March 22, 1932. E. M. WYATT ET AL 1,850,221

FURNACE MECHANISM AND PROCESS FOR BLOATING CLAY

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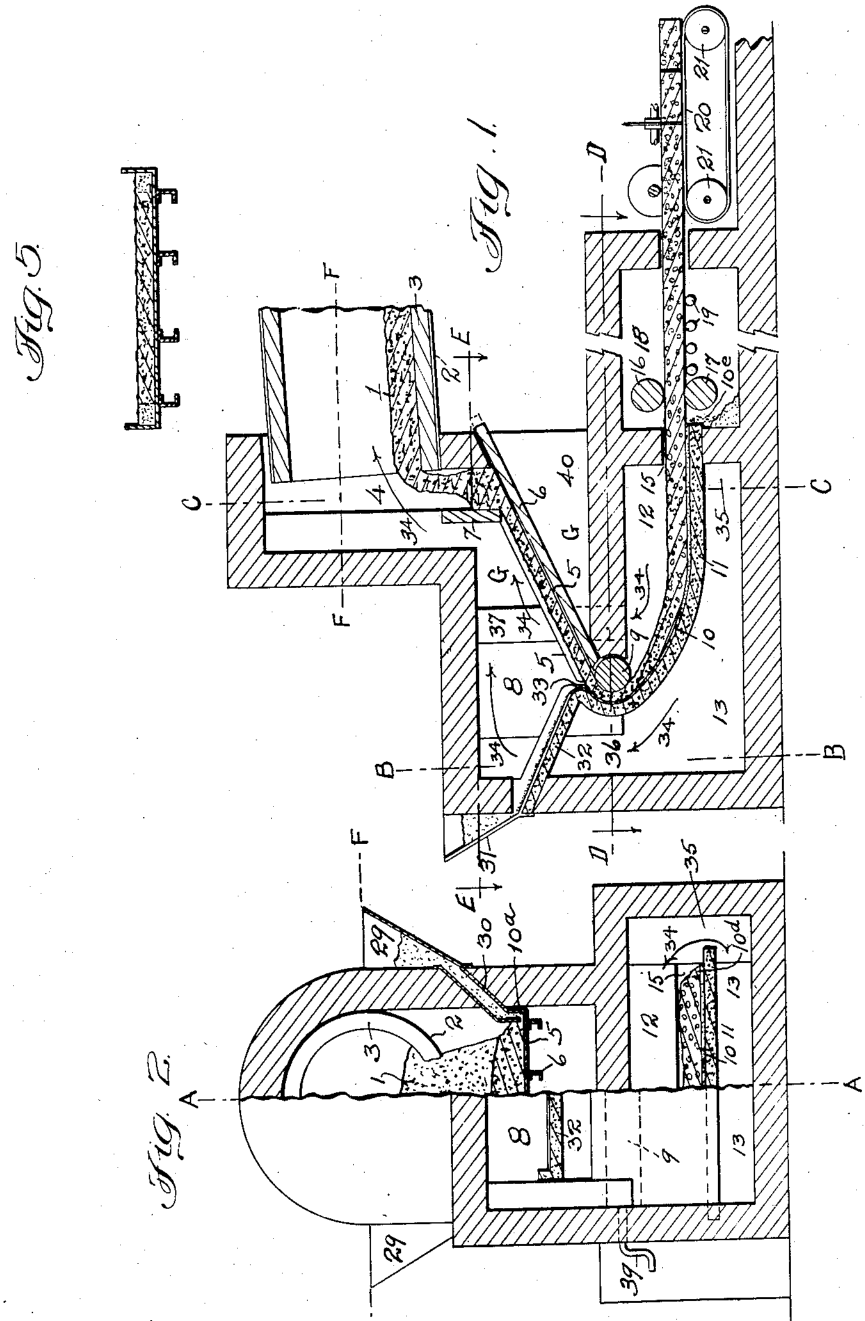

