

(No Model.)

4 Sheets—Sheet 1.

W. H. ZIMMER & O. G. HESS.
POTTERY KILN.

No. 488,413.

Patented Dec. 20, 1892.

Fig. 1.

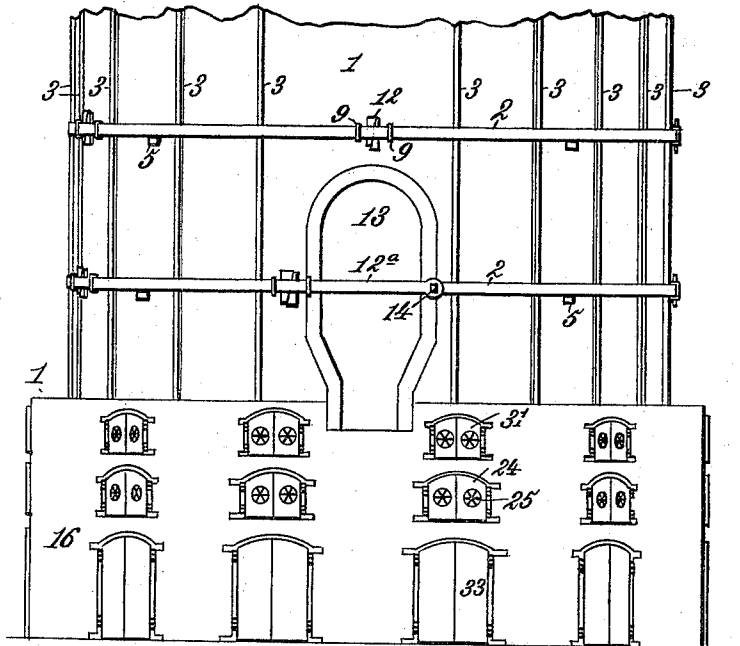
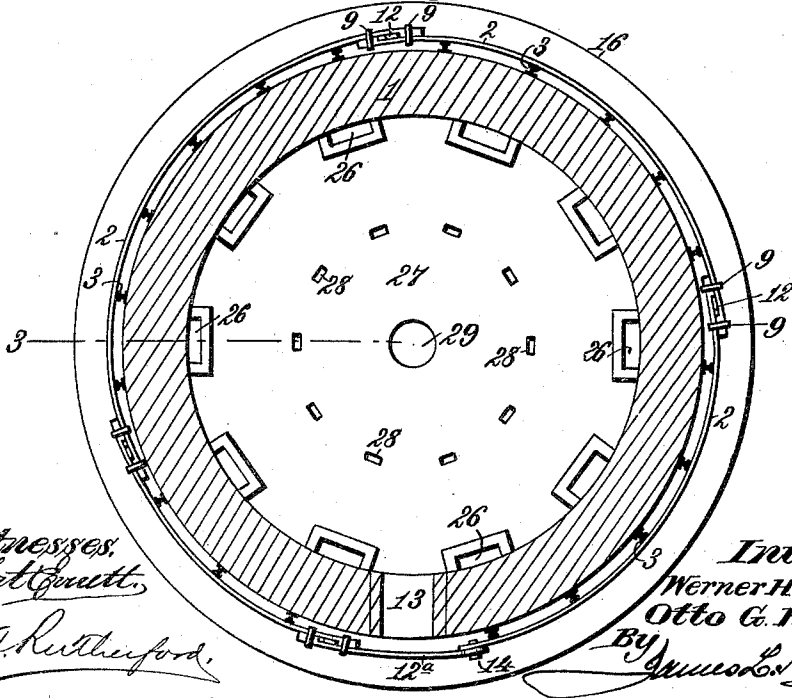


Fig. 2.



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Fig. 3.

