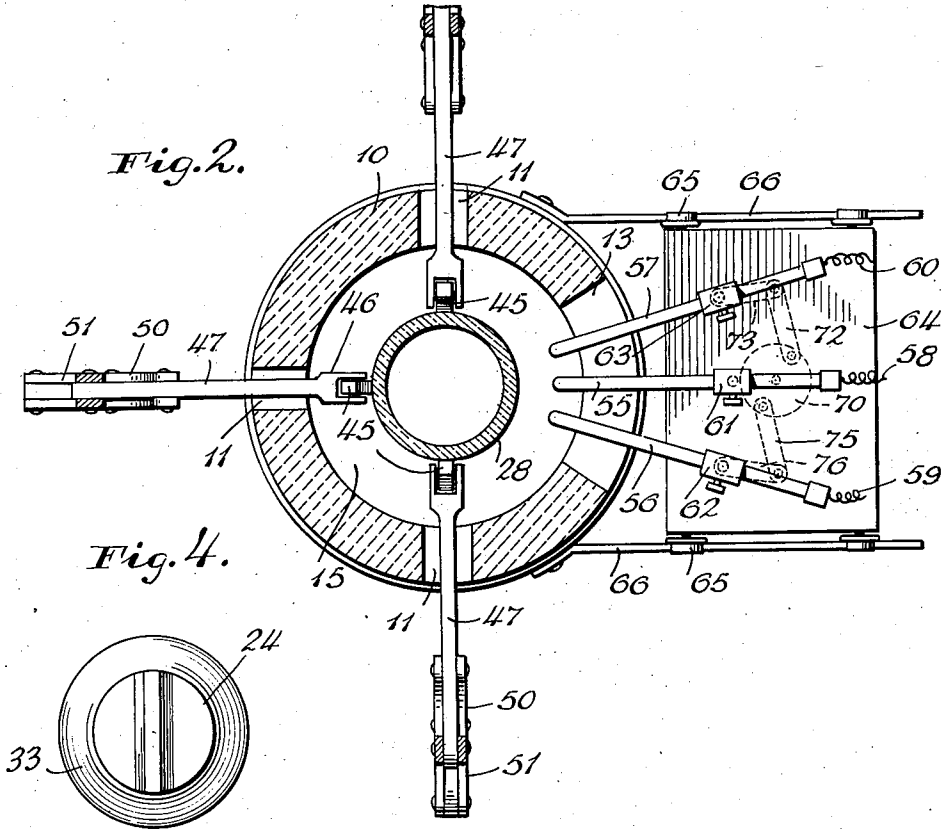
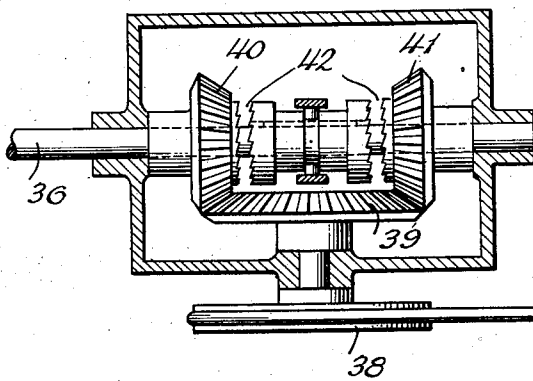


Fig. 3.



INVENTOR
GASTON DELPECH
BY *Richard W. Keiser*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,018,056

METHOD AND MEANS FOR FINISHING
SILICEOUS ARTICLES

Gaston Delpech, Clamart, France, assignor to
Societe Anonyme des Manufactures des Glaces
& Produits Chimiques de Saint-Gobain, Chau-
ny & Cirey, Paris, France

Application July 8, 1933, Serial No. 679,207
In France July 9, 1932

10 Claims. (Cl. 49—1)

This invention relates to a method and means of finishing siliceous articles and relates more particularly to a method and means of treating surfaces consisting of quartz or similar materials.

An object of this invention is to provide a simple and effective method of finishing hot articles immediately after they have been removed from the furnace.

Another object is the provision of means for removing the upper rough surfaces of a siliceous article in such a way as to prevent the formation of cracks in the underlying surfaces.

