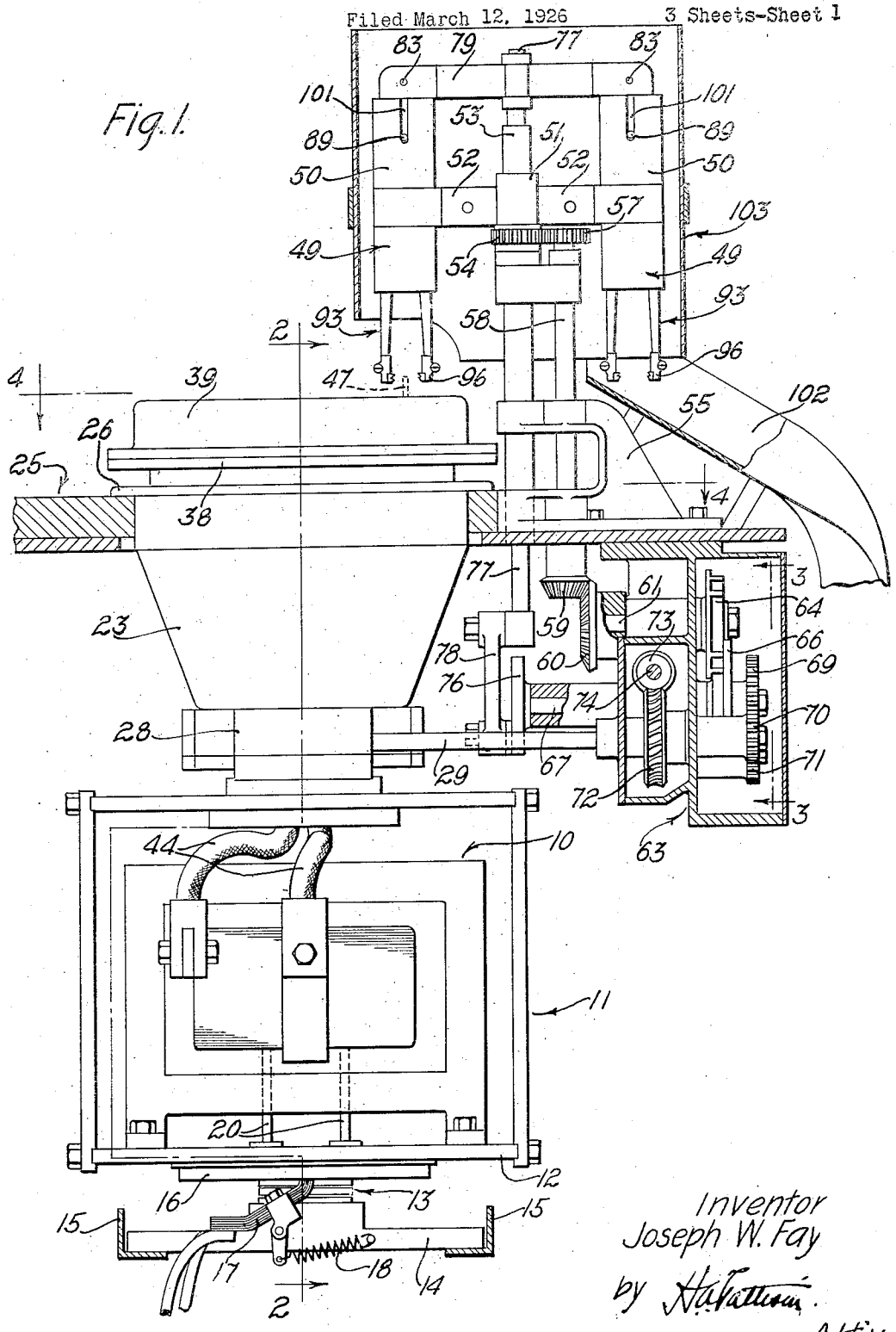
Feb. 21, 1928. 1,659,946

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APPARATUS FOR HEAT TREATING ARTICLES

Filed March 12, 1926 3 Sheets-Sheet 1

Fig. 1.



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APPARATUS FOR HEAT TREATING ARTICLES

Filed March 12, 1926 3 Sheets-Sheet 2

Fig. 2.