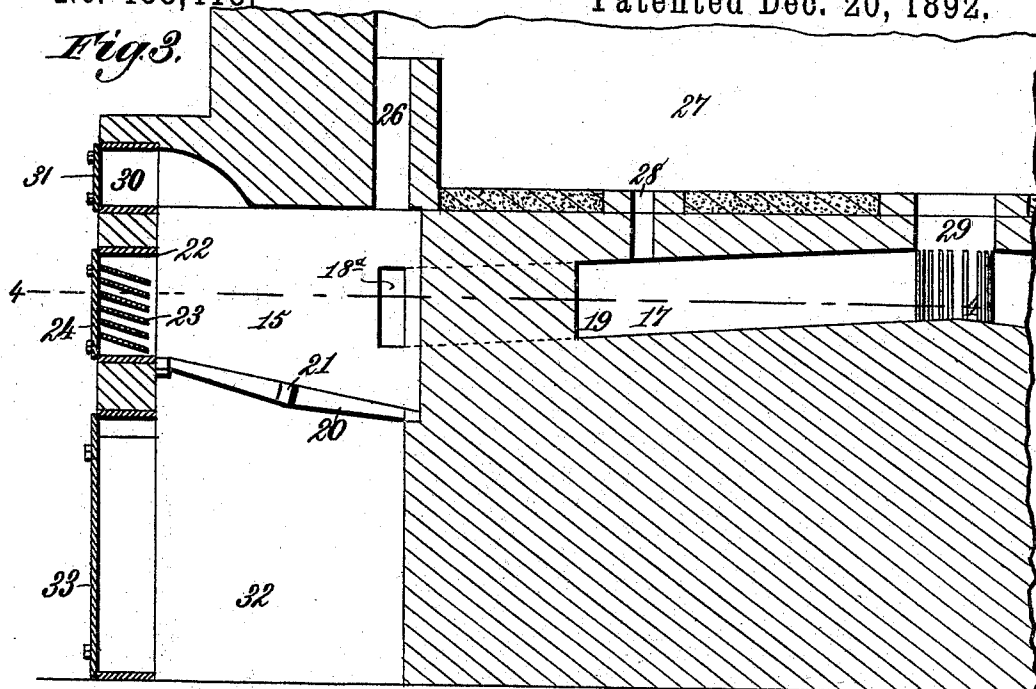
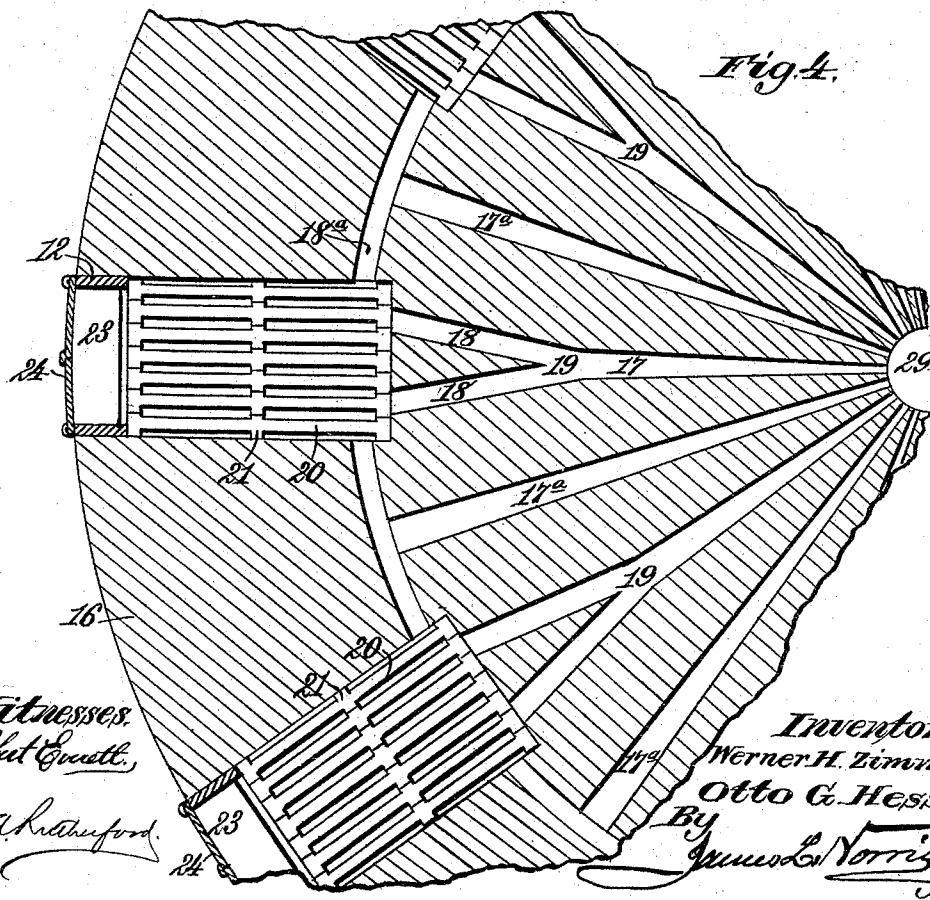