The above and other objects of this invention may be realized by a method of finishing siliceous articles, which comprises grinding or scraping the exterior surfaces of such articles, heating the treated surfaces in order to glaze them, and then reheating the articles. The articles are ground while they are still hot immediately after their removal from the furnace. The temperature of the exterior surfaces of these articles should be as high as possible and in any event should not fall below the so-called "transformation point" of cristobalite, which occurs at a temperature between 200° and 300°. The exterior layers of the articles, which have rough and irregularly shaped surfaces, are completely removed in the course of this treatment. Due to the prevailing high temperature no cracks can be formed in the underlying layers, which consist of cristobalite. The ground surfaces are then heated to a high temperature, i. e. to about 1700°, with the result that cristobalite is transformed into molten silica and that the upper layers become fused, so that glazed-like surfaces are produced. The glazed articles are then reheated to a temperature of at least 1000° C. Particles of silica, which in the course of first heating have been evaporated and then condensed on the surfaces of the articles, are removed during the second heating. This double heat treatment tends to eliminate to a very large extent the inner strains developed within the articles in the course of their manufacture.

Suitable means for carrying out the above-described process, consist in a grinding device and a heating device adapted to be applied in rapid succession to the surfaces of a siliceous article. The article is preferably carried by a movable support surrounded by a shell which supports the grinding and heating means operated from a convenient position outside of the shell.

In some instances, when the thickness of the

articles is sufficient, the surfaces may be ground in the open, although the double heat treatment should be carried out while the article is covered by a shell.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing showing by way of example an embodiment of the inventive idea.

In the drawing:

Figure 1 is a vertical section through a device constructed in accordance with the principles of the present invention.

Figure 2 is a section along the lines 2—2 of Figure 1 on a larger scale.

Figure 3 is a section along the line 3—3 of Figure 1 on a larger scale.

Figure 4 is a section along the line 4—4 of Figure 1 on a larger scale.

The device illustrated in the drawings comprises a metal shell 6, surrounding a hollow cylinder 7 made of a heat-insulating material. The inner surfaces of the cylinder 7 are covered by a refractory coating 8. A plate 9 is firmly connected with the cylinder 7 and forms the bottom closure of said cylinder. A ring 10, made of a refractory material, is situated on top of the cylinder 7 and is provided with a number of openings 11 used for the passage of members forming a part of the grinding means 12. The ring 10 is also provided with an opening 13, through which the heating device 14 passes into the interior of the ring 10. The hollow cylinder 7 and the ring 10 form a chamber 15. Another chamber 16 is situated above the chamber 15, and is formed by the walls of a cylinder 17 made of a heat-insulating material and firmly connected with a cover-plate 18 provided with a central bore 19. The exterior side surfaces of the cylinder 17 are covered by a metallic shell 20, while the inner surfaces of the cylinder 17 are coated by a refractory lining 21. The cylinder 17 is carried by a number of pieces 25, which are placed on top of the ring 10 at certain predetermined distances from each other so as to allow a free circulation of air through the chambers 15 and 16 and a rapid removal of silica vapors produced in the course of the glazing process.

A threaded movable rod 22 passes through a nut 23, which is rigidly connected with the plate 9. The upper end of the vertical rod 22 projects into the chamber 15 and carries a plate 24, which is rotatable along with the rod 22. A support 27, used for carrying an article 28, is placed on top of the plate 24 and is rotated along with this

plate. A rod 29 is rigidly connected with the support 27 and is provided with an upper threaded portion 30. The plate 31, provided with an inner threaded bore 32, is carried by the threaded portion 30 of the rod 29 and is adjustable along this threaded portion. Due to this arrangement, the article 28 may be securely clamped between the plate 27 and the plate 31.

A conical screen 33 carried by the threaded rod 22, is used for protecting the nut 23 and the upper portion of the rod 22 from sand and other particles, which may drop on the bottom of the chamber 15, while the article 28 is being treated.

The threaded rod 22 carries a bevel gear 34, which is rotatable along with the rod 22. The gear 34 meshes with another gear 35 rigidly connected with a shaft 36 supported by a bracket 37. A pulley 38, which is driven by any suitable means, not shown in the drawings, is rigidly connected with a bevel gear 39, shown in Figure 3. In the position shown in Figure 3, two bevel gears 40 and 41, which mesh with the bevel gear 39, are loosely carried by the shaft 36. A coupling 42, which may be operated by a handle 43, shown in Figure 1, is used for operatively connecting the shaft 36 with either the bevel gear 40 or the bevel gear 41. Due to this arrangement, the direction of rotation of the rod 22 may be conveniently and quickly reversed.