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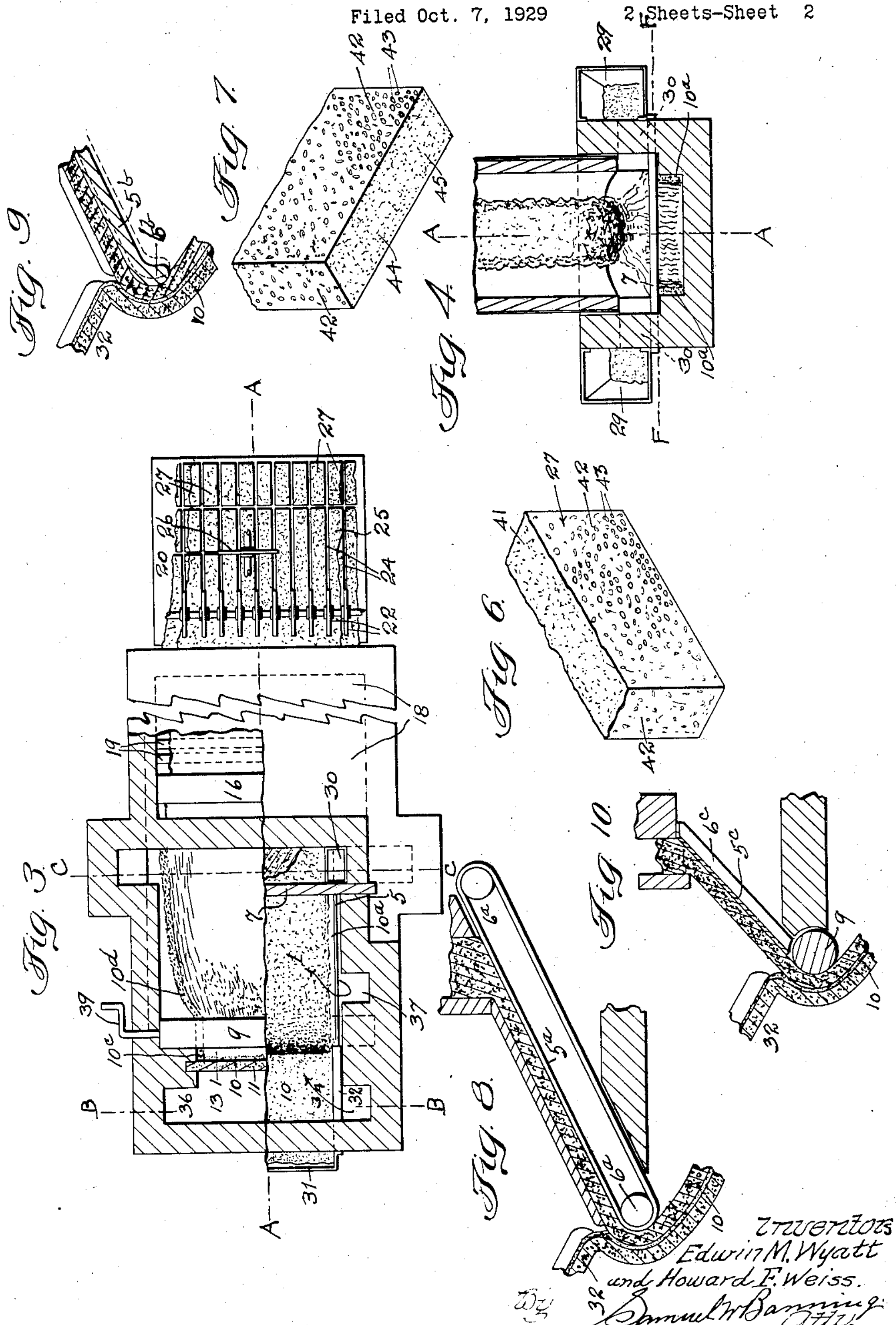

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UNITED STATES PATENT OFFICE

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FURNACE MECHANISM AND PROCESS FOR BLOATING CLAY

Application filed October 7, 1929. Serial No. 398,066.

This invention relates to improvements in furnace mechanism and process for bloating clay, in the manufacture of bloated clay products of the character described and claimed in co-pending application Serial No. 382,358, filed July 31, 1929, cellular building material.

The object of the invention is to provide furnace mechanism adapted to continuously feed the raw argillaceous materials in the form of granular particles and in such a way as to form a continuous slab or column suitable for cutting into building units or other articles of commerce.

Other objects of the invention are to produce such bloated material in a uniform thickness, to keep it from sticking to the furnace, and to bloat the material uniformly from both top and bottom.

