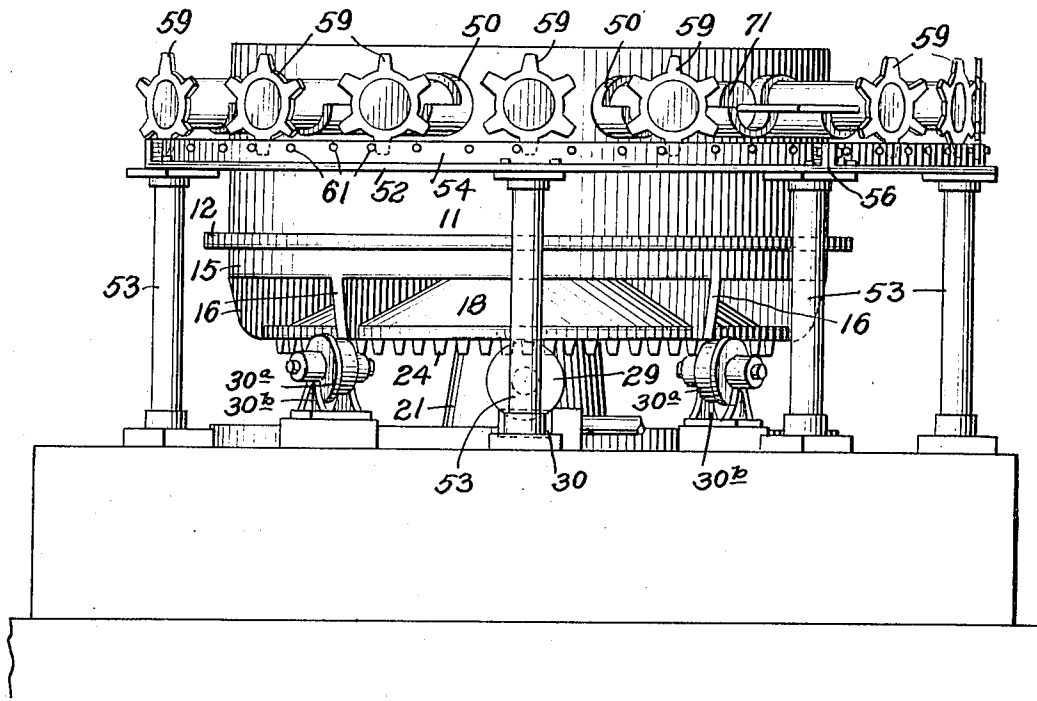
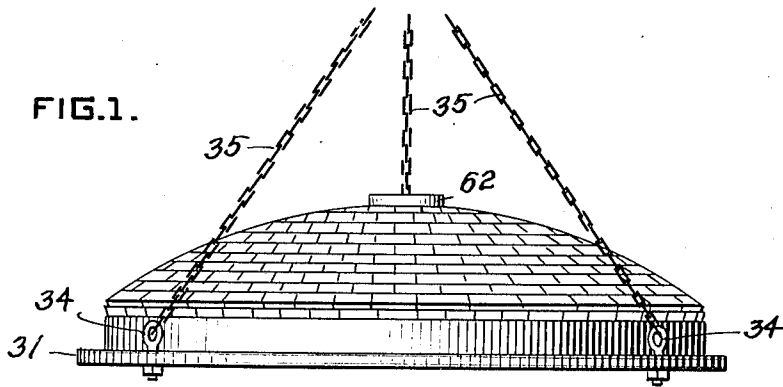


F. J. SPANG.
HEATING AND SOAKING FURNACE.
APPLICATION FILED APR. 25, 1918.

1,280,889.

Patented Oct. 8, 1918.

4 SHEETS—SHEET 1.



WITNESSES

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FIG. 2.