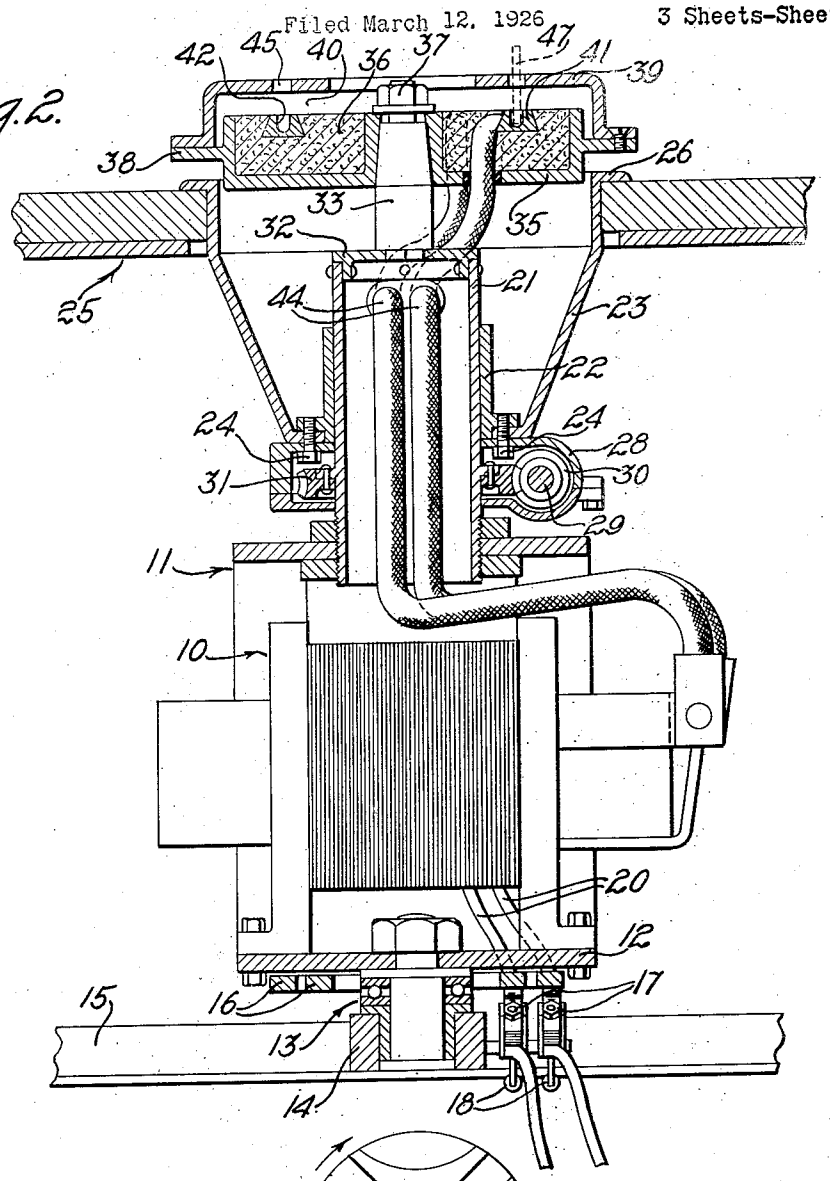
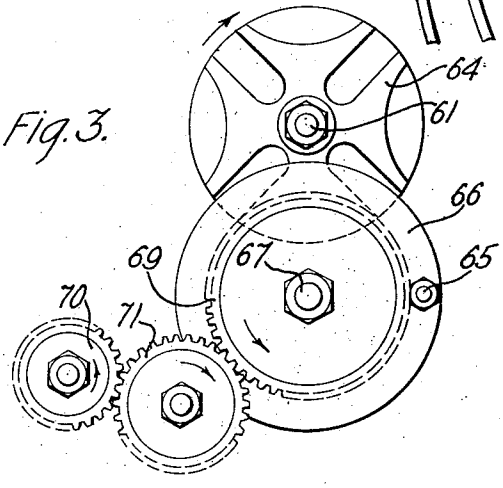


Fig. 3.



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Filed March 12, 1926 3 Sheets-Sheet 3

Fig. 4.