The operations involved are briefly (1) to preheat and agitate the granular argillaceous material, hereinafter called clay, in a rotary kiln to a temperature as high as can be without the clay becoming sticky, usually about 1800° F.; (2) to deposit it on a conveyor that carries it through a furnace chamber at a higher temperature, about 2100° F., where the heat sears over the top of the deposited clay and forms a rubbery skin thereon; (3) to turn the material over the end of the conveyor to bring it other side up on a bed of sand or similar material that keeps the now sticky clay from adhering to the furnace; (4) to move the material through another furnace chamber in this inverted position until the newly exposed surface is skimmed over and the interior of the mass bloats and coheres into a slab or column; (5) to pass the material into a chamber of lower temperature where it cools and anneals; and, (6) finally to pass it out of the furnace where the column or slab is cut into the desired articles of commerce.

These operations will be better understood by study of the accompanying drawings, wherein,—

Figure 1 is a vertical section on the longitudinal center line, marked AA in Figures 2, 3, and 4;

Fig. 2 is a double vertical cross section, the left half being on the line BB of Figures 1 and 3, the right half being on the line CC of Figures 1, 3 and 4;

Fig. 3 is a double plan or horizontal section, the upper half being on a line DD, and the lower half on line EE of Figure 1;

Fig. 4 is a horizontal section taken on the line FF of Figures 1 and 2;

Fig. 5 is a section on the line GG of Figure 1;

Fig. 6 is a top perspective view of a brick cut from a bloated clay slab;

Fig. 7 is a bottom perspective view of a brick cut from a bloated clay slab;

Figs. 8, 9 and 10 are diagrammatic views showing modifications in the conveyor means employed for feeding the granular material and inverting it as it passes from the upper chamber of the furnace to the lower chamber.

The same identifying numerals refer to the same parts in all drawings.

The travel of the clay through the furnace can be followed entirely through on Figure 1, though reference to other drawings will make clearer the shape of the furnace parts involved. The clay to be bloated, marked 1, comes into the furnace from the right through a standard type rotary kiln, the shell of which is marked 2 and the refractory inside 3. Within the rotary kiln, the material in granular form is preheated and subjected to agitation to secure uniformity in the penetration of the heat.

From the rotary kiln the clay pours out through a transfer chamber 4 (shown equally well in Figures 1, 2 and 3) on to an inclined vibrating plate conveyor of which 5 is the deck and sides, and 6 are supporting and stiffening members. (Figures 2 and 5 show the construction of this conveyor best).

The vibration of the conveyor moves the clay under a strike off 7, that levels the material to a uniform depth and carries it along the bottom of a combustion chamber 8 until it works off the lower end of the conveyor over a refractory cylinder 9, which, revolved by the weight of the material and the pressure exerted by the clay being pushed off of the conveyor, carries the material about half way around the cylinder and deposits it other side up on a bed of sand 10 deposited on a refractory slab 11, which is upwardly curved at its receiving end.

Here the clay is subjected on top to the heat from the furnace chamber 12, called the bloating chamber, and from underneath from heat that penetrates the supporting slab 11 from the furnace chamber 13. From the bloating chamber the material passes through the opening 15 in the furnace wall into the annealing chamber 18, which is heated to a lower temperature adequate to anneal the slab and toughen it.

From the annealing oven, the bloated clay slab, now toughened and cooled, passes to the endless belt or plate conveyor 20 supported on conveyor wheels 21. As the conveyor bears the slab from the annealing chamber it carries it under saws or abrasive cutting disks 22 that slit the slab by the kerfs 24 into strips 25. Also while on the conveyor, a cross cutting disk 26 cuts the strips into smaller units 27.

The movement of the column of bloated clay is caused first by gravity as the clay descends around the cylinder 9 and down the inclined portion of the slab 11, and second by pull exerted by certain synchronized power-driven moving parts, namely, the top and bottom compression rolls 16 and 17, the carrying rolls 19, and the conveyor 20.

To keep the sticky fused clay from adhering to the floors and walls of the furnace, sand or other loose refractory material that will part within itself when its outer particles are adhered to is fed in between the clay and the furnace. This sand is first fed in from side hoppers 29 (see Figs. 2 and 4) through the ducts 30 (Figs. 2, 3 and 4) where it flows under the strike off 7 in beside the clay in marginal streams of rectangular cross section 10^a (Figs 2, 3 and 5). It maintains this position while flowing around the cylinder 9, as shown at 10^c of Fig. 3, but after passing the cylinder where the marginal streams are no longer restrained on their outward sides, they fall into the angle of repose on that side, so that each stream then assumes approximately the cross section of a right angle triangle (see 10^d Figs. 2 and 3).