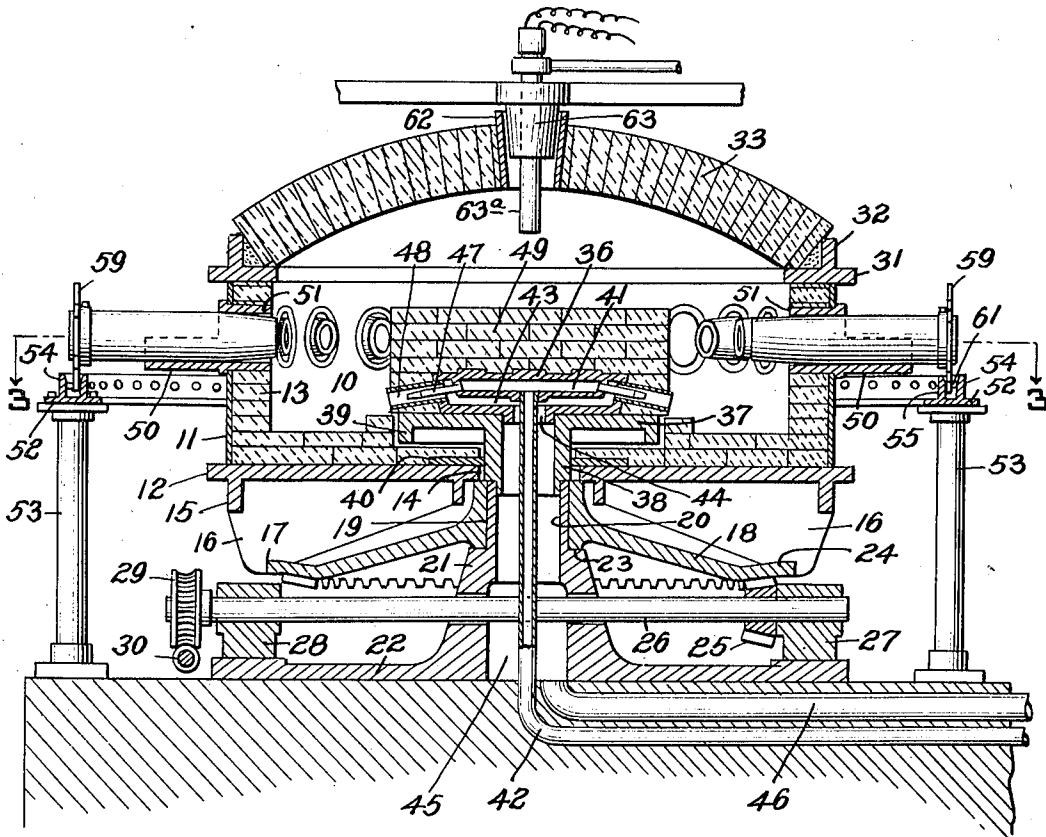


FIG. 4.

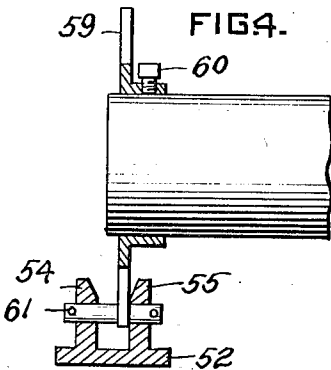
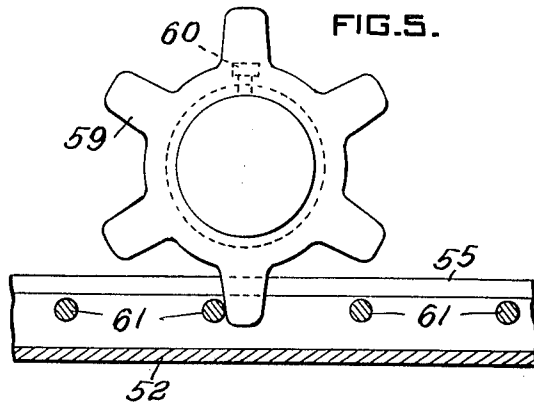


FIG. 5.