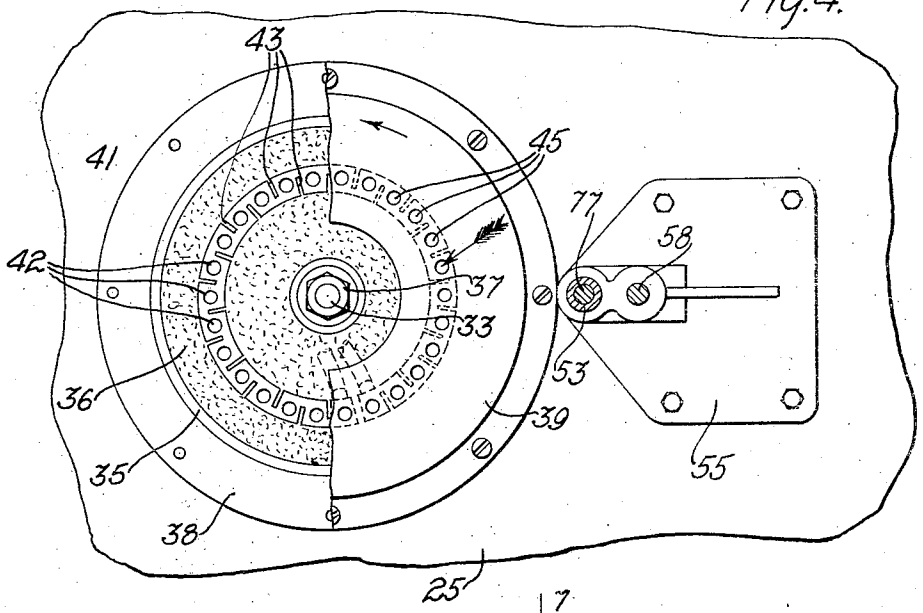


Fig. 5.

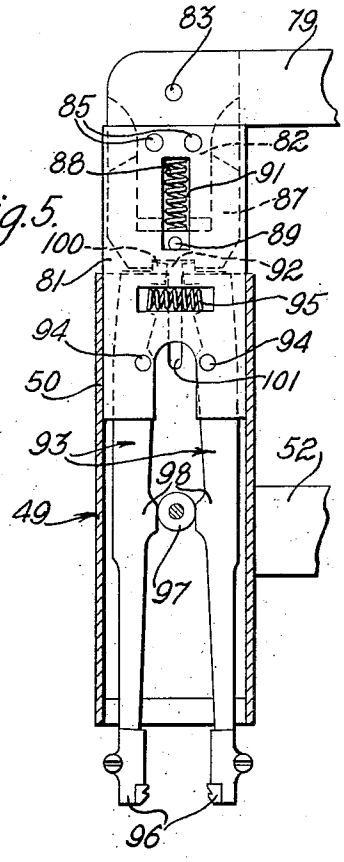


Fig. 6.

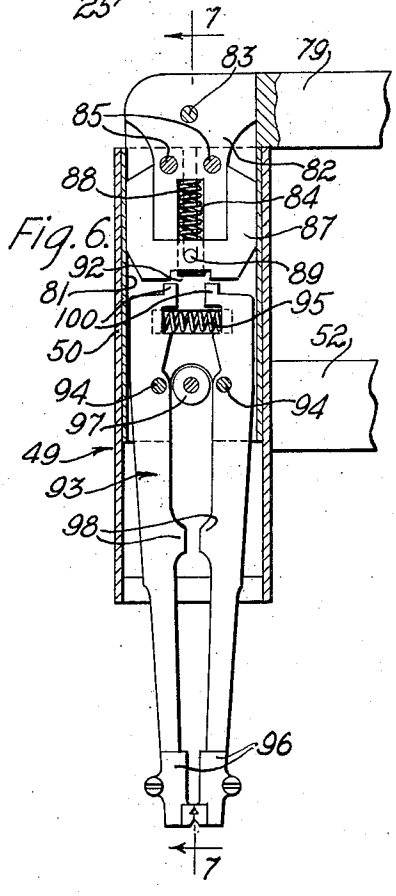
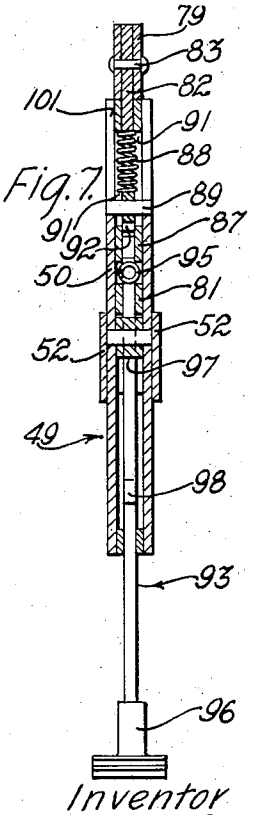


Fig. 7.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR HEAT TREATING ARTICLES.

