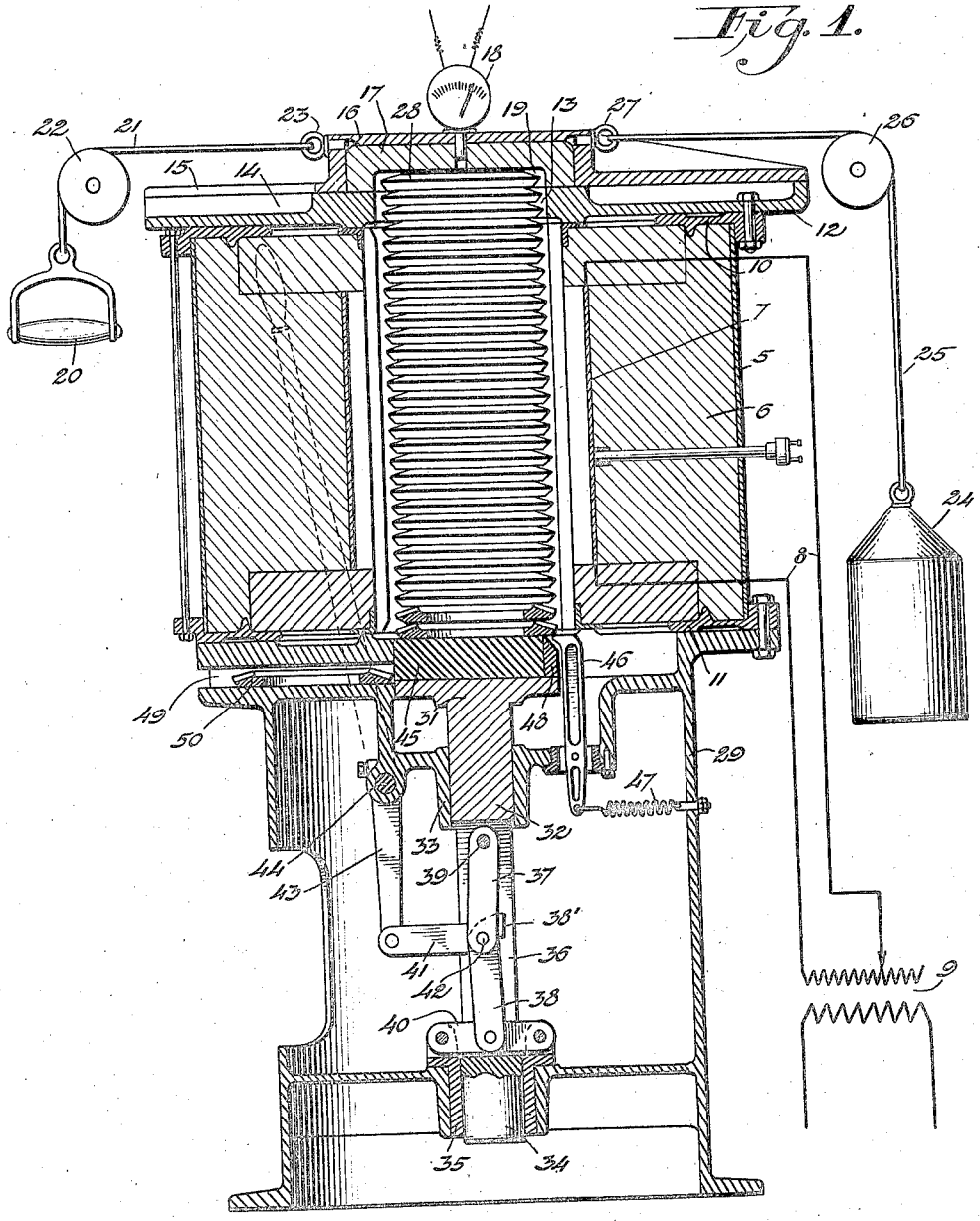
Aug. 18, 1925. 1,549,823

J. W. WHITE

HEATING FURNACE

Filed Dec. 1, 1920 2 Sheets-Sheet 1

Fig. 1.



