United States Patent

[11] 3,591,153

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[73] Assignee **Koppers Company, Inc.**

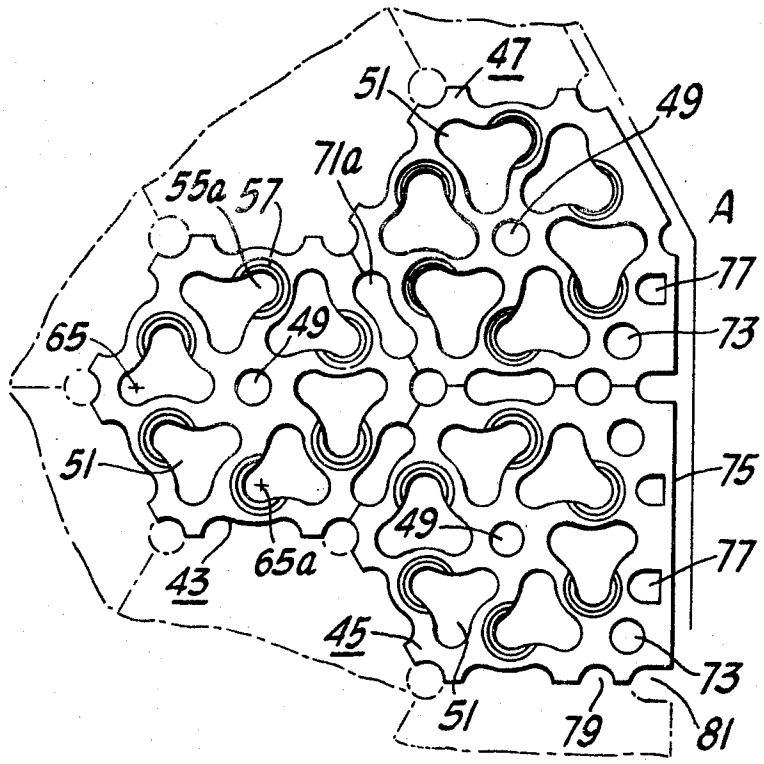
[54] **INTERLOCKING CHECKER BRICKS AND CHECKER SHOES FOR A BLAST FURNACE STOVE**
13 Claims, 13 Drawing Figs.

[52] U.S. Cl. 263/51, 263/19
[51] Int. Cl. F23l 15/02
[50] Field of Search 263/19, 51

[56] References Cited
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Attorneys—Sherman H. Barber, Oscar B. Brumback and Olin E. Williams

ABSTRACT: Interlocking checker bricks and checker shoes for a blast furnace stove include special refractory bricks and special metallic shoes that coact with each other and with the structure of the stove to form a unitary checker mass within the stove.