Sand or its equivalent is also fed into the furnace from the hopper 31 (Figs. 1 and 3) so that it rolls across the refractory slab 32 (Figs. 1, 2, and 3) where it is heated in transit and then falls on top of the sticky top surface of the clay coming down the conveyor and over the cylinder at the point marked 33 on Fig. 1. From there on this surface becomes the bottom surface of the column, and the layer of sand keeps the sticky bloating clay on top of it from adhering to the floor hearth. As the bloated clay enters the annealing chamber, the clay is no longer supported by a hearth slab, so that the sand drops away from the clay as shown at 10^e, Fig. 1.

The heat for the various chambers is derived from burners, not shown, distributed as needed to give the necessary temperatures. Burned gases from the various chambers follow the long arrows 34 to their final discharge through the rotary kiln. The furnace chamber 13 connects with the bloating chamber 12 through the side ducts 35, and with the chamber 8 through side ducts 36. The chambers 12 and 8 are connected through ducts 37. The chamber 8 connects with the rotary kiln through the transfer chamber 4. The burned gases are finally discharged through a stack at the outer end of the rotary kiln, which parts, being of conventional type, are not shown in the drawings.

The crank 39 fastened to the cylinder 9 is to partially control the flow of clay through the application of accelerating or retarding pressure, especially when starting the manufacturing operation. The space 40 (Figs. 1 and 2) is but partially enclosed and consequently somewhat cooled by outside air, so that the conveyor 5 will be kept cool enough so that the clay directly in contact with it will not become sticky and cling to it.

In Fig. 6 is shown a finished brick 27 as it would appear when cut from the slab by the cutting disks. The upper surface 41 has the pebbled brick colored face that comes from its being a part of the top surface of the finished slab, and would be the part of the brick ordinarily exposed in a wall. The surfaces 42 are those exposed by being cut. The cut open cells show and are marked 43. These cut faces are those that in a wall are in contact with the mortar. In Fig. 7, the same cut surfaces show, and in addition the surface that in the slab was in contact with the sand 44. Some of the sand 45 is seen adhering to the brick.

Where it is desired that the completed units have a more level top surface than that given by the compression roller 16, the surface is ground by grinding wheels mounted on the shafts that carry either the cutting disks 22 or 26, or on a special shaft built for that purpose. These variations are not shown in the drawings.

Though sand has been mentioned throughout as the material to be used to keep the bloating clay from sticking to the furnace parts, it is to be understood that other materials, such as talc and mica, can be used in place of sand as parting media.

It should be understood that all of these drawings are more or less schematic, and are to be broadly interpreted as to details, and that in practice many variations may be made in the details shown. To illustrate some of such variations, Figs. 8, 9 and 10 show modifications from the conveyor shown in

Figs. 1, 2 and 3. Figs. 8, 9 and 10 are abbreviated sections made on the same plane as Fig. 1, AA but show different types of conveyors.

In Fig. 8, the vibrating conveyor of previous drawings is replaced by an endless belt or plate conveyor, of which 5^a is a belt or chain of plates, and 6^a are the pulleys carrying the belt.

In Fig. 9, the conveyor is shown as a refractory slab 5^b with a lip 6^b that turns down and takes the place of the cylinler 9 of Fig. 1. This refractory slab is vibrated, not with a back and forth vibration as in the type shown in Fig. 1, but with a four-way circular vibratory movement that causes the material in the throat to move downward under the action of the lip as does the conveyor of Fig. 8, or the cylinder of Fig. 1.

In Fig. 10, the vibrating conveyor is replaced by a stationary incline 5^c and 6^c pitched at slightly less than the angle of repose of the hot clay. The cylinder 9 is mechanically fed at a uniform speed that constantly feeds the clay through the throat and keeps the clay moving down the incline by undermining that supported by the incline.

The material in granular form will be thoroughly dried and preheated as it feeds down the incline of the rotary kiln, and at the same time, during this stage, certain of the more explosive gas forming constituents will be driven off, so that as the material passes from the rotary kiln it will be in suitable condition to enter the zones of higher temperature within which the material becomes fused and the particles coalesce together and are bloated by the formation within the mass of minute cells, separated and defined by cell walls of vitrified material, giving to the mass as a whole the cellular character of baked bread.