Witness.

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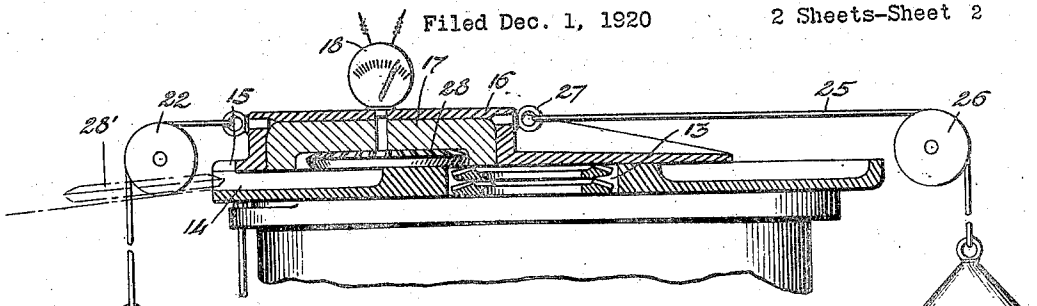


Fig. 2.

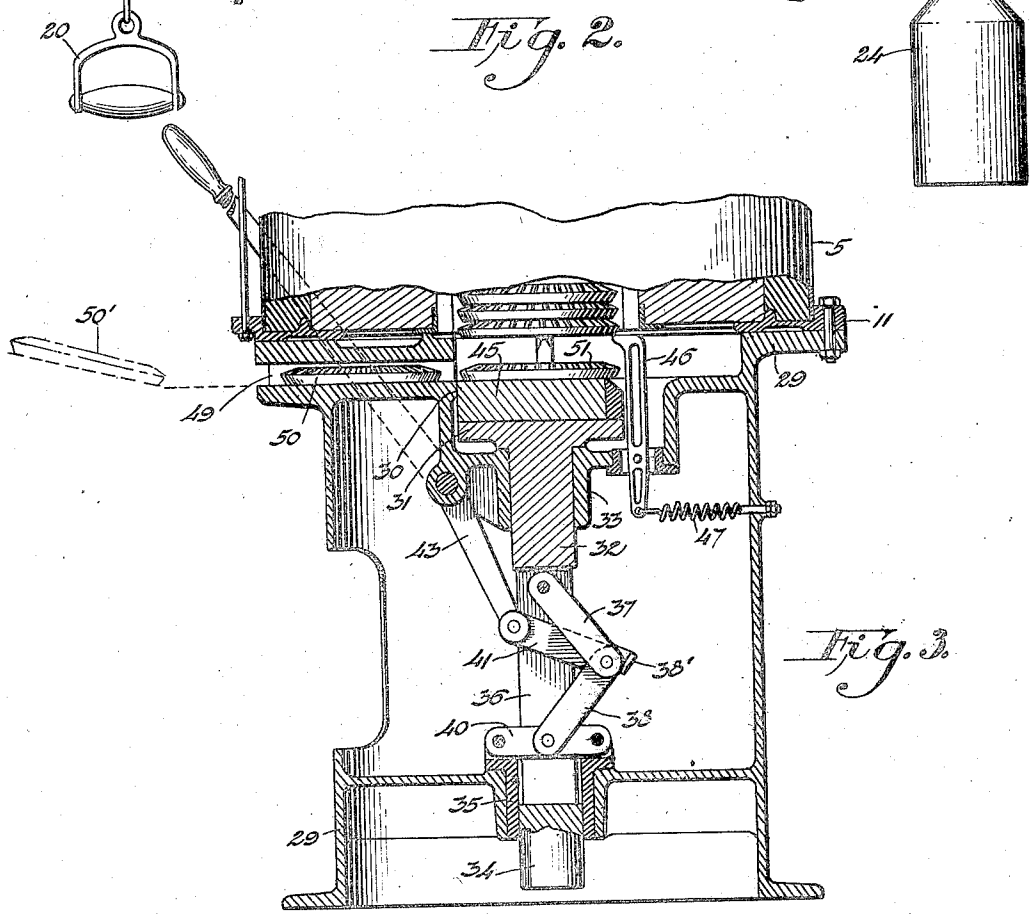


Fig. 3.