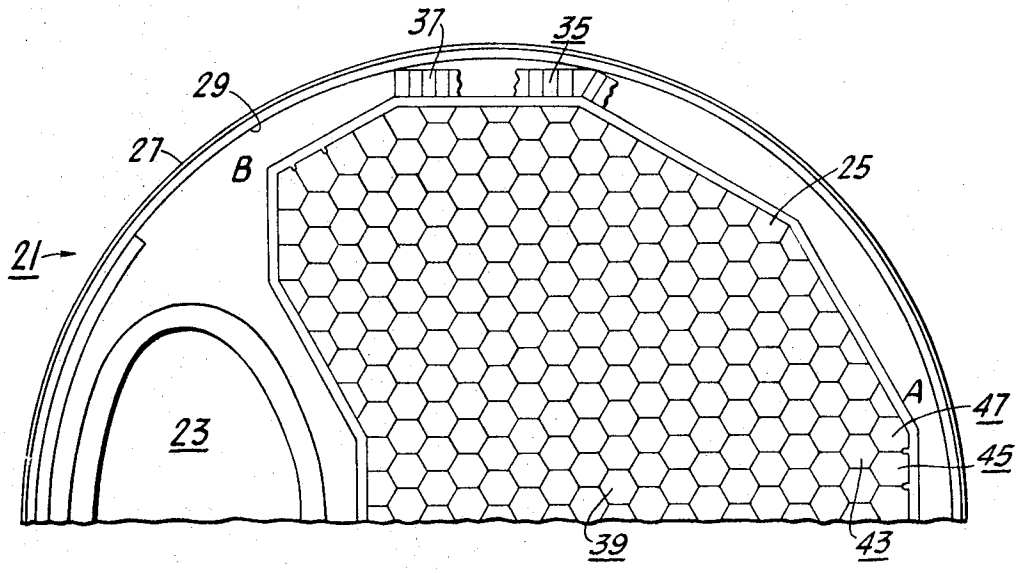


FIG. 1

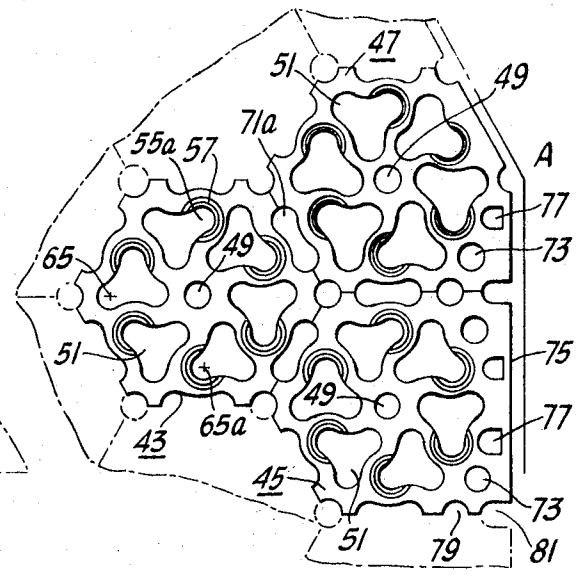


FIG. 2

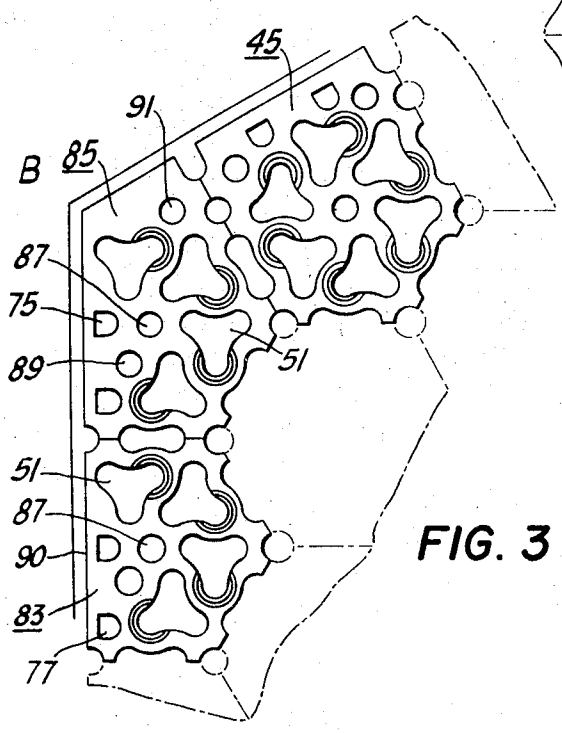


FIG. 3

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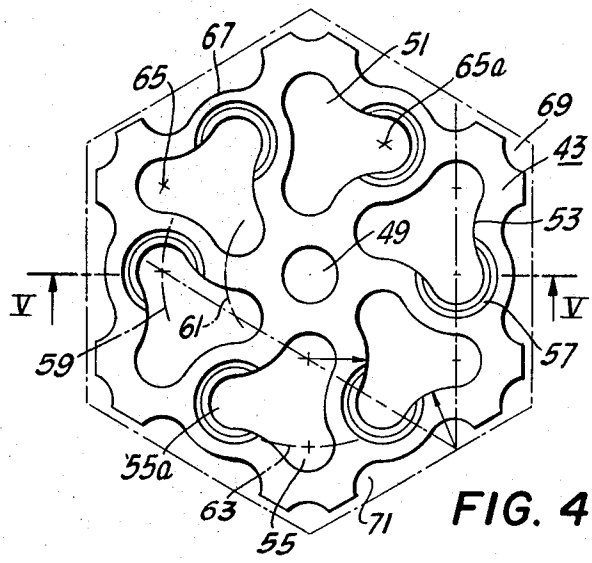