WITNESSES

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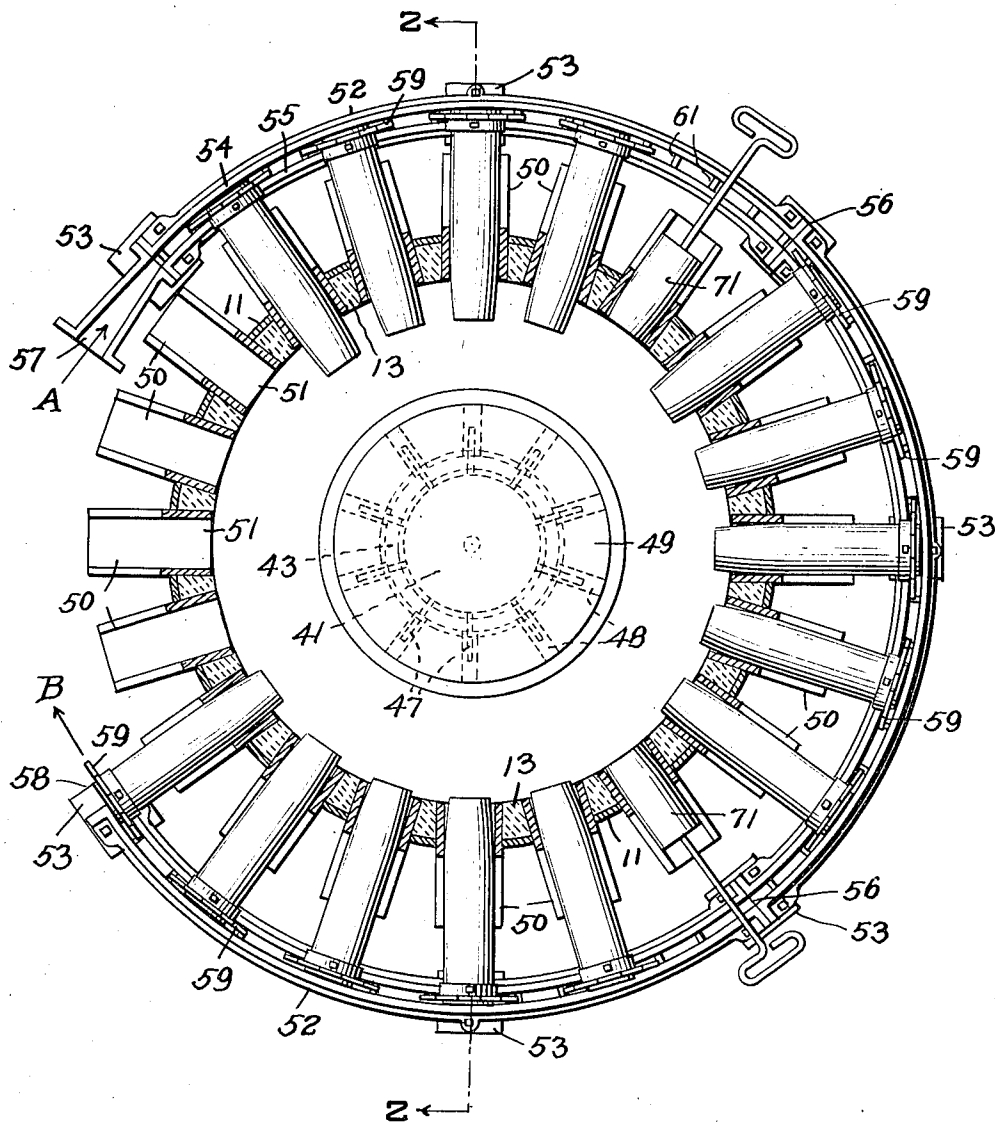
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FIG. 3.



WITNESSES

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4 SHEETS—SHEET 4.

FIG. 6.