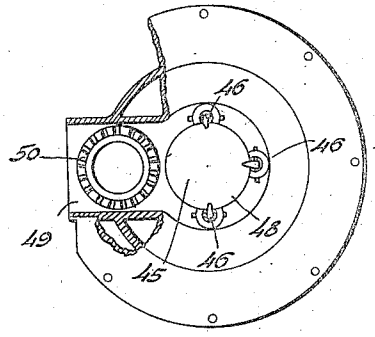


Fig. 4.

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Patented Aug. 18, 1925. 1,549,823

UNITED STATES PATENT OFFICE.

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HEATING FURNACE.

Application filed December 1, 1920. Serial No. 427,598.

To all whom it may concern:

Be it known that I, JOHN W. WHITE, a citizen of the United States, and a resident of Detroit, county of Wayne, and State of Michigan, have invented certain new and useful Improvements in Heating Furnaces, of which the following is a full, clear, concise, and exact description, such as will enable others skilled in the art to which the invention relates to make and use the same, reference being made therein to the accompanying drawings, which form a part of this specification.

The invention relates to a furnace adapted for heating articles in general and designed particularly for heating articles which may be superposed in a stack or pile such as gears or similarly shaped objects, also to a means for conveying articles through a treating chamber, such as an electric furnace or the like.

The invention has for one of its objects the provision of a new and improved furnace, heated by electrical means, and adapted to heat articles uniformly to the desired temperature with the minimum of manipulation and loss of heat.

A further object is to provide a treating chamber such as a heating furnace in which the articles to be treated are supported in a stack or pile to which the articles are supplied at one end and from which the treated articles are removed at the other end.

With the above and other objects in view as will appear more fully from the following description the invention consists in the features of novelty herein described, together with such variations thereof as fall within the scope of the appended claims.

In the accompanying drawings illustrating one embodiment of my invention:

Figure 1 is a vertical sectional view of an electric furnace.

Figures 2 and 3 are vertical sectional views respectively of the upper and lower portions of the furnace shown in Figure 1, but with the movable parts in different positions, and

Figure 4 is a plan view of the base of the furnace.

On the drawings 5 indicates a furnace shell within which is a suitable body of heat insulating material 6. On the interior of the body is arranged electrical heating means 7 which may be of any usual or desired construction and may be supplied with heating current from any convenient source, as by the conductors 8 leading from a transformer 9.

The body of the furnace is retained between end plates 10, 11, the former of which supports a top plate 12 while the latter rests upon and is secured to a base 29. The top plate 12 is provided with a central aperture 13 which will be preferably of the same shape in horizontal cross-section as the articles which are to be treated. A depression 14 is formed in the top plate at one side of the central aperture which depression is adapted to receive below the upper surface of the top plate one of the articles under treatment. The top plate is also provided with guideways, one of which is shown at 15, in which slides a cover 16. The cover will be preferably lined with a body of suitable refractory material 17 and may be provided with a temperature indicating device as 18 adapted to show the temperature of the interior of the furnace. The body 17 is formed with a recess 19 corresponding in size to the over-all dimensions of one of the articles to be treated.

A handle 20 attached to one end of a flexible connection 21 passing over a guide pulley 22 and secured at 23 to the cover 16 provides a means for moving the cover forwardly on the top plate. When the handle is released the cover may be returned to its original position as by the weight 24 and flexible connection 25 passing over pulley 26 and secured to the cover at 27.