Application filed March 12, 1926. Serial No. 94,114.

This invention relates to apparatus for heat treating articles, and more particularly to apparatus for annealing metallic parts.

In heat treating articles for the purpose of annealing, hardening and the like, precaution must be exercised in order to subject the articles to the proper or required degree of heat. It has been found in some instances, for example, in the art of annealing, that the subjection of metals to heat above a certain degree of temperature may result in the formation of an undesirable scale upon the surface thereof. Also, if the article to be treated is subjected to heat which is below a certain requisite degree of temperature the article will not be properly or completely annealed. It is also essential that the article to be annealed be subjected to a certain degree of heat for a definite period of time.

The object of this invention is to provide a durable, inexpensive and efficient heat treating apparatus for subjecting articles associated therewith to the required degree of heat for a definite period of time and for automatically removing the treated articles therefrom.

In order to obtain these and other objects in accordance with the general features of the invention, there is provided in one embodiment thereof, a rotatable, electric heating element for supporting and conveying a plurality of articles or parts to be heat treated. The element is rotatable within a horizontal plane and has in association therewith a chamber for confining or retaining the heat emanating therefrom within a concentrated space in proximity to and in direct association with the articles. The heat and the speed of rotation of said element may be adjusted so that when an article has been carried through one complete rotation of the element it will be properly annealed and in condition to be disassociated therefrom. The article is then automatically removed and is contemporaneously deposited within a suitable receiving tray. By replacing each heat treated article thus removed, by an article to be treated, the operation of the apparatus is made continuous.

These and other objects and features will be apparent from the following detailed description when considered with the accompanying drawings, in which

Fig. 1 is a side elevational view of the heat treating apparatus disclosing an embodiment of the invention, a portion of the gear housing and the guard surrounding the removing and discharge mechanisms being shown in section to disclose parts otherwise hidden;

Fig. 2 is a vertical sectional view of the apparatus taken on the line 2—2 of Fig. 1;

Fig. 3 is a side elevational view taken on the line 3—3 of Fig. 1 showing the arrangement of the Geneva wheel and gears associated therewith;

Fig. 4 is a transverse horizontal section taken on the line 4—4 of Fig. 1;

Fig. 5 is a detailed view of one of the removing and discharge mechanisms, the fixed vertical guide sleeve thereof being shown in section and the slide member therein being shown at its uppermost position;

Fig. 6 is a detail sectional view of the removing and discharge mechanism disclosed in Fig. 5 with the slide member thereof shown in section and at its lowermost position within the guide sleeve, and

Fig. 7 is a vertical section of the removing and discharge mechanism taken on the line 7—7 of Fig. 6.

Referring to the drawings wherein like numerals designate similar parts throughout the various figures, it will be observed that a transformer 10 of conventional design is carried within a box-like frame 11. This frame 11 is revolubly mounted medially of its base 12 upon a suitable roller bearing 13 (Figs. 1 and 2) which is carried by a support bar 14 extending between and mounted upon a pair of angle iron members 15. A pair of concentric contact rings 16 are suitably secured to the underside of the base 12 and are engaged by a pair of companion brush conductors 17 pivotally mounted upon the bar 14 and yieldingly held in contact with the rings 16 by the action of coil springs 18. These brushes 17 are electrically connected with a suitable source of

alternating current supply and a pair of conductors 20 connect one terminal of the primary winding of the transformer 10 with one of the rings 16 and the opposite terminal thereof with the other ring 16. It will be observed that by this construction the primary circuit of the transformer 10 may be continuously maintained during the rotation of the frame 11.

Secured medially of the top of the frame 11 and extending upwardly therefrom is a cylindrical shell 21 (Fig. 2). This shell is rotatable within a flanged bearing member 22 mounted upon the lower flanged portion of a housing 23 and secured thereto by means of bolts 24. The housing 23 is fitted within a suitable bench or work table 25, a peripheral flange 26 formed at the upper end of the housing being designed to bear against the upper surface of the table. A gear housing 28 is secured to the lower flanged portion of the housing 23 by means of the bolts 24 and supplies a bearing for a horizontal shaft 29 having a worm 30 mounted thereon which engages with a worm wheel 31 secured to the cylindrical shell 21.

