The present invention relates in general to improvements in the art of heat transfer, and relates more specifically to improvements in the construction of checkerwork brick structures for heat accumulators or the like.

As indicated in Patent #1,610,575, granted December 14, 1926, it has heretofore been common practice to utilize checkerwork brick structures composed of superimposed transversely extending courses or rows of fire-brick or the like resting upon each other in regenerators, recuperators, air or gas heaters, and for similar heat transfer purposes. It has been found, that while this type of checkerwork effectively functions as a heat accumulator, the structure is frequently subjected to stresses which tend to throw the individual bricks or rows of bricks out of normal position. These stresses may result from various causes such as explosions of combustible mixtures within or adjacent to the checkerwork, settling of the foundation, and vibration of the structure; and may cause the individual bricks or courses to be displaced sufficiently to produce partial or even complete collapse of the checkerwork. This situation will prevail whether the bricks are solid or of hollow formation especially when the weight of the bricks alone is depended upon to hold them in place, and creates a dangerous condition especially in relatively large heat transfer structures.

It is therefore an object of the present invention to guard against such possible distortion or collapse of checkerwork structures, by providing simple and effective means for locking the bricks in place without otherwise interfering with the utility of the structures for their intended purposes. By positively locking the individual bricks and the courses in place, the rigidity of the entire structure is materially enhanced, and the effectiveness of the accumulator may be increased to a maximum by utilizing locking elements constructed of fire brick or other suitable heat absorbing material. The improved locking means may also be readily utilized to hold the entire brick structure in place upon its foundation or within a confining wall, and effectively eliminates possible relative shifting of the individual brick, twisting and distortion of the rows, or separation of the elements forming the checkerwork.

These and other objects and advantages will be apparent from the following detailed description.

Claim 1:

1. A method of constructing the brick and of assembling the same into checkerwork accumulator structures, which comprises the steps of:

a. Providing a foundation for the checkerwork brick structure;

b. Placing transversely extending courses or rows of fire-brick or the like between or upon each other;

c. Providing means for locking the bricks or courses together;

d. Fastening the checkerwork brick structure to the foundation.

Claim 2:

2. The method of claim 1, wherein the means for locking the bricks or courses together comprise at least one of the following:

a. Locking elements constructed of fire brick or other suitable heat absorbing material;

b. Locking elements formed of a material having a lower coefficient of thermal expansion than the bricks or courses;

c. Locking elements formed of a material having a higher coefficient of thermal expansion than the bricks or courses;

Claim 3:

3. The method of claim 1, wherein the checkerwork brick structure comprises:

a. A plurality of bricks or courses of fire-brick or the like;

b. A plurality of locking elements;

c. A foundation.

Claim 4:

4. The method of claim 3, wherein the locking elements are provided in at least one of the following locations:

a. Between the bricks or courses;

b. Between the checkerwork brick structure and the foundation;

c. On the foundation.

Claim 5:

5. The method of claim 4, wherein the locking elements comprise at least one of the following:

a. Dowel connections having square cross-section;

b. Dowel connections having circular cross-section;

c. Dowel connections having rectangular cross-section.

Claim 6:

6. The method of claim 5, wherein the locking elements are utilized to:

a. Connect the checkerwork brick structure to the foundation;

b. Connect the checkerwork brick structure to the foundation and to the locking elements themselves;

c. Connect the checkerwork brick structure to the foundation and to the locking elements, and to the locking elements themselves.

Claim 7:

7. The method of claim 6, wherein the locking elements are utilized to connect the checkerwork brick structure to the foundation, and the locking elements themselves, as follows:

a. To form a checkerwork brick structure having gas conducting passages or spaces along.

Claim 8:

8. The method of claim 7, wherein the checkerwork brick structure comprises:

a. A plurality of bricks or courses of fire-brick or the like;

b. A plurality of locking elements;

c. A foundation.

Claim 9:

9. The method of claim 8, wherein the locking elements are provided in at least one of the following locations:

a. Between the bricks or courses;

b. Between the checkerwork brick structure and the foundation;

c. On the foundation.