FIG. 4

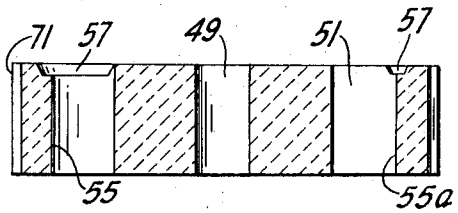


FIG. 5

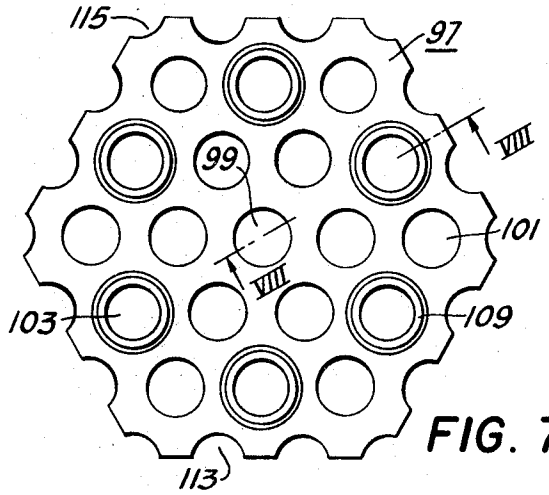


FIG. 7

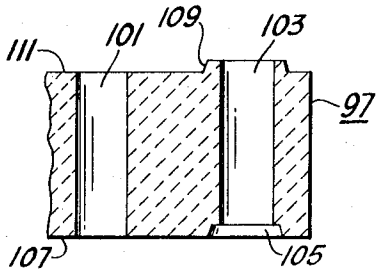


FIG. 8

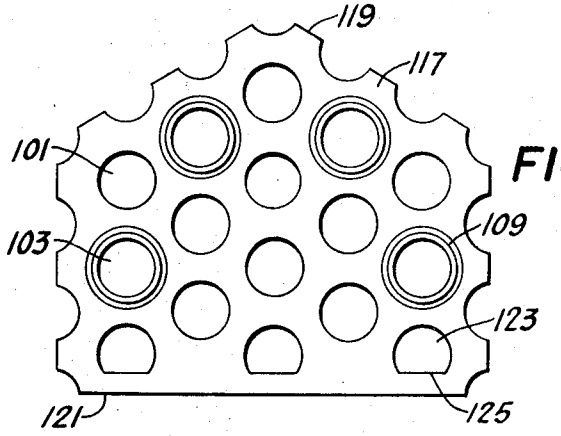


FIG. 9

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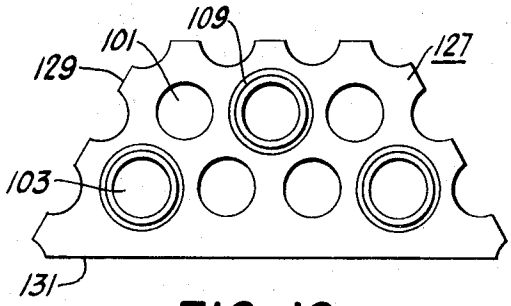