Fig. 4.



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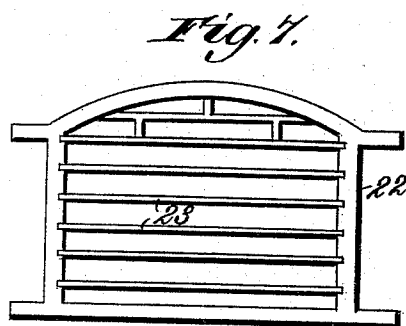
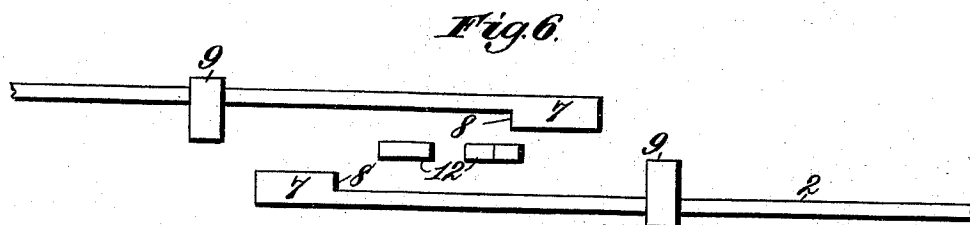
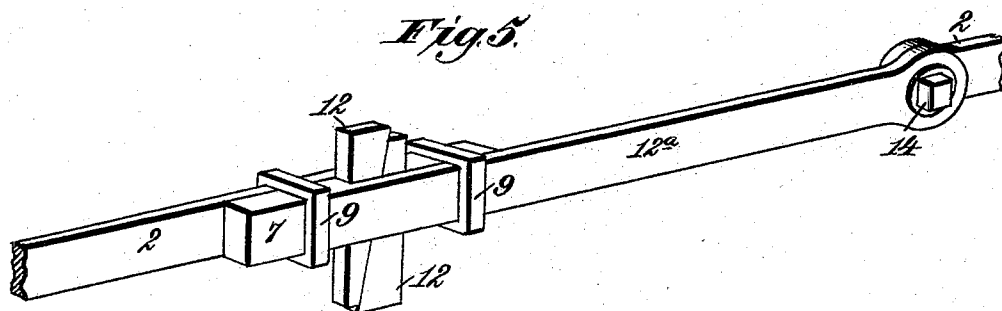
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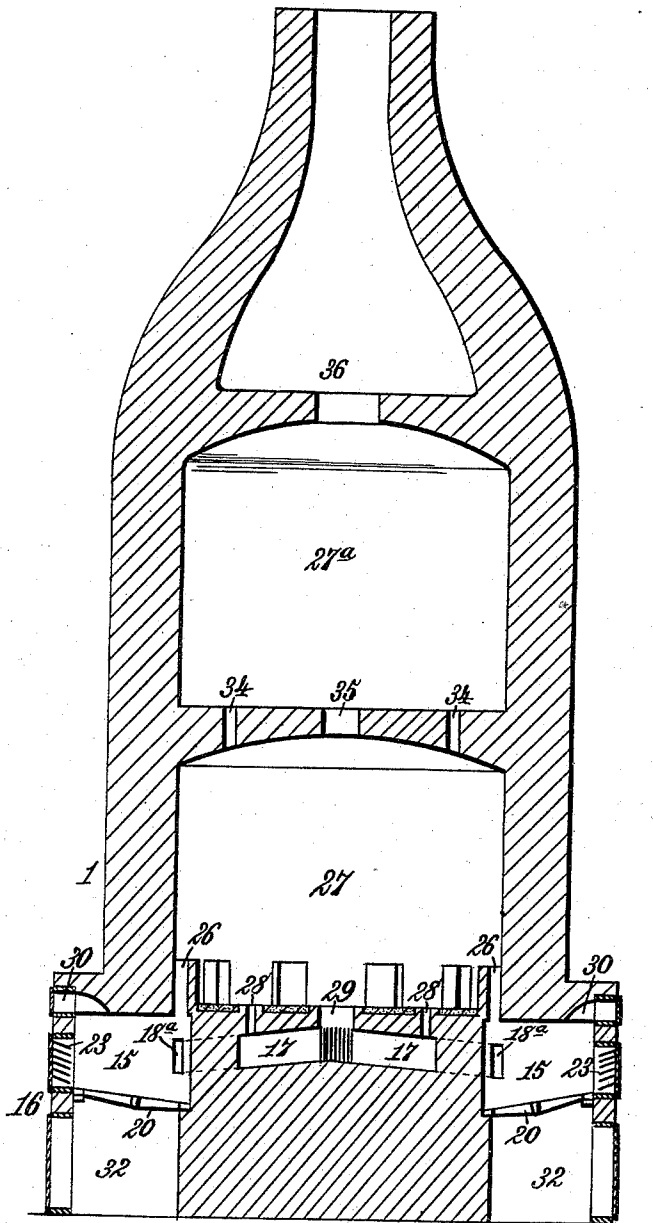
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Fig. 8.