Claim 10:

10. The method of claim 9, wherein the locking elements comprise at least one of the following:

a. Dowel connections having square cross-section;

b. Dowel connections having circular cross-section;

c. Dowel connections having rectangular cross-section.

Claim 11:

11. The method of claim 10, wherein the locking elements are utilized to:

a. Connect the checkerwork brick structure to the foundation;

b. Connect the checkerwork brick structure to the foundation and to the locking elements themselves;

c. Connect the checkerwork brick structure to the foundation and to the locking elements, and to the locking elements themselves.

Claim 12:

12. The method of claim 11, wherein the locking elements are utilized to connect the checkerwork brick structure to the foundation, and the locking elements themselves, as follows:

a. To form a checkerwork brick structure having gas conducting passages or spaces along.

Claim 13:

13. The method of claim 12, wherein the checkerwork brick structure comprises:

a. A plurality of bricks or courses of fire-brick or the like;

b. A plurality of locking elements;

c. A foundation.

Claim 14:

14. The method of claim 13, wherein the locking elements are provided in at least one of the following locations:

a. Between the bricks or courses;

b. Between the checkerwork brick structure and the foundation;

c. On the foundation.

Claim 15:

15. The method of claim 14, wherein the locking elements comprise at least one of the following:

a. Dowel connections having square cross-section;

b. Dowel connections having circular cross-section;

c. Dowel connections having rectangular cross-section.

Claim 16:

16. The method of claim 15, wherein the locking elements are utilized to:

a. Connect the checkerwork brick structure to the foundation;

b. Connect the checkerwork brick structure to the foundation and to the locking elements themselves;

c. Connect the checkerwork brick structure to the foundation and to the locking elements, and to the locking elements themselves.

Claim 17:

17. The method of claim 16, wherein the locking elements are utilized to connect the checkerwork brick structure to the foundation, and the locking elements themselves, as follows:

a. To form a checkerwork brick structure having gas conducting passages or spaces along.
the longitudinal sides or faces of the bricks 15. The adjacent ends of the bricks 15 substantially abut and are provided with semi-circular recesses 19 formed concentric with the line of intersection of the planes of the courses 16, 17, and the foundation 18 may be provided with holes 20 also formed concentric with the recesses 19. Dowel pins 21 may be dropped from above into the vertical pockets formed by the recesses 19 and the holes 20, and if the pins 21 are made of lengths equal to the height of each brick 15 and the holes 20 have depths equal to one-half of the length of a pin 21, these pins will be staggered as shown, with respect to the planes of coaction of the successive superimposed rows. This formation and disposition of the pins 21, not only prevents relative shifting of the individual bricks 15 of each course 16, 17, but also locks the successive rows against displacement relative to each other. Since the bricks 15 are ordinarily formed of fire clay, the pins 21 may also be formed of the same material, and the recesses 19 and holes 20 are formed of sufficient size to provide clearance for free insertion of the pins 21.

Referring to Figs. 3 and 4, the bricks 32 are of tubular construction and have beveled corners provided with recesses 23 within which dowel pins 24 are insertible from above when the bricks 22 have been assembled into a checkerwork structure. These bricks 22 may likewise be arranged in superimposed rows or courses to form a checkerwork wherein the successive hollow bricks are staggered with respect to each other both vertically and horizontally. When the tubular bricks 22 are assembled, the recesses 23 again provide vertical holes which may be caused to register with holes 20 in the foundation 18, and the pins 24 may be dropped into these vertical holes to lock the individual bricks 22 of each course, as well as the successive courses, against displacement.

Referring specifically to Figs. 5 and 6, the solid rectangular bricks 25 are again disposed in superimposed horizontal rows or courses 26, 27 which extend in planes substantially perpendicular to each other, and providing a checkerwork having gas conducting passages therein. The adjacent ends of the bricks 25 abut each other and are provided with upper and lower substantially triangular projections 28 which form upper and lower recesses 29 cooperating with similar recesses in the adjoining brick to provide locking grooves formed concentric with the lines of intersection of the planes of the courses 26, 27.