The descending mass engages the strike-off 7 at a time when it is still in the granular or non-coalescent form, so that it will be leveled down to a uniform thickness before the surface begins to fuse, which occurs within the chamber 8, so that during the progress of the mass through this chamber it will begin to assume the character of a coalescing or continuous mass, although at this stage the heat will not penetrate sufficiently to the interior of the mass to cause complete fusion within the interior.

As the coalescing mass, which now begins to assume the character of a continuous slab, passes over the roller 9, it will be inverted, so that the previously formed surface skin will now be presented at the bottom of the mass and rest upon the sand which is spread upon the curved refractory slab 11 to prevent adhesion. This inversion of the column brings the previously unexposed surface upwardly and subjects it to the intense heat within the lower chamber 12, so that at this stage, a surface skin will rapidly form and the heat will penetrate to the interior, so that the bloating will continue in increasing degree as the now full coalescing column progresses through the lower chamber, with the result that during this stage of the operation a continuous and coherent column will evolve, which is capable of being drawn forward by the action of the rollers 16 and 17 within the annealing chamber 18.

As shown in Fig. 1, the upper roller 16 not only serves as a feeding element but also tends to press down or smooth down the upper surface of the fused and now somewhat plastic mass, but if it is desired to retain the surface in its natural or undeformed and pebbled condition, the roller means 16 may be provided which merely engage the margins of the slab and do not exert a positive compressive contact with the exposed surface. It will be understood, however, that other feeding devices of any suitable character may be employed in lieu of the rollers, which are adequate to grip or engage the column and exert the necessary pull or tension thereon to draw the same through the furnace.

It will thus be observed that during the initial stage formation and while the mass is in a granular and noncoherent condition, the feeding will be effected by gravity or by vibration, but that thereafter, as the material progressively coalesces into a continuous column possessing tensile strength, the feeding will be effected by draw rollers or similar means adapted to draw the continuous slab forward.

The invention is one in which the parts are so related that the heated gases flow from the zone of the highest temperature in upward direction and in opposition to the direction of movement of the material, so that the cooling gases are utilized in full within the upper heat zones where a maximum temperature is not desirable, and are finally discharged through the rotary kiln and into the stack, thereby conserving the heat units to the fullest possible extent.

The invention is one which serves to produce a product of substantially homogeneous or uniform character, by reason of the inversion of the slab which permits the heat to penetrate uniformly to the interior and at the same time results in the formation of a slab which is provided with a continuous skin on both of its surfaces.

We claim:

1. The process of bloating earthy material in the formation of a continuous slab, which consists in feeding a layer of granular material through a zone maintained at a temperature adequate to cause fusion of the granular material and maintaining the layer within said zone through a period of time sufficient to cause the formation of a continu-

ous fused skin upon the exposed surface of the layer, inverting the layer of material and exposing the previously unexposed granular surface, and subjecting the inverted material to a temperature and for a time adequate to cause fusion and bloating of the mass into the form of a continuous slab.

2. The process of bloating earthy material, which consists in feeding granular material in the form of a continuous layer through a heat zone and subjecting it to a temperature adequate to cause the formation of a continuous fused skin upon the exposed surface, inverting the layer of material to expose the previously unexposed surface within a heat zone of higher temperature, to first cause formation of a surface skin on the surface thus exposed, and to finally cause bloating of the entire mass and the formation of a continuous slab.

3. The process of bloating earthy material, which consists in feeding granular material in the form of a continuous layer through a heat zone and subjecting it to a temperature adequate to cause the formation of a continuous fused skin upon the exposed surface, inverting the layer of material to expose the previously unexposed surface within a heat zone of higher temperature, to first cause formation of a surface skin on the surface thus exposed, and to finally cause bloating of the entire mass and the formation of a continuous slab, and drawing the continuously formed slab forwardly and out of the heat zone.

4. The process of bloating earthy material, which consists in feeding granular material in the form of a continuous layer through a heat zone and subjecting it to a temperature adequate to cause the formation of a continuous fused skin upon the exposed surface, inverting the layer of material to expose the previously unexposed surface within a heat zone of higher temperature, to first cause formation of a surface skin on the surface thus exposed, and to finally cause bloating of the entire mass and the formation of a continuous slab, and drawing the continuously formed slab forward and out of the heat zone, and subjecting the continuously formed bloated slab to an annealing temperature.