The grinding means 12, illustrated in Figures 1 and 2 of the drawings, comprise three separate devices, each one of which projects through a separate opening 11, formed in the ring 10. The three devices are preferably situated at different distances from the bottom of the chamber 15.

Since all the three devices 12 are substantially alike, only one of them will be described hereinafter.

The grinding device 12 comprises a grinding stone 45, which consists of quartz or silicon carbide and which is pivotally mounted on the forked end 46 of a lever 47. This end 46 is situated within the chamber 15. A support 48 is carried by the shell 6 and the cylinder 7. The two ends of a link 50 are pivotally connected with the lever 47 and the support 48, respectively. One of the ends of a lever 51 is also pivoted in the support 48 and carries a pivot 52 passing through the outer end of the lever 47. The upper end of the lever 51 carries a weight 53, which is used for pressing the grinding stone 45 against the exterior surfaces of the article 28.

The heating device 14 comprises three electrodes 55, 56 and 57 (Figure 2), which are connected by wires 58, 59 and 60 to a source of electrical energy, not shown in the drawings. The electrodes 55, 56 and 57 are situated somewhat lower than the grinding devices 12 and project into the chamber 15 through the opening 13 formed in the ring 10. The electrode 55 is carried by a suitable socket 61, while the electrodes 56 and 57 are carried by sockets 62 and 63, respectively. The socket 61 carrying the central electrode 55 is rigidly connected with the carriage 64, supported by wheels 65. The carriage 64 is movable along rails 66, which are carried by the shell 6 and the cylinder 7. A pin 68 provided with a handgrip 69 passes through a plate 70, which is rotatable along with the pin 68. A member 71 attached to the lower surface of the carriage 64, is used for carrying the pin 68. One of the ends of a link 72 is pivotally connected with the plate 70, while the other end of the link 72 is pivotally connected with another link 73. The opposite end of the link 73 is rigidly connected with the

socket 63, which carries the electrode 57. Another link 75 is also pivotally connected with the plate 70 and a link 76. The link 76 is rigidly connected with the socket 62 of the electrode 56. The handgrip 69, which is used for moving the carriage 64, along the rails 66, may also be used for rotating the plate 70. Due to the provision of the links 72, 73, 75 and 76 a rotation of the plate 70 causes the projecting ends of the electrodes 55 and 57 to approach or to recede from the immovable central electrode 56. Due to this arrangement the flame of the electrical arc between these electrodes may be adjusted at will.

The device is operated as follows:

The driving means, not shown in the drawings, are switched on and rotate the pulley 38. Then the lever 43 is manipulated to couple the shaft 36 with either the gear 40 or the gear 41 (Figure 3), depending on the direction of rotation of the pulley 38. The rotation of the shaft 36 is transmitted through the gears 35 and 34 to the threaded rod 22. The rod 22 passing through the nut 23 is caused to move upward, until the plate 24 reaches a level which is only somewhat lower than that of the grindstones 45. Then the lever 43 is switched off and the hollow article 28 is placed on top of the plate 27. The plate 31 is moved along the rod 29 until it comes in contact with the upper edges of the article 28 and is pressed against the article, which is then held tightly between the plates 27 and 31. The cylinder 17 is then placed over the article 28 and on top of the supporting pieces 25 carried by the ring 10. The article 28 then occupies the position shown in broken lines in Figure 1 of the drawings. Then the lever 43 is switched in the opposite direction with the result that the rotation of the shaft 36 is reversed, so that the threaded rod 22 begins to move downward. Each part of the exterior surfaces of the article 28 moves downward along a helical line, and in the course of this movement, the exterior surfaces come in contact first with the three grinding devices 12. Immediately afterwards they are heated by the flame of the electric arc formed between the electrodes 55, 56 and 57. Due to this arrangement, the exterior surfaces of the article 28 are first ground and immediately afterwards glazed. This grinding and glazing process begins at the bottom of the article and gradually proceeds to the top thereof until the entire article is treated. The article moves slowly downward from the position shown in broken lines in Figure 1, to the position shown in full lines in that figure. At that time the lever 43 is switched to the neutral position, so that the rotation of the rod 22 is stopped. Then the operator swings the levers 51 in a direction away from the article 28 thus withdrawing the grindstones 45 from contact with the exterior surfaces of the article 28. Then the lever 43 is switched on again so that the threaded rod 22 begins to ascend. The speed of the pulley 38 is increased with the result that the rod 22 and the article 28 carried by it move quite quickly from the position shown in full lines in Figure 1 to the position shown in broken lines in the same figure and beyond the last-named position. In the course of this rapid movement, the flame which is produced by the arc, formed by the electrodes 55, 56 and 57 removes all parts of the silica adhering to the glazed surfaces. The current passing through the electrodes 55, 56 and 57 should be adjusted in such a way that the article is heated to a temperature of at least 1000° C. This cleansing and