FIG. 10

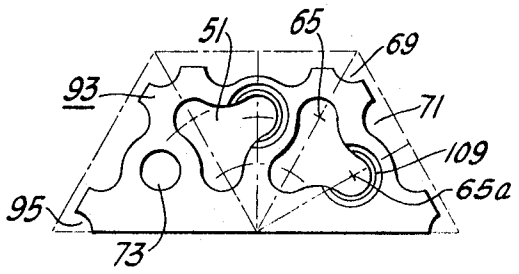


FIG. 6

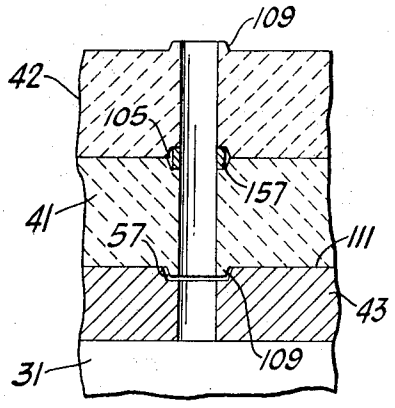


FIG. 13

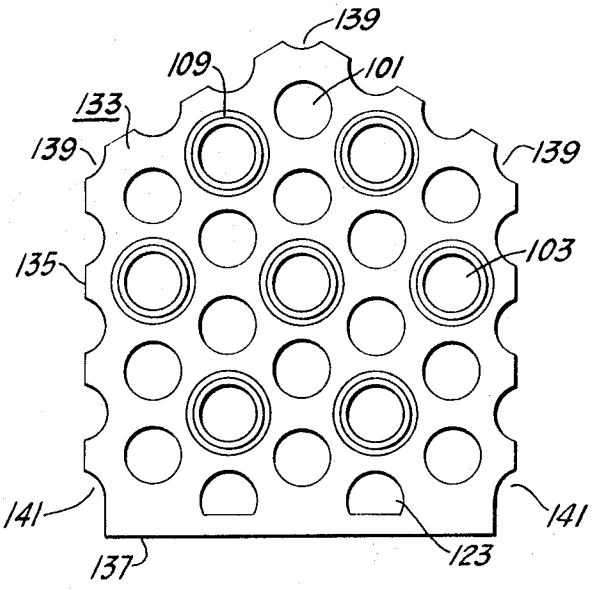


FIG. 11

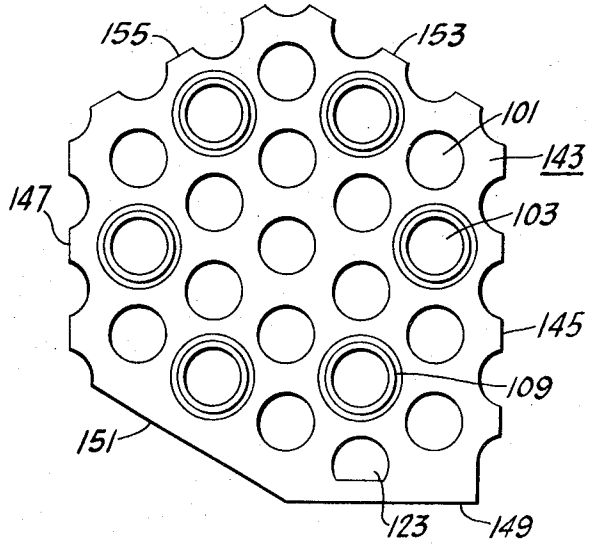


FIG. 12

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INTERLOCKING CHECKER BRICKS AND CHECKER SHOES FOR A BLAST FURNACE STOVE

BACKGROUND OF THE INVENTION

This invention relates to stoves for use with a blast furnace, and more particularly, to an improved checkerwork brick structure and checker shoe structure for use within a blast furnace stove.

Conventional stoves of the two-pass type, which are the type generally preferred, include a side-combustion chamber and a checkerwork chamber wherein a multiplicity of checker bricks are located. The checker bricks are supported upon a grid structure and a single course of checker shoes is disposed between the first course of checker bricks and the grid structure.

In the prior art, there are many types of checker bricks and checker shoes, and each type has its particular features and advantages. The present invention, however, includes features and advantages not heretofore known in the prior art which improve the efficiency of the stove and avoid known deficiencies in the structures available from the prior art.

SUMMARY OF THE INVENTION

The invention comprises checker shoes and checker bricks having shapes that provide for interfitting of the shoes and interfitting of bricks in horizontal courses in a blast furnace stove whereby elongate vertical flues are formed by holes in one course matching with holes in contiguous courses above and below. The shoes and the bricks have holes arranged in specific locations as well as scalloped edges that become holes when bricks abut bricks in a course of bricks, and when shoes abut shoes in a course of shoes.

For a further understanding of the invention and for features and advantages thereof, reference may be made to the following description in conjunction with the drawings which show for the purpose of exemplification one embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a schematic plan view of a portion of a blast furnace stove showing an arrangement of checker bricks in accordance with the invention;

FIG. 2 is a plan view of an arrangement of checker shoes in region A of FIG. 1;

FIG. 3 is a plan view showing an arrangement of checker shoes in region B of FIG. 1;

FIG. 4 is a plan view of a full hexagonal checker shoe;

FIG. 5 is a sectional view along line V–V of FIG. 4;

FIG. 6 is a plan view of a one-half checker shoe;

FIG. 7 is a plan view of a full hexagonal checker brick;

FIG. 8 is a sectional view along line VIII–VIII of FIG. 7;

FIG. 9 is a plan view of a three-quarters checker brick;

FIG. 10 is a plan view of a one-half checker brick;

FIG. 11 is a plan view of an edge checker brick;

FIG. 12 is a plan view of a special checker brick; and

FIG. 13 is a typical sectional view in elevation through the grid structure, with checker shoes and the two lowermost courses of checker bricks supported on the grid structure.

DETAILED DESCRIPTION

FIG. 1 illustrates an arrangement of checker bricks in a conventional two-pass type of blast furnace stove 21 having a conventional side-combustion chamber 23, and a checker work chamber 25. The stove 21 is a generally cylindrical vertical unit having an outer shell 27, and an inner lining 29, both of conventional construction.

A conventional grid structure 31 (FIG. 13), which is supported in the usual manner on columns (not shown) within the lower part of the stove 21, also supports a checkerwork mass 39 comprised of checkerwork shoes 43 and checkerwork bricks 41, 42. Between the checkerwork mass 39 and the inner lining 29 there is a conventional profile wall 35 that is comprised of refractory shapes 37.

As is conventional, a mass of interlocking checker bricks 39 are arranged in courses within the checkwork chamber 25, and the lowermost course of checker bricks 41 (FIG. 13) cooperates with a single course of checker shoes 43 lying on and supported by the grid 31. Above the lowermost course of checker bricks 41, and lying contiguous therewith is a second course of checker bricks 42 which cooperate with the first course of checker bricks in a manner to be described hereinafter.

FIG. 2 illustrates an arrangement of checker shoes in the region A of FIG. 1, and such arrangement is comprised of a full hexagonal checker shoe 43, an edge shoe 45, and a special checker shoe 47.

The full hexagonal checker shoe 43 is also shown at a slightly larger scale in FIG. 4. The hexagonal shoe 43 has a central cylindrical axial hole 49 and six other triangular-shaped holes 51 having the shape shown in FIGS. 2 and 4.