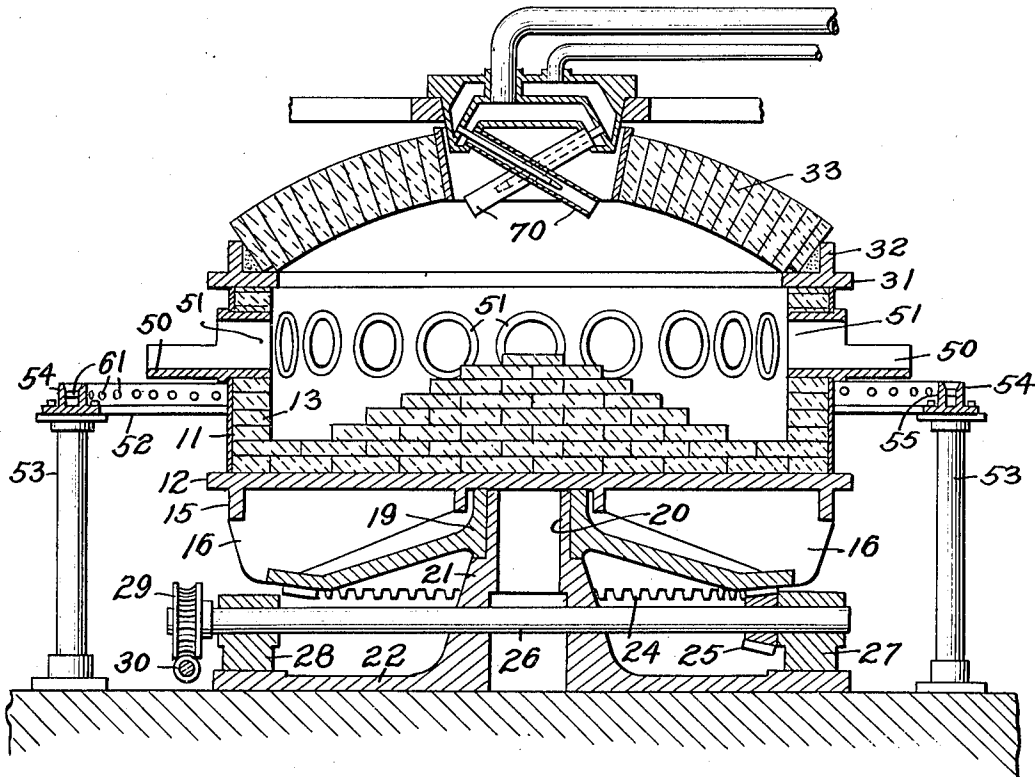
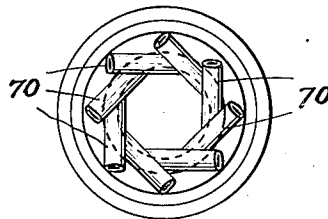


FIG. 7.



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UNITED STATES PATENT OFFICE.

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HEATING AND SOAKING FURNACE.

1,280,889.

Specification of Letters Patent.

Patented Oct. 8, 1918.

Application filed April 25, 1918. Serial No. 230,804.

To all whom it may concern:

Be it known that I, FERDINAND J. SPANG, a citizen of the United States, and a resident of Butler, in the county of Butler and State of Pennsylvania, have made a new and useful Invention in Heating and Soaking Furnaces, of which the following is a specification.

This invention relates to furnaces and more particularly to heating or soaking furnaces for heating the nose end of shell blanks or similar articles.

In the manufacture of certain types of shells (projectiles) it is customary to draw or press the shells from steel blanks into cylindrical form having one closed end. The cylinders are then rough machined outside and finish machined inside. The blanks are then heated and the open end is nosed in after which the exterior is finish machined.

As the nosing-in process, even when the nose portion is properly heated or soaked is apt to collapse or distort the remainder of the shell unless it is relatively cool, it becomes important to properly and uniformly soak or heat the nose end of the shell without softening the remainder to a degree which will allow it to collapse or distort during the nosing-in operation.

An object of this invention is to provide a soaking furnace for shell blanks or similar articles whereby the nose end of the shells may be uniformly and properly heated without heating the remainder of the blanks to a detrimental degree.

A further object of this invention is to provide a simple, rugged and effective rotary soaking furnace for shell blanks and similar articles by means of which the heating or soaking period and the region of soaking is automatically controlled.