The grooves formed by the recesses 29 are adapted to receive continuous ring-like locking members 30 which constitute loops embracing the lower adjoining projections 28 of the bricks of an upper course 26, and the upper adjoining projections 28 of the bricks of the adjacent lower course 27. The members 30 may be formed of the same material as the bricks 25, and may be dropped vertically within the recesses 29 at the upper portions of the adjoining bricks when the structure is assembled, and the successive rows may be built upon the previous courses by merely piling the bricks 25 and members 30 upon each other in an obvious manner. The loop members 30 of this embodiment, not only prevent lateral displacement of the adjoining bricks 25 of each row and of the adjacent courses 26, 27, but also prevent separation of the bricks 25 thus providing a positive interlock.

Referring to Figs. 7 and 8, the special hollow bricks 32 are also disposed in superimposed substantially straight horizontal rows or courses 33, 34 extending transversely of each other, and provide an open checkerwork for the passage of gases therethrough. The adjacent ends of the bricks 32 are provided with substantially semi-circular vertical recesses 35 which may cooperate with holes 36 in the foundation 18 to provide vertical holes for the reception of cylindrical dowel pins 38. These pins 38 function identically the same as in the embodiment of Figs. 1 and 2, and may again be formed of the same material as the bricks 32. The special bricks 32 provide relatively grooved 39 for surface, and the retaining pins 36 in no way interfere with the flow of the gases through the checkerwork and may be readily inserted within the recesses 35 and holes 20 in the manner previously described.

With reference to Fig. 9, the bricks 37 are similar to those of Figs. 7 and 8, but have their ends provided with rectangular recesses 38 adapted to receive square locking pins 39. Otherwise, the structure of Fig. 9 is the same as that previously described, but it may provide a firmer interlock between the brick ends and the rows 33, 34.

Referring to Figs. 10 and 11, the hollow bricks 40 are likewise similar to the bricks 32, 37 previously described, but have their upper and lower opposite ends provided with substantially semi-circular projections 41 forming recesses 32 adapted to receive annular ring-like locking members 42. This structure may be assembled into a checkerwork form in a manner similar to that of Figs. 5 and 6, and also serves to provide a positive interlock between the adjacent ends of the bricks 40 and between the adjoining rows or courses. The members 43 may again be formed of fire-clay, and embrace the lower projections 41 of the bricks 40 of an upper row and the upper projections 41 of the bricks of the adjoining lower row. The foundation 44 may be provided with annular recesses 45 to receive the lowermost ring members 46, thus positively preventing shifting of the checkerwork structure thereon.

From the foregoing description it will be apparent that the present invention provides simple, compact and effective means for maintaining a checkerwork of bricks in alignment and for preventing undesirable distortion and possible collapse thereof. The retaining members do not obstruct the gas passages within the accumulator, and may be readily applied when the bricks are assembled. The fasteners eliminate necessity of utilizing pastes or mortar to hold the bricks together, and being composed of the same material as the brick, they enhance rather than impair, the heat transfer. The connectors can be readily produced at moderate cost, and do not materially enhance the cost of the bricks with which they are adapted to cooperate. It should be made clear that it is not desired to limit the invention to the exact details of construction herein shown and described, for various modifications within the scope of the claims may occur to persons skilled in the art.

It is claimed and desired to secure by Letters Patent:

1. A heat accumulator comprising, superimposed rows of bricks lying in intersecting planes and having the adjacent brick ends lying substantially in the planes of intersection, and means disposed coaxial with the lines of intersection and coacting with the adjacent ends of the bricks of several adjoining rows for preventing relative displacement of the rows and lateral shifting of the bricks in each row.
2. A heat accumulator, comprising, superimposed horizontal courses of brick, alternate courses lying in the same planes which intersect the planes of the intermediate courses and the ends of the individual bricks lying substantially in the planes of intersection, and means coating with the adjoining brick ends of alternate and intermediate rows for preventing relative displacement of the rows and of the individual bricks.