The triangular-shaped holes 51 are generally equilaterally shaped, having arcuate sides 53 joined to rounded apices 55. One rounded apex 55*a* merges with a recess 57 in one surface of the checker shoe 43. It will be noted that the centers of the rounded apices 55*a* of the several triangular-shaped holes 51 lie on a circle 59 that is concentric with the circular central hole 49. The other rounded apices 55 lie on concentric circles 61, 63, having the same center as circle 59. It will be noted further that the centers 65 of the rounded apices 55 lie on diagonals of the hexagon passing through the apices, and that the centers 65*a* of the rounded apices 55*a* lie on the perpendicular bisectors of the sides of the hexagon shaped shoe 43.

The perimetrical surface 67 of the full hexagonal shoe 43 is scalloped, with a one-third hole notch 69 at the apices of the hexagonal shoe 43. Midway along the permetrical surface 67 of each side of the shoe 43, there is another notch 71 which is one-half of the elongate oval hole 71*a* formed by two abutting shoes; such hole shape being shown in FIG. 2 and 3.

FIG. 2 also shows the edge shoe 45 which has five sides. The edge shoe 45 has a plurality, six in number, of the triangular-shaped holes 51, and these holes are arranged about a central cylindrical hole 49, with a pair of other cylindrical holes 73 located near the one straight edge 75 of the shoe 45. Between the lower cylindrical holes 73 there are two other holes 77 having a shape defined by two straight parallel sides, a straight bottom and a semicircular top.

The perimeter of the edge shoe 45 is scalloped in the same way as the full hexagonal shoe 43, except that the one edge adjacent the profile wall 35 is straight. The two parallel edge surfaces have, besides the one-half notch 71, a one-half cylindrical hole notch 79, and a one-half other notch 81, shaped as shown in FIG. 2.

The special shoe 47 has a plurality of sides, six in number, and there are a plurality, six in number, of triangular-shaped holes 51 surrounding a central cylindrical hole 49. The triangular holes 51 are arranged in the same way as the triangular-shaped holes 51 in shoes 43 and 45. The special shoe 47 also has one of the holes 77, and one of the other cylindrical holes 73 located about where shown in FIG. 2.

In the region B of FIG. 1, shown in detail in FIG. 3, there are an edge shoe 45, described hereinbefore, a three-quarters shoe 83, and a special shoe 85.

The three-quarters shoe 83 has five sides, with four triangular-shaped holes 51 arranged about a cylindrical hole 87 that is placed in the same relative location as the hold 49 in the edge shoe 45 and the hexagonal shoe 43. The shoe 83 also has an additional cylindrical hole 89 and two other holes 77 that are located about where shown in FIG. 3. Four of the five sides of the three-quarters shoe 83 are scalloped as shown; the notches at the apices and along the side surfaces being like those described previously herein. The three-quarters shoe 83 has one straight side 90 which is disposed adjacent to the vertical plates 33 outlining the perimeter of the checkerwork mass in the checkerwork chamber 25.

The special shoe **85** has five sides and an arrangement of holes that are substantially like the arrangement of holes in the three-quarters shoe **83**, except that one additional cylindrical hole **91** is located where shown in FIG. **3**. The sides of the special shoe **85** are scalloped like those of the three-quarters shoe **83**, except that two adjacent sides of the special shoe **85**, those sides which are adjacent the profile wall **35** are not scalloped.

FIG. **6** illustrates a four-sided one-half shoe **93** which has two triangular-shaped holes **51** and one cylindrical hole **73**, arranged as shown. Three of the four sides of the one-half shoe **93** are scalloped; the notches being similar to the notches **69** at the corners, and to the notches **71** along the sides of the hexagonal shoe **43**. The two lower corners of the one-half shoe **93** are notched to provide one-sixth hole notches **95**.

FIG. **7** illustrates a regular hexagonal checker brick **97** that is provided with a central axial hole **99** and a plurality of other holes therethrough, arranged in a generally regular manner. The checker brick **97** has a plurality of straight cylindrical holes **101** and recessed holes **103**; there being a recess **105** surrounding the hole **103** in one surface **107** of the brick **97** and a protrusion **109** around the hole **103** on the opposite surface **111** of the checker brick **97**. The protrusions **109** of one brick coact with and match with the recesses **105** in a contiguous checker brick and also with the recesses **57** in a contiguous shoe.

The holes **99**, **101**, **103** are disposed along lines that are parallel to the sides of the hexagonal checker brick **97**, with a recessed hole **103** being located adjacent the midlength point of each side of the checker brick **97**.

The perimetrical sides of the checker brick **97** are scalloped as shown; there being two one-half hole notches **113** in each side surface and a one-third hole notch **115** at each apex of the hexagonal-shaped checker brick **97**.