The upper end of the shell 21 supplies a mounting for a cap 32 and secured centrally of this cap 32 and reaching upwardly therefrom is a stub shaft 33. The upper portion of the stub shaft 33 is tapered to receive a disk 35 which is formed with an annular recess to accommodate insulating packing 36 such as asbestos or the like. The disk 35 is secured in position upon the stub shaft 33 by means of a locking nut 37 and the periphery of the disk 35 is formed with a flange 38 which supports a cover member 39. This cover member which is provided with a central opening serves as the upper casing of a heating chamber 40, and the function of this chamber will be more clearly understood as the description progresses. It will also be observed that by this arrangement, foreign matter is effectively prevented from becoming lodged within the chamber.

Embedded within the insulating packing 36 is an annular, metallic heating element 41 (Figs. 1 and 2) which supplies an endless conveyor for articles associated therewith. This conveyor or heating element 41 is provided with a plurality of equally spaced apertures or pockets 42 and is formed with vertical slits 43 (Fig. 4) alternately disposed on the inner and outer portions of the element 41 and between adjacent apertures 42. By having slits 43 formed in the heating element 41 as described, heat which is generated by a flow of current through said element is effectively concentrated about each of the pockets 42. The terminals of the heating element 41 (Fig. 4) are connected with the terminals of the secondary winding of the transformer 10 by means of conductors 44. Registering with each of the pockets 42 of the heating element 41 is a companion opening 45 formed in the cover member 39 and by means of this structure it will be understood that an article to be heat treated, such as an elongated article 47 (dotted lines Figs. 1 and 2) may be inserted into each of the openings 45 and supported within each of the corresponding or companion pockets 42. From the foregoing it will be clear that rotation of the shaft 29 will impart a relative rotation to the heating element 41 through the medium of the worm 30 and the worm wheel 31 secured to the cylindrical shell 21. At this point it is to be understood that by developing the requisite degree of heat in the element 41 and the proper corresponding speed of rotation to the shaft 29, an article 47 (to be heat treated) may be inserted within one of the openings 45 and when the heating element 41 has completed one revolution this article 47 will be properly annealed and in condition to be removed therefrom.

A pair of removing and discharge mechanisms 49 include a pair of stationary vertical guide sleeves 50 oppositely and equally disposed from a central bearing 51 (Fig. 1) and secured to the bearing 51 by means of a lateral bracket arm 52. The bearing 51 is revoluble upon a fixed vertical sleeve 53 and rests upon and is secured to a gear 54 which is likewise revoluble upon the sleeve 53. The sleeve 53 is supported in fixed position by means of a bracket member 55 suitably secured to the work table 25. The gear 54 meshes with a gear 57 mounted at the upper end of a vertical shaft 58, which is rotatably mounted within the bracket 55 and has a bevel gear 59 secured to the lower extremity thereof which meshes with a companion bevel gear 60. This bevel gear 60 is secured to the inner end of a shaft 61 (Figs. 1 and 3) which is mounted within a gear housing denoted generally by the numeral 63, the opposite end of the shaft 61 having a Geneva wheel 64 mounted thereon. The wheel 64 is adapted to be rotated by the action of a pin 65 (Fig. 3) carried by a disk 66 mounted upon a shaft 67. Mounted adjacent to the disk 66 upon the shaft 67 is a gear 69 which is operatively connected in train with a driving gear 70 carried at the outer extremity of the shaft 29 through the medium of an idler gear 71 interposed therebetween. Mounted upon the shaft 29 within the gear housing 63 is a worm wheel 72 which engages with a worm 73 mounted upon a drive shaft 74 (Fig. 1) connected with any suitable source of power (not shown). Referring to Fig. 3, it will be observed that for every rotation of the disk 66 a quarter of a revolution will be imparted to the Geneva wheel 64 and likewise to the bevel gear 60. A quarter revolution of the bevel gear 60 will impart a half of a revolu-

tion to its companion bevel gear 59 and consequently this half of a revolution will be imparted from the gear 57 mounted at the upper end of the shaft 53 to the gear 54 and to its associated bearing 51 which supports the removing and discharge mechanisms 49.