reheating process, which forms the last step of the described method, begins at the top of the article 28 and includes all the surfaces of the article to the bottom thereof. In the course of the ascending movement, the article 28 is moved beyond the position which is shown in broken lines in Figure 1. The rod 22 is stopped when the upper portion 30 of the rod 29 has passed through the opening 19 formed in the cover 18. Then the operator can grasp this end 30, remove the cylinder 17 together with the article 28 and the plates 31 and 27, and place them in a suitable cooling chamber. The cooled article has extremely well glazed and polished surfaces and is much more durable than articles produced by processes known in prior art.

What is claimed is:

1. A method of treating siliceous articles, comprising grinding the surfaces of a hot siliceous article, said surfaces being maintained at a temperature which is at least equal to the transformation point of cristobalite, heating the ground surfaces while they are maintained at said temperature to glaze the same, and then reheating the article.

2. A method of treating siliceous articles, comprising grinding the surfaces of a hot siliceous article, said surfaces having a temperature which is at least equal to the transformation point of cristobalite, simultaneously heating the ground surfaces while other surfaces are being ground, and then reheating the article to a temperature which is at least equal to 1000° C.

3. Means for treating siliceous articles, comprising a support adapted to carry an article, means connected with said support for reciprocating and rotating said support along with said article, a shell surrounding said support, heating means supported by said shell and adapted to be applied to the surfaces of said article, means situated outside of said shell for adjusting said heating means, and grinding means adapted to be applied to the surface of said article.

4. Means for treating siliceous articles, comprising a support adapted to carry an article, means connected with said support for reciprocating and rotating said support along with said article, means surrounding said support and comprising a lower fixed shell, an upper removable shell, and means carried by the lower shell and supporting the upper shell; heating means supported by the lower shell and adapted to be applied to the surfaces of said article, means situated outside of said shell for adjusting said heating means, grinding means supported by the lower shell and adapted to be applied to the surfaces of said article, and means situated outside of said shell for adjusting said grinding means.

5. Means for treating siliceous articles, comprising a support adapted to carry an article, means connected with said support for reciprocating and rotating said support along with said article, means surrounding said support and comprising a lower fixed shell, an upper removable shell, a ring carried by said lower shell, and a plurality of supporting pieces carried by said ring and carrying the upper shell, a support connected to the outer surface of the lower shell, a grindstone adapted to be applied to the exterior surfaces of said article, a plurality of interconnected levers connecting said grindstone with said support, rails connected to the outer surface of the lower shell, a carriage supported by said rails, electrodes supported by said carriage and adapted to heat the exterior surfaces of said article, and means supported by said carriage for adjusting the relative position of said electrodes.

6. A method of treating siliceous articles, comprising grinding the surfaces of a hot siliceous article, said article being maintained at a temperature which is higher than the transformation point of cristobalite, glazing the surfaces, and then uniformly reheating the article to a temperature of at least 1000° C.

7. A method of treating siliceous articles, comprising maintaining a hot siliceous article at a temperature which is higher than the transformation point of cristobalite, grinding the surfaces of said article during the first-mentioned step, then glazing these surfaces during the first-mentioned step by heating the same, and then reheating the article to a temperature of at least 1000° C.

8. A method of treating siliceous articles, comprising grinding the surfaces of a siliceous article while the temperature of said article is continuously maintained at a level which is higher than the transformation point of cristobalite, glazing the ground surfaces of said article, and uniformly reheating said article at a temperature of at least 1000° C.

9. A method of treating siliceous articles, comprising grinding the surfaces of a siliceous article while the temperature of said article is continuously maintained at a level which is higher than the transformation point of cristobalite, glazing the ground surfaces of said article, the temperature of said article being maintained at said level during the last-mentioned step, and uniformly reheating said article at a temperature of at least 1000° C.

10. A method of treating siliceous articles, comprising grinding the surfaces of a siliceous article while the temperature of said article is continuously maintained at a level which is higher than the transformation point of cristobalite, simultaneously glazing the ground surfaces while other surfaces are being ground, and uniformly reheating said article at a temperature of at least 1000° C.

GASTON DELPECH.