5. The process of bloating earthy material, which consists in feeding granular material in the form of a continuous layer through a heat zone and subjecting it to a temperature adequate to cause the formation of a continuous fused skin upon the exposed surface, inverting the layer of material to expose the previously unexposed surface within a heat zone of higher temperature, to first cause formation of a surface skin on the surface thus exposed, and to finally cause bloating of the entire mass and the formation of a continuous slab, and drawing the continuously formed slab forwardly and out of the heat zone, and subjecting the continuously formed bloated slab to an annealing temperature, and finally severing the slab into building units of the desired dimensions.

6. The process of bloating earthy material, which consists in first subjecting granular material to a preheating temperature, then spreading the preheated material while in granular condition in the form of a layer of uniform thickness and in advancing the layer of material through a heat zone of temperature adequate to fuse the exposed surface and form a continuous skin thereover, next in inverting the skinned-over layer and introducing the layer other side up into a heat zone having a temperature adequate to first form a skin over the newly exposed surface and thereafter bloat the interior of the mass to form a continuous slab of cellular material.

7. The process of bloating earthy material, which consists in first subjecting granular material to a preheating temperature, then spreading the preheated material while in granular condition in the form of a layer of uniform thickness and in advancing the layer of material through a heat zone of temperature adequate to fuse the exposed surface and form a continuous skin thereover, next in inverting the skinned over layer and introducing the layer other side up into a heat zone having a temperature adequate to first form a skin over the newly exposed surface and thereafter bloat the interior of the mass to form a continuous slab of cellular material, and in continuously drawing said bloated slab through the last mentioned heat zone under tension.

8. The process of bloating earthy material, which consists in first subjecting granular material to a preheating temperature, then spreading the preheated material while in granular condition in the form of a layer of uniform thickness and in advancing the layer of material through a heat zone of temperature adequate to fuse the exposed surface and form a continuous skin thereover, next in inverting the skinned over layer and introducing the layer other side up into a heat zone having a temperature adequate to first form a skin over the newly exposed surface and thereafter bloat the interior of the mass to form a continuous slab of cellular material, and in continuously drawing said bloated slab through the last mentioned heat zone under tension, and in continuously delivering said slab to a zone heated to an annealing temperature.

9. The process of bloating earthy material, which consists in first subjecting granular material to a preheating temperature, then spreading the preheated material while in granular condition in the form of a layer of uniform thickness and in advancing the layer of material through a heat zone of temperature adequate to fuse the exposed surface and

form a continuous skin thereover, next in inverting the skinned over layer and introducing the layer other side up into a heat zone having a temperature adequate to first form a skin over the newly exposed surface and thereafter bloat the interior of the mass to form a continuous slab of cellular material, and in continuously drawing said bloated slab through the last mentioned heat zone under tension, and in continuously delivering said slab to a zone heated to an annealing temperature, and finally in continuously discharging the slab from the annealing zone and cutting it into building units of the desired dimensions.

10. The process of bloating earthy material, which consists in first subjecting granular material to a preheating temperature under conditions of agitation, then spreading the preheated material while in granular condition in the form of a layer of uniform thickness and in advancing the layer of material through a heat zone of temperature adequate to fuse the exposed surface and form a continuous skin thereover, next in inverting the skinned over layer and introducing the layer other side up into a heat zone having a temperature adequate to first form a skin over the newly exposed surface and thereafter bloat the interior of the mass to form a continuous slab of cellular material, and in continuously drawing said bloated slab through the last mentioned heat zone under tension, and in continuously delivering said slab to a zone heated to an annealing temperature, and finally in continuously discharging the slab from the annealing zone and cutting it into building units of the desired dimensions.

11. In furnace mechanism of the class described, the combination of a furnace partitioned to provide an upper chamber and a lower chamber in communication with one another, an inclined conveyor within the upper chamber, and a refractory slab within the lower chamber, the parts being so related that a layer of material passing down the conveyor in the upper chamber will pass on to the slab in the lower chamber in inverted position, and means adapted to exert tension for withdrawing the material, when in the form of a coherent bloated slab, from the lower chamber.