FIG. **9** illustrates a three-quarters checker brick **117** that has five side surfaces; four side surfaces **119** are scalloped like the sides of the hexagonal checker brick **97**, and one side surface **121** is straight and not scalloped. The three-quarters checker brick **117** has a plurality of straight cylindrical holes **101**, recessed holes **103**, and other holes **123**. The holes **123**, in cross section, are segments of a circle, with bottoms **125** (chords of the circular cross section) that are parallel to the straight side **121**.

FIG. **10** illustrates a one-half checker brick **127** with three scalloped side surfaces **129**, and one straight side surface **131**. The one-half checker brick **127** has a plurality of the straight cylindrical holes **101**, and a plurality of the recessed holes **103**, as shown in FIG. **8**. The holes **101**, **103** are disposed in rows that are parallel to the sides **129**, with the recessed hole **103** located adjacent the midpoint of the length of the side surfaces **129**.

FIG. **11** illustrates an edge checker brick **133** having four scalloped side surfaces **135** and one straight side surface **137**. The edge checker brick **133** also has a plurality of the straight cylindrical holes **101**, a plurality of the recessed holes **103**, and a plurality of the other holes **123** having a circular segmental cross section. The holes **101**, **103** are disposed in rows that are parallel to two of the scalloped parallel sides **135** that are perpendicular to the straight side **137**, about as shown in FIG. **11**. The three upper apices of the edge checker brick **133** are one-third hole notches **139**, like the notches **115** in checker brick **97**; but, at the bottom there are corner notches **141** that are one-half of an elongated notch like the notch **81** in the edge shoe **45**.

A special-shaped checker brick **143** is shown in FIG. **12** and it has six side surfaces; two surfaces **145**, **147** being scalloped and parallel, and two other side surfaces **149**, **151** being straight, while the two other scalloped surfaces **153**, **155** are angularly disposed toward the parallel side surfaces **149**, **151**. The special-shaped checker brick **143** has a plurality of holes **101**, **103** in it, and the holes are arranged in rows that are parallel to the parallel side surfaces **145**, **147**; there being only one other hole **123** located adjacent the side surface **149**, as shown in FIG. **12**.

FIG. **13** illustrates how the checkerwork shoes **43**, the grid structure **31**, and the first two courses of checker bricks **41**, **42** are arranged. The checker shoes **43** are so positioned that the recess **57** of each shoe mates with a protrusion **109** on the other surface **111** of the first course of checker bricks **41**. The surface **107** of the checker bricks **41**, having a recess **105**, therein, is contiguous with the surface **107** of the checker bricks in course **42**. A cylindrical tubular sleeve **157** is located in the matching recesses **105** of the checker bricks in courses **41**, **42** as shown. Such a tubular sleeve **157** acts to interlock the checker bricks in courses **41**, **42**. The checker bricks are then disposed in regular horizontal courses above course **42** within the checkerwork chamber **25**, and the protrusions **109** of one course of checker bricks interlock with the recesses **105** of the checker bricks in the next contiguous course of checker bricks immediately above the one course of checker bricks.

From the foregoing description, one skilled in the art will recognize several significant features and advantages among which are:

That each checker brick interlocks with other checker bricks to form an interlocking checker brick mass; the greater percentage of the checker bricks being interlocked to six other checker bricks. That is to say, three of the six checker bricks are in the contiguous course immediately below, and three of the six checker bricks are in the contiguous course immediately above a particular checker brick;

That a particular checker brick in any course, except the topmost course, cannot be displaced laterally because of the mutual interconnection between the checker bricks in the courses above and below the particular checker brick. But, as to the bricks in the topmost course, they are interconnected each to the three bricks in the next lower course and they are thereby prevented from shifting laterally;

That the upstanding protrusions in all courses of checker bricks except the lower most course make it easier to fit checker bricks in one course to the checker bricks in the immediately contiguous lower course since there are no recesses in the top surface of the lower course which can become filled with dirt and dust and chips of the refractory material. Therefore, the laying of one course of checker bricks upon another course of checker bricks is accomplished more quickly and advantageously; and

That the tubular sleeves placed in matching recesses of the first and second courses of checker bricks provide effective interlocks between these two courses of checker bricks.

While the invention has been described in connection with a two-pass type of stove, it would be understood by those skilled in the art that the invention is not limited to use in such stoves only. The interlocking checker bricks and checker shoes may be used in stoves of the single-pass type as well.

While the invention has been described herein with a certain degree of particularlity, it is understood that the disclosure has been made as an example and that the scope of the invention is defined by what is hereinafter claimed.