These, as well as other objects which will readily appear to those skilled in this art, I attain in the device described in the specification and illustrated in the drawings accompanying and forming a part of this application and throughout which similar elements are denoted by like characters.

In the drawings, Figure 1 is a view in side elevation of an apparatus embodying this invention showing the dome or cover raised for giving access to the interior of the heating chamber thereof, Fig. 2 is a view in sectional elevation of said appa-

ratus and shows the cover in place. This view is taken on line 2—2 of Fig. 3, Fig. 3 is a plan view in section of the apparatus taken on line 3—3 of Fig. 2, Figs. 4 and 5 are detail views of portions of the apparatus, Fig. 6 is a view in sectional elevation of a modified form of apparatus embodying this invention and Fig. 7 is a detail view of a portion of the apparatus shown in Fig. 6.

The heating chamber 10 consists of an outer cylindrical heavy sheet metal wall 11 supported on a cast iron base 12. A fire brick lining 13 for the bottom and side walls is provided. Supporting base 12 which is circular in form, is provided with a central opening 14, a depending annular flange 15 and depending strengthening and supporting radially extending webs or ribs 16.

The lower edges of ribs 16 are notched at 17 so as to center the supporting base 12 with relation to a supporting bracket 18 upon which the base 12 rests.

Supporting bracket 18 at its center 19 is bored out to fit an upright cylindrical portion 20 formed as an extension of an upstanding hollow central column 21 formed on the base plate 22. Cylindrical portion 20 serves as a centering column about which the furnace rotates.

The under face of supporting bracket 18 is formed in the nature of a gear wheel 24, and with this gear, a pinion 25 carried on a cross shaft 26 meshes. The cross shaft is journaled in bearings formed in blocks 27 and 28 secured to base plate 22 and the shaft is driven through a worm wheel 29 and worm 30 from any suitable source of power, such as an electric motor. The lower face of supporting bracket 18 outside of the gear teeth presents a smooth surface which rests on roller 30^a journaled in brackets 30^b mounted on the base plate. The rollers support the weight of the furnace and allow it to freely rotate. To facilitate in the manufacture of the apparatus support 12 and supporting bracket 18 are cast separately. If desired, however, these can be combined in one casting with slight modification.

A furnace dome or top supporting ring 31 provided with an upstanding annular flange 32 rests on the top of cylindrical wall 11 and supports an arched brick or tile dome or cover 33. Eye bolts 34 are secured to

the supporting ring 31 in order that the cover may be lifted from the furnace by means of chains 35 when access to the furnace is desired.

- 5 The furnace may be either gas or oil fired, or if desired powdered coal may be used, but in the form illustrated I have shown a gas fired furnace. The burner comprises a casting 36 of circular form which rests upon
10 a burner support 37. The burner support is annular in form and at its center has a depending cylindrical flange 38 which rests upon the top of annular upstanding flange 20 of the base plate. The outer periphery of
15 the burner support 37 has a depending annular flange 39 below and in proximity with which the inner or central portion of the brick floor of the furnace rotates.

- A sealing plate 40 carried by support 12
20 closely encircles the outer surface of stationary flange 38 to form a seal between the furnace interior and the burner support.

- The burner casting is provided with a gas chamber 41 supplied with gas through a pipe
25 42 from any suitable source of supply, and an air chamber 43 supplied with air through its central inlet 44 which communicates with the central opening in the burner support 45 which communicates with the interior of
30 the support column 20, which is supplied with air under pressure conveyed through a pipe 46 from any suitable source such as a blower. An annular series of gas nozzles 47 projecting from gas chamber 41 are ar-
35 ranged so as to lie within burner tubes 48 which project radially from air chamber 43. This construction affords a series of Bunsen burners for projecting the heating flames into the furnace chamber. In order to pro-
40 tect the burner tubes and the top of the burner casting from the heat within the furnace the burner casting and the tubes are covered with a brick shield 49.

- An annular series of shell supports 50 are
45 secured within suitable openings in the outer cylindrical wall 11 of the furnace and have their inner ends 51 embedded within the brick lining.