The inner end of the shaft 67 (Fig. 1) supports a crank disk 76 which is connected to the lower end of a vertically reciprocable shaft 77 by means of a connecting link 78. This shaft 77 is slidable within the sleeve 53 and supports a cross bar 79 at its upper extremity. From the foregoing it is to be understood that when the shaft 67 and the crank disk 76 mounted thereon make one complete revolution, the vertical shaft 77 will be reciprocated within the sleeve 53 and during the first half of this cycle of operation, namely the upward stroke of the shaft 77, the shaft 58 will experience a half of a revolution.

The removing and discharge mechanisms 49 comprise a slide member 81 (Figs. 5, 6 and 7) which is slidable within the vertical guide sleeve 50. Each outer end of the cross bar 79, mounted at the upper extremity of the shaft 67, supports one of the slide members 81, the outer extremities of the cross bar being bifurcated to receive the upper portion of a depending tongue 82 which is secured to the cross bar by means of a rivet 83. The depending portion of the tongue 82 is provided with a vertical slot 84 (Fig. 6) and is fitted within the upper portion of the slide member 81, being secured thereto by suitable rivets 85. A U-shaped latch member 87 vertically slidable within the slide member 81 straddles and is slidable upon the depending portion of the tongue 82. A coil spring 88 lodged within the slot 84 of the tongue 82 engages with the upper surface of the closed portion of the U-shaped latch member 87 and serves to yieldingly urge the latch downwardly within the slide member 81. The downward movement of the latch 87 occasioned by the action of the spring 88 is limited by the engagement of a stop pin 89, which traverses the latch 87, with the lower end of a vertical opening 91 (Figs. 5 and 7) provided in the sides of the slide member 81. A recess 92 formed medially of the lower portion of the latch 87 is adapted to accommodate the upper extremities of a pair of fingers 93. These fingers 93 are pivoted within the slide member 81 at 94 and a coil spring 95 interposed between the upper ends of the fingers 93 serves to yieldingly effect the closing of tip portions 96 thereof. A roller 97 carried by the guide sleeve 50 between the fingers 93 is designed to be engaged by lugs 98 formed upon the opposed portions of said fingers to effect the opening thereof against the closing action of the springs 95 when the cross bar 79 approaches its uppermost position during the upward stroke of the vertical rod 77 as clearly shown in Fig. 5.

In this connection it is to be observed that when the fingers 93 are open, the upper ends of said fingers are swung together and shoulders 100 provided at this end of the fingers become lodged within the recess 92 of the U-shaped latch member 87. As the cross bar 79 is moved downwardly the lugs 98 of the fingers 93 become disengaged from the roller 97, but the shoulders 100 being at this stage of the operation lodged within the recess 92, prevent the immediate closing of the fingers 93 by the action of the spring 95. As the cross bar 79 and the slide member 81 continue to move downwardly the stop pin 89 is brought into contact, with the bottom portions of vertical slots 101 in the guide sleeves 50 during the latter part of this downward movement, with the result that the latch member 87 is urged upwardly within the slide 81 sufficiently to be disengaged from the shoulders 100 of the fingers 93. The tips 96 of the fingers 93 are closed together by the action of the coil spring 95 and do not become separated until the lugs 98 of the fingers 93 have again been moved into engagement with the roller 97.

The removing and discharge mechanisms 49 are so arranged that the closing of the fingers 93 thereof is occasioned when the tips 96 of said fingers are carried into gripping relationship with respect to one of the articles 47 supported by the heating element 41. The timing of the gear and Geneva wheel arrangements is such that immediately subsequent to the closing of the fingers 93, the rod 77 will begin to move upwardly and the rod 58 will contemporaneously begin to make a half of a revolution in the manner hereinbefore described and the article 47 gripped between the fingers 93 will thus be elevated and carried in an arcuate path to a position superimposing a delivery chute 102 (Fig. 1) which is secured at its upper end to a cylindrical guard 103. Upon completion of the half revolution of the rod 58 the rod 77 will be carried to its uppermost position and the fingers 93, being automatically opened as heretofore described, permit the article 47 to be released therefrom and deposited into the chute 102. The rod 77 is then carried downwardly and the tips of the fingers 93 of the mechanism 49 oppositely disposed from its companion mechanism just described are in position to grip the article 47 next advanced by the continuous rotation of the heating element 41.