What we claim is:

1. A checkerwork brick of hexagonal form comprising:

a. six side surfaces and parallel top and bottom surfaces that are substantially perpendicular to the side surfaces,

b. said checkerwork brick being pierced through by a first hole at its geometric center and by six second holes disposed equidistant from said first hole and on the perpendicular bisectors of the sides of said brick, each one of said second holes merging with a recess in one surface of the top and bottom surfaces and each one of the second holes having a protrusion around it on the other one of the top and bottom surfaces,

c. said checkerwork brick being pierced through further by a plurality of other holes disposed on lines containing the centers of said first and second holes that are parallel to said sides of said checkerwork brick;

d. a one-third hole notch at each apex of said checkerwork brick; and

e. at least one one-half hole notch in each of the six side surfaces. triangular-shaped

2. A checkerwork brick comprising:

a. three equal length side surfaces and a fourth side surface connecting two side surfaces with top and bottom parallel surfaces that are substantially perpendicular to the side surfaces,

b. said checkerwork brick being pierced through by first holes disposed on the perpendicular bisectors of the three equal length side surfaces, each one of said first holes merging with a recess in one of the top and bottom surfaces and each one of said first holes having a protrusion around it on the other one of said top and bottom surfaces,

c. said checkerwork brick being pierced further by other second holes disposed on lines containing the centers of said first holes, said lines being parallel to said fourth side surface;

d. a one-third hole notch at the apices formed by the intersection of two of the three equal length side surfaces;

e. a one-sixth hole notch at the apices formed by the intersection of the fourth side surface with each one of two of the equal length side surfaces; and

f. at least one one-half hole notch in each one of the equal length side surfaces.

3. A checkerwork brick comprising:

a. five side surfaces and top and bottom surfaces that are substantially parallel and that are perpendicular to said side surfaces, two of said side surfaces being parallel and perpendicular to a third side surface while the other two of said side surfaces are equal in length and are angularly disposed toward said parallel surfaces,

b. said brick being pierced through by a plurality of holes disposed on spaced-apart parallel lines that are also parallel to said parallel sides and that are parallel to each one of said other two equal length sides, with

c. first ones of said holes merging with a recess in one of the top and bottom surfaces and with a protrusion surrounding each one of the holes on the other one of the top and bottom surfaces, with

d. second ones of said holes having a circular segment cross section and located adjacent said third side surface;

e. a one-third hole notch at the apices formed by the intersection of said parallel side surfaces and said equal length side surfaces and of said equal length side surfaces;

f. a one-fourth hole notch at the apices formed by the intersections of each one of the two parallel side surfaces and said third side surface; and

g. at least one one-half hole notch in each of the two parallel and the equal length side surfaces.

4. A checkerwork brick comprising:

a. five side surfaces and top and bottom surfaces that are substantially parallel and that are perpendicular to said side surfaces, two of said side surfaces being parallel and perpendicular to a third side surface while the other two of said side surfaces are equal in length and are angularly disposed toward said parallel surfaces,

b. said brick being pierced through by a plurality of holes disposed on spaced-apart parallel lines that are also parallel to said parallel sides and that are parallel to each one of said other two equal length sides, with

c. first ones of said holes merging with a recess in one of the top and bottom surfaces and with a protrusion surrounding each one of the holes on the other one of the top and bottom surfaces, with

d. one of said first holes being at a center and with a plurality of other ones of said first holes being located equidistant from said center first hole and with said first holes being located on three spaced apart lines parallel to said third sides, with

e. second ones of said holes having a circular segment cross section and located adjacent said third side surface;

f. a one-third hole notch at the apices formed by the intersection of said parallel side surfaces and said equal length side surfaces and of said equal length side surfaces;

g. a one-half elongate notch at the intersection of said parallel sides and said third side; and

h. at least one one-half hole notch in each of the two parallel and the equal length side surfaces.

5. A checkerwork brick comprising:

a. six side surfaces and top and bottom surfaces that are parallel and that are perpendicular to said side surfaces, two of said side surfaces being parallel and perpendicular to a third side surface with two other side surfaces being of equal length and disposed obliquely toward said parallel side surfaces, with one of said equal length side surfaces being parallel to another one of said side surfaces,

b. said brick being pierced through by a plurality of holes disposed on spaced-apart parallel lines that are also parallel to said parallel sides and that are parallel to each one of said other two equal length sides, with

c. first ones of said holes merging with a recess in one of the top and bottom surfaces and with a protrusion surrounding each one of the holes on the other one of the top and bottom surfaces, with

d. said first ones of said holes being disposed at equal distances from a center hole and located on lines parallel to said third side surface;

e. at least one second hole through said brick having a circular segment cross section and being located adjacent said third side surface;

f. a one-third hole notch at the apices formed by the intersection of said parallel side surfaces and said equal length side surfaces and of said equal length side surfaces;

g. a one-half hole notch at the apex formed by the intersection of one of said parallel side surfaces and said another one of said side surfaces;

h. a one-half elongate notch at the intersection of the other one of said parallel side surfaces and said third side surface; and

i. at least one one-half hole notch in each of the two parallel and the equal length side surfaces.