- The shell supports at their inner ends are
50 cylindrical and are bored out so as to more or less snugly fit the shells to be treated. The outer portion of the supports have their tops cut away and form semi-cylindrical supporting shelves.

- 55 A stationary shell guiding member 52 is supported eccentrically with relation to the furnace chamber on a series of support columns 53 and the member is provided with upstanding flanges 54 and 55 forming there-
60 between a guiding channel. The guiding member is preferably made up in segments joined together as at 56 (Fig. 3) and extends substantially around the furnace leaving room for an operator between its entrance
65 end 57 and its exit end 58.

The entrance end of the guide channel is flared so as to give easy access thereto.

Prior to placing the shell blanks within the shell supports approaching the entrance end of the guiding channel a star wheel 59
70 such as shown in Fig. 5 is secured to the outer or base end of each shell blank by means of a set screw 60.

Pins 61 extend at suitable intervals through flanges 54 and 55 forming the guid-
75 ing channel and the star wheels contacting with said pins cause the shell blanks to rotate about their axes as they are carried from the entrance end of the guiding channel of the exit end by the rotating furnace. 80 As the star wheels lie within the guiding channel and as the guiding channel is eccentrically arranged with relation to the furnace the shells in their travel along the guide are caused to reciprocate within the shell
85 guides; the arrangement is such that the nose portions of the shells are soaked and the extreme nose ends are soaked longer than the remainder of the nose portions. By the eccentric arrangement of the guiding
90 channel or track the time of soaking is varied.

The top dome or cover 33 at its center is provided with a tapered casting 62 adapted to be normally closed by a plug 63; this
95 opening is provided for the introduction of a thermo couple 63^a.

In the modified form shown in Figs. 6 and 7 the fuel is introduced through an opening in the center of the dome or cover
100 and is projected into the furnace through a series of burners 70. With this form the floor of the furnace chamber can be continuous throughout as shown in Fig. 6.

Plugs such as plugs 71 are provided for
105 closing the shell blank openings during the warming up period of the furnace and for certain openings during the operation of the furnace if it becomes necessary. As the shells are simultaneously revolved about
110 their axes which reciprocated within their supports the resistance to the reciprocating movement is reduced.

A, may be termed the feeding in point of the furnace and B the point of removal.
115 Assuming that the furnace has reached the proper temperature for soaking and that the same is rotating at the proper speed, the shell blanks to be treated are each equipped with a star wheel such as shown in Fig. 5
120 prior to insertion in the shell support then approaching the entrance end of the guiding device. The star wheels are clamped onto the base end of the shell blanks by means of the set screw and the star wheel is
125 then guided until it enters the entrance end 57 of the guide. The guide insures that the shell will be moved into the furnace the desired distance so that the nose thereof will be subjected to the heat therein. In the
130

travel of the furnace relative to the guiding device the star wheels by means of the pins, acting as a rack cause the shells to rotate simultaneously with their reciprocation or move into and out of the furnace. The guiding device is so arranged with relation to the furnace and its eccentricity is such that the shells are first caused to move into the furnace until about one-fourth of the length of the shells are exposed to the direct heat; as the shells move away from the entrance point and toward the removal point their distance within the furnace is decreased until they reach a position just prior to the removal point when they are again moved farther into the heating chamber. In this way it is assured that the noses of the shells will be uniformly heated to a high temperature while the remainder of the shell walls are relatively cool or rather cool enough to withstand the nosing-in operation without themselves collapsing or becoming distorted.

If for any reason it is found desirable, the eccentric relation between the guiding track or channel and the furnace may be varied so long as an arrangement is kept whereby the nose portions of the shell blanks are subjected to the direct heat of the furnace in varying amounts as the furnace revolves from the entrance point to the exit point. It is desired that the nose portion be heated to about 1950° F. while the portion seven inches from the nose on a six inch shell to only 1500°. The rotation of the shells about their axes during the rotation of the furnace insures a uniform soaking of the nose portions and it has been found that when the shells reach the exit or removal point they are in condition for the nosing-in operation.