In the operation of the apparatus, current is supplied from a suitable source of supply to the brushes 17 and the heating element 41 is thereby heated to the required temperature, this temperature being governed by the type of article to be treated. Power applied

to the drive shaft 74 causes the heating element 41 to revolve slowly and articles to be heat treated are individually placed within the pockets 42 at a point where said pockets begin to move away from the gripping position of the tips 96 of the fingers 93 as indicated by the feathered arrow in Fig. 4. By the time the article first associated with the heating element 41 approaches the completion of its travel, that is, upon the complete rotation of the heating element 41, it will be moved between the tips 96 of the fingers 93 which, at this stage of the operation, are approaching their lowermost position as shown in Fig. 1. The advanced article is now completely annealed and ready to be disassociated from the heating element 41 and the chamber 40, and as it reaches a position medially of the lowered finger tips 96, said tips are closed together and yieldingly grip the article. Immediately subsequent to the closing of the fingers 93 the article is carried upwardly away from the heating element and chamber, and as said fingers approach their uppermost position the annealed article will have been swung through an arcuate path and contemporaneously discharged into the chute 102. The fingers 93 of the companion, oppositely disposed mechanism 49 are now in position to be lowered into gripping relationship with respect to the next advanced article. The cycle of operation just described is continuously repeated throughout the operation of the apparatus and the only manual operation required is the refilling of the pockets 42 following the automatic removal of annealed articles therefrom by the mechanisms 49. Variations in the speed of rotation of the heating element 41 and the degree of heat occasioned by the current flow through said element may be adjusted in accordance with the type of articles to be treated.

Although the invention as herein illustrated and described is particularly well adapted for use in connection with apparatus for annealing articles, it should be understood that the novel features thereof are capable of other applications and should be limited only by the scope of the appended claims.

What is claimed is:

1. In an apparatus for heat treating articles, a movable heating element for receiving and conveying an article, means for holding articles in association with the heating element, means for disassociating a heat treated article from the heating element, and means for moving the heating element and actuating the disassociating means.

2. In an apparatus for heat treating articles, a movable heating element for receiving and conveying an article, a heat retaining chamber associated therewith, means for supporting articles within the chamber, means for removing heat treated articles from the chamber, and means for moving the heating element and actuating the removing means.

3. In an apparatus for heat treating articles, a movable heating element designed to support and convey articles for heat treatment, intermittently operable means for removing articles supported by the heating element after said articles have been heat treated for a predetermined length of time, and means for continuously moving the heating element and for operating the removing means.

4. In an apparatus for heat treating articles, an endless conveyor comprising an electrical heating element designed to support an article for heat treatment, means for removing an article from the heating element after said article has been supported thereby for a predetermined length of time, and means for operating the heating element and the removing means.

5. In an apparatus for heat treating articles, a movable heating element for receiving and conveying an article, means for holding articles in association therewith, a receiver, means for disassociating a heat treated article from the heating element and for contemporaneously delivering said article to the receiver, and means for moving the heating element and for actuating the disassociating means.

6. In an apparatus for heat treating articles, a rotary heating element for receiving and conveying an article, means for holding articles in association with the rotary heating element, means for disassociating an article therefrom, and means for actuating the heating element and the disassociating means.

7. In an apparatus for heat treating articles, a rotary heating element formed with a plurality of pockets designed to retain articles to be heat treated, means for removing articles from their respective pockets, and means for actuating the heating element and the removing means.

8. In an apparatus for heat treating articles, a rotary heating element for receiving and conveying an article, a heating chamber associated therewith, means for supporting articles to be heat treated within the chamber, means for removing a heat treated article from the heating chamber, and means for actuating the heating element and the removing means.

9. In an apparatus for heat treating articles, a rotary heating element, means for holding articles in association therewith for heat treatment, a receiver, a mechanism comprising a pair of gripping fingers designed to remove a heat treated article from association with the heating element and contemporaneously to deliver said article to the

receiver, and means for actuating the heating element and the disassociating means.

10. In apparatus for heat treating articles, a movable heating element, a mechanism comprising gripping members designed to remove a heat treated article from association with the heating element and to deliver said article to a predetermined position, and means for actuating the heating element and its disassociating means.

In witness whereof, I hereunto subscribe my name this 24 day of February, A. D. 1926.

JOSEPH WILLIAM FAY.