3. A heat accumulator comprising, a plurality of alternate and intermediate courses of brick forming a checkerwork having gas conducting passages therein, the alternate courses lying in planes which intersect the planes of the intermediate courses, and means disposed substantially coaxial with the lines of intersection of said planes for locking the coating courses against relative displacement.

4. A checkerwork heat accumulator comprising, coating rows of end coating bricks, and means for locking adjacent bricks against spreading and the adjoining rows against displacement relative to each other.

5. A checkerwork heat accumulator comprising, coating superimposed rows of end coating bricks extending transversely of each other, and means interposed between the adjacent ends of bricks of adjoining rows for preventing horizontal relative displacement of said bricks and of said rows.

6. A checkerwork heat accumulator comprising, transversely extending rows of end coating bricks resting one row upon another, and retaining means coating with several bricks of coating rows for preventing relative displacement of the rows, said means being formed of the same material as the bricks and being freely vertically inser tible to assemble the structure.

7. A checkerwork heat accumulator comprising, coating fire-brick forming a network of gas conducting passages on all longitudinal faces of the bricks, and means coating with grooves in the ends of the brick for preventing relative displacement thereof.

8. A checkerwork heat accumulator comprising, horizontal courses of hollow bricks, successive of said courses crossing each other and the bricks of one course having ends overlapping those of the adjoining courses, and vertically insertible retaining means coating with the bricks of adjoining courses for preventing relative displacement thereof, said means avoiding obstruction to the passages through and around said bricks.

9. A checkerwork heat accumulator comprising, superimposed courses of end coating bricks disposed at an angle to each other, each of said bricks having projections at the ends thereof, and means embracing the projections of several adjacent bricks for preventing separation thereof.

10. A checkerwork heat accumulator comprising, superimposed courses of end coating bricks disposed at an angle to each other, each of said bricks having projections at the ends thereof, and means embracing the projections of several adjacent bricks of the same and of adjoining courses for preventing separation thereof.

11. A checkerwork heat accumulator comprising, superimposed courses of end coating bricks disposed at an angle to each other, each of said bricks having projections at the ends thereof, and continuous loop members formed of the same material as said bricks and embracing the projections of several adjacent bricks for preventing separation thereof.

12. A checkerwork heat accumulator comprising, superimposed courses of hollow end coating bricks, each of said bricks having end projections, and means embracing the projections of several adjacent bricks of the same and of adjoining courses for preventing separation thereof, said means avoiding obstruction through and around said bricks.

13. A checkerwork heat accumulator comprising, superimposed courses of hollow end coating bricks, each of said bricks having end projections, and means coating with the projections of several adjacent bricks of the same and of adjoining courses for preventing separation thereof, said means avoiding obstruction through and around said bricks.

14. A checkerwork heat accumulator comprising, superimposed courses of hollow end coating bricks, each of said bricks having end projections, and continuous loop members formed of the same material as said bricks and embracing the projections of several adjacent bricks of the same and of adjoining courses for preventing separation thereof, said means avoiding obstruction through and around said bricks.

15. A heat accumulator, comprising, superimposed horizontal courses of bricks, alternate courses lying in the same planes which intersect the planes of the intermediate courses and the ends of the individual bricks lying near the lines of intersection of said planes, and means coating with end portions of the individual bricks of each row for preventing relative displacement thereof.

16. A checkerwork heat accumulator comprising, coating superimposed rows of end coating hollow bricks extending transversely of each other, and means interposed between the adjacent ends of the adjacent bricks of a row and coating with the adjacent bricks of an adjoining row for preventing horizontal relative displacement of said bricks and of said rows.

17. A checkerwork heat accumulator comprising, coating superimposed rows of end coating hollow bricks extending transversely of each other, the adjacent ends of said bricks in each row being provided with registering recesses, and means disposed within each set of said registering recesses and coating with the bricks of an adjoining row for preventing horizontal relative displacement of said recessed hollow bricks and of said adjoining row.

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