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UNITED STATES PATENT OFFICE.

WERNER HERMANN ZIMMER AND OTTO GEORGE HESS, OF WHEELING,
WEST VIRGINIA, ASSIGNORS TO THE OHIO VALLEY CHINA COMPANY,
OF SAME PLACE.

POTTERY-KILN.

SPECIFICATION forming part of Letters Patent No. 488,413, dated December 20, 1892.

Application filed June 6, 1892. Serial No. 435,657. (No model.)

To all whom it may concern.

Be it known that we, WERNER HERMANN ZIMMER, a subject of the Emperor of Germany, but who has declared his intention of becoming a citizen of the United States, and OTTO GEORGE HESS, a citizen of the United States, both residing at Wheeling, in the county of Ohio and State of West Virginia, have invented new and useful Improvements in Pottery-Kilns, of which the following is a specification.

Our invention relates to kilns of the type employed in burning porcelain, terra-cotta, pipes, tiles and pottery of all descriptions.

It is the purpose of our invention to provide a novel and improved construction for kilns of this type, whereby the necessary high temperature shall be secured and an economy of time and fuel effected, these results being due to the more perfect and complete combustion which we secure by means of the introduction of considerable bodies of air, the temperature of which is raised before it is brought in contact with the fire, the volume of air being regulated as circumstances may require; the reduction of time required, in attaining the necessary temperature, being the indirect result of the intense heat due to this more perfect combustion and to the raised temperature of the air introduced.

It is our further purpose to provide means whereby an oxidizing flame without smoke may be produced, or a reducing flame with smoke, the products of combustion being either wholly, or partially consumed, as may be required, and the residue of ash being reduced to a minimum, by an extremely simple adjustment of the firing-mechanism.

It is another purpose of our invention to provide a pottery-kiln with a support, or binding, by which contraction and expansion, under opposite extremes of temperature, shall be resisted; to combine with such a binding, or support, simple means whereby the several parts thereof may be either relaxed, or placed under any required tension, to enable said binding or support, to be tightened when the kiln is cold, whereby cracking of the latter, due to excess of expansion and contraction, shall be avoided, and to so construct and combine said binding with the kiln that un-

obstructed access may be had, at any time, to the interior of the kiln through the ordinary entrance.