12. In furnace mechanism of the class described, the combination of a furnace partitioned to provide an upper chamber and a lower chamber in communication with one another, an inclined conveyor within the upper chamber, and a refractory slab within the lower chamber, the parts being so related that a layer of material passing down the conveyor in the upper chamber will pass on to the slab in the lower chamber in inverted position, and means for withdrawing the material, when in the form of a coherent bloated slab, from the lower chamber, and a preheater located above the conveyor and adapted to discharge material in granular form on to the conveyor.

13. In furnace mechanism of the class described, the combination of a furnace partitioned to provide an upper chamber and a lower chamber in communication with one another, an inclined conveyor within the upper chamber, and a refractory slab within the lower chamber, the parts being so related that a layer of material passing down the conveyor in the upper chamber will pass on to the slab in the lower chamber in inverted position, and means for withdrawing the material, when in the form of a coherent bloated slab, from the lower chamber, and a preheater located above conveyor and adapted to discharge material in granular form on to the conveyor, and a strike off device for leveling the material discharged on to the conveyor.

14. In furnace mechanism of the class described, the combination of a furnace provided with an interior partition dividing the furnace into an upper chamber and a lower chamber, in communication with one another, a conveyor within the upper chamber, adapted to continuously carry forward a layer of material through the upper chamber to the point of communication with the lower chamber, a supporting surface within the lower chamber extending reversely with respect to the line of movement effected by the conveyor in the upper chamber, and adapted to receive the layer of material from the upper chamber in inverted position to present the hitherto unexposed surface to the heat of the lower chamber.

15. In furnace mechanism of the class described, the combination of a furnace provided with an interior partition dividing the furnace into an upper chamber and a lower chamber, in communication with one another, a conveyor within the upper chamber, adapted to continuously carry forward a layer of material through the upper chamber to the point of communication with the lower chamber, a supporting surface within the lower chamber extending reversely with respect to the line of movement effected by the conveyor in the upper chamber, and adapted to receive the layer of material from the upper chamber in inverted position to present the hitherto exposed surface to the heat of the lower chamber, and roller means located at the foot of the conveyor and in proximity to the supporting surface in the lower chamber, and adapted to feed the layer of material past the angle between the conveyor and the supporting surface.

16. In furnace mechanism of the class described, the combination of a furnace provided with an interior partition dividing the furnace into an upper chamber and a lower chamber, in communication with one another, a conveyor within the upper chamber, adapt-

ed to continuously carry forward a layer of material through the upper chamber to the point of communication with the lower chamber, a supporting surface within the lower chamber extending reversely with respect to the line of movement effected by the conveyor in the upper chamber, and adapted to receive the layer of material from the upper chamber in inverted position to present the hitherto unexposed surface to the heat of the lower chamber, and roller means located at the foot of the conveyor and in proximity to the supporting surface in the lower chamber, and adapted to feed the layer of material past the angle between the conveyor and the supporting surface, and pulling means positioned to engage the material when bloated to the form of a continuous slab within the lower chamber and to withdraw it therefrom.

17. In furnace mechanism of the class described, the combination of a furnace provided with an interior partition dividing the furnace into an upper chamber and a lower chamber, in communication with one another, a conveyor within the upper chamber, adapted to continuously carry forward a layer of material through the upper chamber to the point of communication with the lower chamber, a supporting surface within the lower chamber extending reversely with respect to the line of movement effected by the conveyor in the upper chamber, and adapted to receive the layer of material from the upper chamber in inverted position to present the hitherto unexposed surface to the heat of the lower chamber, and roller means located at the foot of the conveyor and in proximity to the supporting surface in the lower chamber, and adapted to feed the layer of material past the angle between the conveyor and the supporting surface, pulling means positioned to engage the material when bloated to the form of a continuous slab within the lower chamber and to withdraw it therefrom, and an annealing chamber communicating with the lower chamber and in position to receive the slab of material withdrawn therefrom.

18. In furnace mechanism of the class described, the combination of a furnace provided with an interior partition dividing the furnace into an upper chamber and a lower chamber, in communication with one another, a conveyor within the upper chamber, adapted to continuously carry forward a layer of material through the upper chamber to the point of communication with the lower chamber, a supporting surface within the lower chamber extending reversely with respect to the line of movement effected by the conveyor in the upper chamber, and adapted to receive the layer of material from the upper chamber in inverted position to present the hitherto unexposed surface to the heat of the lower chamber, roller means located at the foot of the conveyor and in proximity to the supporting surface in the lower chamber, and adapted to feed the layer of material past the angle between the conveyor and the supporting surface, pulling means positioned to engage the material when bloated to the form of a continuous slab within the lower chamber and to withdraw it therefrom, and an annealing chamber communicating with the lower chamber and in position to receive the slab of material withdrawn therefrom, and cutting devices located at the discharge end of the annealing chamber for severing the material into units of the desired size.

19. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, and a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber.

20. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a strike off located above the conveyor in spaced relation thereto and adapted to level down the material to the form of a layer of uniform thickness, and a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber, and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber.

21. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end

to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, and a roller interposed between the lower end of the conveyor and the proximate end of said slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber.

22. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a strike off located above the conveyor in spaced relation thereto and adapted to level down the material to the form of a layer of uniform thickness, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber, and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, and a roller interposed between the lower end of the conveyor and the proximate end of said slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber.

23. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, and a roller interposed between the lower end of the conveyor and the proximate end of said slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, and roller means adapted to engage the material when formed into a continuous slab and to withdraw the same from the chamber.

24. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a strike off located above the conveyor in spaced relation thereto and adapted to level down the material to the form of a layer of uniform thickness, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber, and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a roller interposed between the lower end of the conveyor and the proximate end of said slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, and roller means adapted to engage the material when formed into a continuous slab and to withdraw the same from the chamber.

25. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower Chamber, a roller interposed between the lower end of the conveyor and the proximate end of the slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, and a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber.

26. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the up-

per chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a strike off located above the conveyor in spaced relation thereto and adapted to level down the material to the form of a layer of uniform thickness, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber, and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a roller interposed between the lower end of the conveyor and the proximate end of said slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, and a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber.

27. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a roller interposed between the lower end of the conveyor and the proximate end of the slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, and a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber, and means for discharging marginal streams of material upon the conveyor along the edges of the granular material discharged thereonto.

28. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a strike off located above the conveyor in spaced relation thereto and adapted to level down the material to the form of a layer of uniform thickness, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber, and means for discharging marginal streams of material upon the conveyor along the edges of the granular material discharged thereonto.

29. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a roller interposed between the lower end of the conveyor and the proximate end of the slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, and a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber, and roller means located beyond the lower chamber and adapted to engage the continuous bloated slab formed therein and to continuously withdraw the same therefrom.

30. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with

the lower chamber, a strike off located above the conveyor in spaced relation thereto and adapted to level down the material to the form of a layer of uniform thickness, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber, and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a roller interposed between the lower end of the conveyor and the proximate end of said slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber, and roller means located beyond the lower chamber and adapted to engage the continuous bloated slab formed therein and to continuously withdraw the same therefrom.

31. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a roller interposed between the lower end of the conveyor and the proximate end of the slab, and adapted to underlie the oncoming layer of material and assist in reversing its direction of movement and in inverting it to bring the previously unexposed surface upwardly within the lower chamber, and a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber, and means for discharging marginal streams of material upon the conveyor along the edges of the granular material discharged thereonto, and roller means located beyond the lower chamber and adapted to engage the continuous bloated slab formed therein and to continuously withdraw the same therefrom.

32. In furnace mechanism of the class described, the combination of a furnace provided with an upper chamber and a lower chamber, in communication with one another, a rotary preheater discharging into the upper chamber of the furnace, an inclined conveyor leading through the upper chamber from the discharge end of the preheater to the point of communication with the lower chamber, a strike off located above the conveyor in spaced relation thereto and adapted to level down the material to the form of a layer of uniform thickness, a slab within the lower chamber extending therethrough in divergent relation with respect to the conveyor in the upper chamber and curvedly upturned at its converging end to receive the layer of material from the conveyor and invert the same to bring the previously unexposed surface upwardly within the lower chamber, a chute for delivering material to prevent adhesion and located to discharge such material in interposed relation between the layer of granular material and the slab in the lower chamber, means for discharging marginal streams of material upon the conveyor along the edges of the granular material discharged thereunto, and roller means located beyond the lower chamber and adapted to engage the continuous bloated slab formed therein and to continuously withdraw the same therefrom.

In witness that we claim the foregoing, we have hereunto subscribed our names this 19th day of September, 1929, and this 23rd day of September, respectively.

EDWIN M. WYATT.
HOWARD F. WEISS.