It will be understood from the foregoing description that the top of the chamber within the furnace walls will be tightly closed by the cover 16 which is designed to fit closely to the surface of the top plate 12. When the furnace chamber has been fully charged, as with a stack of ring gears, the upper one of the stack of articles as the ring gear 28, will lie within the recess 19. If now the cover 16 be moved to the left, as shown in Figure 2, the upper article, as gear 28, will be removed from the stack and deposited in the depression 14 from which it may be removed automatically or otherwise and pass, as indicated at 28′, down an incline or in any other convenient manner to a point of delivery for hardening or any further treatment to which it is desired to subject the articles.

The base 29 is formed with a central aperture 30 in which reciprocates a ram 31, the ram having a reduced portion 32 fitting within the guide 33 and the lower end 34 operating in the guide 35. The intermediate portion of the ram is slotted as indicated at 36, and in the slot operates a pair of toggle levers 37, 38, the lever 37 being pivoted to the ram as at 39 and lever 38 being pivotally supported upon a bar 40 carried by the lower guide bearing 35 and extending through slot 36. A link 41 connected to the toggle levers at their movable joint 42 is attached to an actuating device as lever 43 pivoted to the frame as at 44. A stop 38′ on lever 38 serves to hold the toggle locked as shown, and prevents its movement too far beyond the straight line position.

The structure described constitutes a convenient and powerful means for raising the ram 31 together with the stack of articles which will be supported thereon, but it will be understood that various other forms of mechanism may be employed within the scope of the invention.

The upper end of ram 31 is covered by a block 45 of refractory and heat insulating material suitable to support the articles under treatment. Detents 46, the upper ends of which are yieldingly forced inwardly, as by adjustable spring means 47, are pivoted upon the base and arranged to engage over the upper end of the block 45, a wear plate or ring 48 being provided to engage with the ends of the detents.

In operation the detents will be so positioned that their upper ends are immediately below the stack or pile of articles in the heating chamber, their inward movement being limited by the wear ring 48. If now the ram be lowered, as by operation of the toggle mechanism heretofore described, the stack will be supported upon the detents, this permitting the introduction of another one of the articles to be treated at the bottom of the stack.

The base 29 is hollowed out as at 49 to form a channel having a cross-section slightly greater than that of the articles to be introduced into the interior chamber. Any suitable means, automatic or otherwise, may be provided to supply the articles to this channel. As shown at 50′ they may be fed by gravity along an inclined way.

In the normal operation of the device, the ram having been lowered, as shown in Figure 3, so that the upper surface of block 45 is substantially at the level of the channel 49, the stack of articles will be supported upon the detents 46, thus providing a space into which an article, as gear 50, may slide to a position immediately below the stack, as shown at 51. By proper manipulation of the ram hoisting mechanism the ram may now be raised to the position indicated in Figure 1, thus raising the article 51 up past the detents 46 and into the lower portion of the heating or treating chamber. This movement, as will be obvious, will cause the entire stack of articles to advance a distance equal to the thickness of one article, and will cause the uppermost article to lie within the recess 19 in position to be removed laterally by proper manipulation of the cover 16, as previously described.

Thus it will be seen that I have provided a means whereby a stack or pile of articles to be treated may be caused to travel by a step-by-step progression through a treating chamber, the articles being added, preferably one at a time, at one end and removed similarly one at a time from the other end, without at any time opening the chamber at both ends simultaneously or at either end farther than to the minimum extent necessary to introduce and remove a single element or fraction of the charge.

While I have described and prefer the arrangement whereby the charge is introduced at the bottom and removed from the top, such arrangement being of particular advantage in a heating furnace in that it permits the progression of the charge from the colder to the hotter portion of the furnace, still the invention may also be employed in some of its details in a treating apparatus wherein the direction of travel is reversed or is at any desired angle to the vertical. Various other changes may be made in the details of construction and operation without departing from the spirit and scope of the invention and therefore I do not wish to be limited to the specific structure shown.