It is our purpose, finally, to simplify and improve the construction and operation of kilns employed in the ceramic art, and the firing devices thereof, and to the several ends proposed our invention consists in the novel features of construction and new combinations of parts hereinafter fully set forth and then particularly pointed out and defined in the claims which conclude this specification.

To enable others skilled in the art to which said invention belongs to understand and practice the same, we will proceed to describe in detail a firing-kiln in which our invention is embodied, reference being had, for such purpose, to the accompanying drawings, in which—

Figure 1 is an isometric projection, or elevation, of a firing-kiln constructed in accordance with said invention. Fig. 2 is an interior plan view of the same. Fig. 3 is a vertical section through a portion of the kiln, the section-plane being shown by the line 3—3, in Fig. 2. Fig. 4 is a horizontal section of a segmental portion of the firing-kiln, upon the line 4—4 of Fig. 3. Fig. 5 is a detail view of a portion of the exterior binding, or support, to show the construction of the joint connecting the ends, the means for tightening and relaxing the same, and the pivoted section in front of the entrance. Fig. 6 is a further detail view of the same parts. Fig. 7 is a detail view of one of the draft openings, or air-racks. Fig. 8 is a central vertical section of a kiln constructed in accordance with our invention, and having two tiers, a kiln-chamber being provided above the main kiln-chamber.

In the said drawings the reference numeral 1 indicates the inclosing wall of the kiln, which is of circular, or any other preferred form, and of dimensions suitable to the purpose, the same being known to those familiar with the art. Upon the exterior of this inclosing wall are placed binding or supporting girdles 2, which preferably consist of bands of iron, steel, or other suitable material, of such width and thickness as to enable them to resist the strain to which they are subjected. These girdles will usually be at least

two in number, and may be used in any number desired, according to the circumstances of each case. Between the said girdles and the exterior face of the wall of the kiln, are arranged a series of metal rails 3, placed vertically at substantially uniform intervals, the intervening spaces being, preferably, such as to prevent the girdles 2 from touching the wall at points between said rails. We may vary this interval, however, to any extent consistent with the accomplishment of the purposes in view. As shown in the drawings, these rails are arranged at intervals of about two feet.

In the present instance we have illustrated thirty-pound rails, of ordinary construction, as these answer the purpose remarkably well. It will be understood, however, that we do not confine our invention to this, or any other specific construction, as we may use any form of interposed device suitable for the purpose. In order to sustain the girdles, should the wall contract so far as to release their clamping engagement, a small shoulder, or bracket, 5 may be either formed, or mounted, at proper intervals upon the rails 3, or upon the exterior face of the wall 1. Or, we may employ any other form of support, which may be either positive or non-positive attachments. The ends of the bands forming the girdles are lapped upon each other, and are provided with thickened extremities 7, which form shoulders 8, arranged to lie adjacent to the inner faces of the overlapping portions of the ends. These portions are held against each other by means of loops 9, which closely surround both the overlapping portions, but permit their movement, one upon the other. In the opening or space between the shoulders 8, we insert two wedges 12, entering in opposite directions and acting upon the shoulders 8 to separate them, as said wedges are driven inward. This movement contracts the girdles and as the angle of the wedges 12 is small, great power may be exerted by them. When the kiln is cold and therefore contracted to about the limit of contraction, the wedges are driven up to the proper point, after which they need but little attention.

The entrance to the kiln is by way of the usual door 13, and as the entrance space is crossed by one or more of the girdles 2 it is desirable that provision be made for temporarily removing such an obstruction, or such obstructions, from this space. For this purpose, we divide the girdle, or each of the same, should more than one cross the entrance-space, the point of division being located upon one side of the said entrance. The arrangement is such that the joint connecting the overlapping ends of said girdle is upon the side of the entrance 13 opposite that upon which the point of division is located. The separate portion 12^a of the girdle, therefore will be of a length somewhat in excess of the width of the entrance. It is connected to the girdle by a pivoted joint 14. By dis-

connecting the wedges 12 and sliding the loops 9 off the overlapping portions, the pivotally attached sections 12 may be turned upon the pivotal connections and removed entirely from the front of the entrance, having the same wholly free from obstruction.