In accordance with the provisions of the patent statutes I have described the operation of my invention, together with the device which I now consider to represent the best embodiment thereof, but I desire to have it understood that the device shown is only illustrative and that the invention can be carried out in other ways.

Having thus described my invention, what I claim is—

1. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber, and means for longitudinally advancing a shell partially into and then out of said chamber and for simultaneously rotating the same about its axis.

2. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber having a shell opening in a wall thereof, and means for reciprocating a shell within said opening and simultaneously rotating the same about its axis.

3. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber, a shell support extending through a

wall thereof, and means for reciprocating a shell within said support and simultaneously rotating the same about its axis.

4. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber, and means located outside thereof for moving a shell partially into and out of said chamber and for simultaneously rotating the same about its axis.

5. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber having a shell opening in a wall thereof, and means located outside of said chamber for reciprocating a shell within said opening and simultaneously rotating the same about its axis.

6. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber, a shell support extending through a wall thereof, and means located outside of said chamber for reciprocating a shell within said support and simultaneously rotating the same about its axis.

7. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber, a shell support extending through a wall thereof, a shell, and means operatively connected to the outer end of said shell for reciprocating the same within said support and simultaneously rotating it about its axis.

8. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber, a burner within said chamber, means for rotating the walls of said chamber, a shell support extending through a wall of said chamber, and means for reciprocating a shell within said support and simultaneously rotating the same about its axis.

9. In a furnace for heating the nose ends of shell blanks or the like, a rotary furnace, a series of shell supports extending through a wall thereof, and means for reciprocating shells within said supports and simultaneously rotating them about their axes.

10. In a furnace for heating the nose ends of shell blanks or the like, a rotary furnace, a series of shell supports extending through a wall thereof, shells within said supports, a stationary guide, and means carried by said shells and cooperating with said guide for reciprocating said shells within said supports and rotating the same about their axes.

11. In a furnace for heating the nose ends of shell blanks or the like, a rotatably mounted chamber, means for rotating said chamber, heating means located within said chamber, shell carriers mounted in a wall of said chamber, and means for reciprocating shells within said shell carriers and simultaneously rotating the same in their movement around said heating means.

12. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber mounted for rotation about a vertical

axis, means for rotating said chamber, a series of shell supports extending through the vertical walls of said chamber, a stationary guide outside of said chamber and eccentrically mounted with relation thereto, shells
5 located within said supports, and means connected with said shells and associated with said eccentric guide for reciprocating said shells within said supports and simultaneously rotating the same during the travel
10 of said chamber.

13. In a furnace for heating the nose ends of shell blanks or the like, a heating chamber mounted for rotation about a vertical
15 axis, means for rotating said chamber, a series of horizontally disposed shell supports extending through a wall of said chamber, and guiding means located outside of said chamber for causing shells within said supports to be projected into said chamber in
20 varying distances from the feeding-in point of said shells to the removal point thereof.

14. In a soaking furnace, a rotatably mounted heating chamber, means for rotating
25 said chamber, supports for articles extending through a wall of said chamber, and means for causing articles carried in said supports to be rotated about their axes dur-

ing the rotating of said chamber and to be successively projected into and removed
30 from said chamber in varying amounts during the travel of said chamber.

15. In a soaking furnace, a heating chamber, a burner within said chamber, means for rotating the walls of said chamber
35 around said burner, a shell support extending through a wall of said chamber, and means for reciprocating a shell within said support and simultaneously rotating the same about its axis.
40

16. In a soaking furnace, a heating chamber mounted for rotation about a vertical axis, means for rotating said chamber, a stationary heating device for projecting a flame
45 within said chamber, a series of horizontally disposed shell supports extending through a wall of said chamber and guiding means located outside of said chamber for causing shells within said supports to be reciprocated therein and simultaneously rotated
50 about their axes.

In testimony whereof, I have hereunto subscribed my name this 19th day of April, 1918.

FERD. J. SPANG.