It will be understood that, although not limited thereto, the invention is of especial utility in connection with the heating of articles, such as gears, preliminary to subjecting them to the process of hardening. In operations of this character it is important that the articles be heated uniformly and accurately to the desired temperature, which temperature should be capable of being readily regulated at will. These results are easily attained with the apparatus herein set forth, with the added advantages of simplicity of construction, ease of operation, and minimum loss of heat.

I claim:—

1. In combination, a chamber for treating articles arranged in superposed relation, means for introducing articles into the chamber at the lower end thereof to form a stack, and means for removing said articles from said stack at the upper end of the chamber, said means constructed and arranged to maintain the chamber substantially closed at the upper end during removal of articles.

2. In combination, a chamber for treating

articles arranged in superposed relation, means for successively introducing articles in predetermined increments at the lower end of the chamber to form a stack therein, and means for successively removing articles in predetermined quantities from the upper end of the stack.

3. In combination a vertically arranged treating chamber, means for introducing the material to be treated at the lower end of the chamber said means comprising a vertically movable ram, and means for removing such material from the upper end of the chamber comprising a laterally movable cover.

4. In combination a treating chamber, a reciprocatory ram at one end of the chamber adapted to force into said chamber an increment of material to be treated, and a sliding cover for the other end of the chamber, said cover comprising means for removing from the chamber a portion of the treated material.

5. In combination a chamber, heating means therefor, means for introducing into said chamber articles to be heated and means for removing from said chamber the heated articles comprising a cover having a recess therein adapted to receive an article, and means for moving said cover laterally of the chamber.

6. In combination a vertically arranged chamber, heating means therefor, a ram for introducing articles successively into the lower end of said chamber, devices for supporting the articles in said chamber during the reciprocations of said ram, and means for removing articles successively from the upper end of said chamber.

7. A heating furnace comprising a vertically arranged chamber, electrical heating means therefor, a ram adapted to introduce articles successively into the lower end of said chamber, detents adapted to support a stack of articles within said chamber during the reciprocation of said ram, and a sliding cover for the upper end of said chamber, said cover having a recess adapted to receive a heated article and remove the same from said chamber by sliding movement of said cover.

8. In heat-treating apparatus, the combination of a chamber, means for heating said chamber, means for introducing into said chamber material to be treated, and means for removing successive increments of said material comprising a sliding cover for said chamber having a recess therein adapted in one position of said cover to receive a portion of said material and in another position to discharge said material outside of said chamber, said cover adapted to close substantially the discharge opening in said chamber in both positions.

9. In heat-treating apparatus, the combination of a heating chamber, a ram for introducing articles into the chamber at the lower end to form a stack, and means for guiding articles to said ram in proper position to be introduced into the chamber.

10. In heat-treating apparatus, the combination of a heating chamber, a ram for introducing articles into the chamber at the lower end to form a stack, means enclosing the ram and the lower end of the chamber to obstruct entry of air into the chamber, and a guideway leading to the interior of said enclosing means for introducing articles to said ram.

11. In heat-treating apparatus, the combination of a heating chamber, means enclosing the lower end of said chamber, a reciprocatory charging device positioned in the lower end of said chamber for supplying articles thereto, means through which articles may be introduced successively to said charging device, and means for supporting articles in said chamber when the charging device is in its lowered position.

12. In apparatus for heat-treating articles, a chamber having a cross-section corresponding approximately to the peripheral contour of the articles to be treated, means for introducing articles one at a time into the lower end of the chamber to form a stack therein, and means for removing articles one at a time from the upper end of the chamber.

13. In combination, a heat treating chamber adapted to receive articles arranged in a stack, means for heating said chamber, means for supplying articles successively to the lower end of the chamber to form a stack therein, and means cooperating with said chamber to prevent circulation of air therethrough during the charging operation.

In testimony whereof I affix my signature.

JOHN W. WHITE.