The firing apparatus is arranged in the foundation wall 16 of the kiln, and consists of a series of combustion chambers, 15 arranged at substantially equal intervals entirely around the same. These chambers communicate with blast-passages 17, which will be described presently, the avenues of communication being divergent flues 18, which open from the rear of the chamber 15 at or near the sides thereof and unite with each other and with the passages 17 at the point 19. Between the passages 17 are placed auxiliary passages 17^a, which are supplied by curved passages 18^a which open from the side of each combustion chamber at or near the rear (Figs. 3 and 4). Within said combustion chambers are arranged fire grates 20, composed of grate-bars, which are provided with lugs 21 to give the necessary strength and rigidity whenever the grates are subjected to great heat. The grate-bars, contrary to the arrangement in many kilns, have a rearward and downward inclination, the end next the fuel door being the highest. At this end the grate is at, or nearly at, the same level as the lower part of a frame 22, which incloses a draft-opening in the wall, through which air is admitted in such quantities as may be required. Within this opening are arranged inclined plates 23, having substantial parallelism with the plane of inclination of the grate 20. The draft-opening is closed by doors 24, having dampered openings 25. Opening from the rear of the combustion-chambers 15 are auxiliary draft passages 26, passing upward and discharging into the kiln-chamber 27. A further series of similar passages 28 connect the draft passages 17 with the kiln-chamber, being located just beyond the point 19 where the flues 18 unite with the passages 17. These passages 17 and the passages 17^a all run in lines radiating from a common center 29, which is the central part of the kiln chamber. At this point is a common discharge for all the passages centering therein, and from this discharge the heat from the passages tributary thereto is carried into the kiln-chamber 27 save, only, that entering by way of the passages 26 and 28. Above the draft openings in the outer wall are placed fuel-openings 30, closed by suitable doors 31, and below the combustion-chambers 15 and grates 20 are ash-pits, 32, access thereto being had by doors 33.

Our invention practically excludes the danger of the cracking of the wall of the kiln, which has always been a cause of injury and a source of expense, as the excessive expansions and contractions are extremely liable to disintegrate the walls rapidly. It provides,

also, a simple construction by which unobstructed entrance to and exit from the kiln may be had at any time. It will be noted, also, that inasmuch as the space below the grate is not sufficient in area to supply the volume of air required during certain stages of the process of firing, the draft-space, or opening, 22, is provided, and so arranged that air passing through the same must come in contact with the heated plates 23, while the air entering from beneath the grate will likewise be raised in temperature before it mingles with the products of combustion. There will, therefore, be no sudden chilling, or lowering of temperature, due to the influx of a large body of air of normal temperature. We are able, also, to produce a reducing flame with, or an oxydizing flame without smoke, by simply closing or opening the doors of the draft-space 22. It will be noted, also, that we provide means whereby large volumes of air may be admitted to the combustion-chambers, at any moment, the quantity, or volume, being suitably regulated. By this means, in conjunction with the ordinary draft from beneath the grate, we obtain a high temperature in a shorter time and with a more perfect combustion of the fuel and of the products of combustion, and thereby effect a material economy of time and fuel.

Our invention is entirely compatible with constructions similar to that shown in Fig. 8. In this figure, the body of the kiln is extended upward sufficiently to provide a second kiln-chamber 27^a, directly over the main chamber 27, which latter we have already referred to. Communication is had between the two chambers by means of the draft-openings 34, arranged at a suitable radial distance from a central opening 35. The heated gases, entering from the main chamber hereby, traverse the chamber 27^a and then pass through the central opening 36, above, whence they go to the stack. In other respects, the construction is not unlike that already explained. The lower arch, or chamber 27, is used for glazed ware and the upper deck, or chamber 27^a, for "biscuit" ware; or,—as it was once termed,—"bisque" ware, a term which is still used occasionally. The openings 26, leading directly from the rear, upper portion of the combustion-chamber 15 into the kiln-chamber 27, are preferably walled up for about one foot and nine inches, more or less, above the bottom of the kiln-chamber, as best seen in Figs. 3 and 8. This distance is sufficient to prevent the heat from becoming too intense upon the lower saggars. It may also be stated that all the openings into the kiln-chamber are, preferably, walled up, or inclosed, for about two inches above the floor, and the space intervening between the several inclosures, which rise above the surface of the floor, is filled with sand, giving a uniform foundation for saggars and causing the brick structure to wear better. This construction, which we have not mentioned in the specification at

any preceding point, is regarded as preferable, though it may not, in all cases, be used, or be equally desirable. It is substantially shown by Fig. 3 of the drawings.

What we claim is:—

1. In a pottery kiln, the combination with the inclosing wall thereof, of one or more girdles, surrounding the same at suitable intervals, and having their ends lapped and confined by loops, wedges engaging opposite shoulders on said overlapping ends for taking up any slack in said girdles produced by expansion and subsequent contraction of the wall of the kiln, and a series of vertical supports, interposed between the wall of the kiln and the surrounding girdles, substantially as described.

2. In a pottery kiln, the combination with the wall of girdles arranged upon its exterior face and tightly clasping the wall to prevent excessive expansion, said girdles having overlapping, shouldered ends confined by loops, and wedges engaging said shoulders to take up any slack in said girdles, the latter being provided, at points near the entrance-opening of the kiln, with pivotally attached sections, the pivotal point being upon one side of the said entrance and the overlapping ends of said sections upon the other side of said entrance-opening of the kiln, substantially as described.

3. In a pottery kiln, the combination with the combustion-chambers having grades inclined downward from their outer toward their inner ends, the higher ends being arranged adjacent to an air and fuel-supply opening of air-directing plates arranged in said opening at substantially the same angle with the grate, substantially as described.

4. In a pottery kiln, the combination with the wall of the kiln of surrounding girdles, one or more, their overlapping ends provided with opposite shoulders, wedges inserted between said shoulders and vertical rails interposed between the wall and girdles and supporting the latter, substantially as described.

5. In a pottery kiln, the combination with a kiln-chamber having a central heat passage in its floor, of a series of combustion chambers arranged about the foundation of the kiln, radial passages opening into said central passage and communicating with flues diverging from their outer ends and entering the rear of the combustion chambers at or near the sides thereof, a series of vertical heat passages entering the kiln-chamber and communicating with the radial passages last referred to and a separate series of vertical heat passages having communication with said kiln-chamber and with the combustion chambers direct, substantially as described.

6. In a pottery kiln the combination with a kiln-chamber having a central heat-passage in its floor, of two series of heat-passages radiating from said opening, one series supplied by flues which open from the rear of the combustion-chambers on both sides the median

line thereof and converge to points of communication with said passages, between the said combustion-chambers and the central heat-passage and the second series alternating with the first and supplied from curved passages opening through the adjacent lateral walls of the combustion-chambers, at or near the rear of said chambers, substantially as described.

7. In a pottery kiln, the combination with a kiln-chamber of a series of combustion-chambers arranged around the same and having heat-passages communicating therewith, a corresponding series of draft-openings in the front wall inclosing the combustion-chambers and above the outer ends of the downwardly

and rearwardly inclined grates therein, each draft-opening having a series of air-directing and air-heating plates, arranged at an angle substantially equal to the angle of inclination to the fire-grates, and means for regulating the admission of air, or entirely cutting off the same, substantially as described.

In testimony whereof we have hereunto set our hands and affixed our seals in presence of two subscribing witnesses.

WERNER HERMANN ZIMMER. [L. S.]
OTTO GEORGE HESS. [L. S.]

Witnesses:

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