6. A checkerwork shoe comprising:

a. six side surfaces and parallel top and bottom surfaces that are substantially perpendicular to said side surfaces,

b. said shoe being pierced through by a plurality of holes; a first one of said holes being cylindrical and located at the geometric center of said top and bottom surfaces, the other second ones of said holes being generally triangular in shape with arcuate apices, said apices being located on concentric circles,

c. one of said arcuate apices having its center located on the perpendicular bisector of a side surface and merging with a recess in one surface of the top and bottom surfaces, with

d. the centers of the arcuate other two apices of each said second holes lying on diagonals of said shoe that pass through said center hole and an apex formed by the intersection of two adjacent side surfaces;

e. a one-third hole notch at each apex formed by the intersection of two adjacent side surfaces; and

f. a one-half elongate oval hole notch in each side surface.

7. A checkerwork shoe comprising:

a. four side surfaces and parallel top and bottom surfaces that are perpendicular to said side surfaces with three of said side surfaces being of equal length and with the fourth side surface connecting two side surfaces;

b. said checkerwork shoe being pierced through by a plurality of holes; a first one of said holes being generally triangular in shape with arcuate apices that are disposed on concentric circular arcs,

c. one of said arcuate apices having its center located on the perpendicular bisector of a side surface and merging with a recess in one surface of the top and bottom surfaces, with

d. the centers of the other two arcuate apices being located on the bisectors of the angles formed by the intersection of two adjacent equal length side surfaces, with
e. said shoe being pierced through by at least one cylindrical other hole;
f. a one-third hole notch being located at each apex formed by the intersection of two adjacent equal length side surfaces,
g. with a one-sixth hole notch being located at each apex formed by the intersection of an equal length side with said fourth side surface; and
h. a one-half elongate oval hole notch in each equal length side surface.

8. A checkerwork shoe comprising:
a. five side surfaces and top and bottom surfaces that are substantially parallel and that are perpendicular to said side surfaces, two of said side surfaces being parallel and perpendicular to a third side surface while the other two of said side surfaces are equal in length and are angularly disposed toward said parallel surfaces,
b. said shoe being pierced through by a plurality of holes; a first one of said holes being cylindrical and centrally located toward a plurality of second triangular-shaped holes, having arcuate apices that are centered on circles that are concentric with said one hole, with
c. one of said arcuate apices having its center located on the perpendicular bisector of a side surface and merging with a recess in one surface of the top and bottom surfaces, with
d. the centers of the arcuate other two apices of each second hole being located on the bisector of the angles formed by the intersections of the two equal length sides and of each one of the equal length sides and a parallel side, with
e. the centers of the one apices being located on lines passing through the center of said first hole that are perpendicular to at least one of said side surfaces, with
f. said shoe being pierced through by a plurality of other holes disposed adjacent said third side surface;
g. a one-third hole notch being located at the apices formed by the intersection of an equal length side surface and a parallel side surface and of said two equal length side surfaces;
h. a one-half elongate notch at the intersection of said parallel sides and said third side; and
i. a one-half elongate oval hole notch in each equal length and in each parallel side surface.

9. A checkerwork shoe comprising:
a. five side surfaces and top and bottom surfaces that are substantially parallel and that are perpendicular to said side surfaces, two of said side surfaces being parallel and perpendicular to a third side surface while the other two of said side surfaces are equal in length and are angularly disposed toward said parallel surfaces,
b. said shoe being pierced through by a plurality of holes; a first one of said holes being cylindrical and located at the intersection of the perpendicular bisectors of the two equal length side surfaces, the other second ones of said holes being generally triangular in shape with arcuate apices that are located on concentric circular arcs centered at said first hole,
c. said arcuate apices having their centers located on the perpendicular bisectors of the equal length and the parallel side surfaces and merging with a recess in one surface of the top and bottom surfaces, while
d. the centers of the arcuate other two apices of each said second holes lying on diagonals of said shoe that pass through said center hole and an apex formed by the intersection of two adjacent side surfaces;
e. a one-third hole notch at each apex formed by the intersection of an equal length side surface and a parallel side surface and of the two equal length side surfaces;
f. a one-fourth hole notch at the apex formed by the intersection of a parallel side surface and said third side surface; and
g. a one-half elongate hole notch in each equal length side surface and in each parallel side surface.

10 A checkerwork shoe comprising:
a. six side surfaces and parallel top and bottom surfaces that are substantially perpendicular to said side surfaces with two of said side surfaces being parallel and perpendicular to another one of said side surfaces and with three of said side surfaces being of equal length,
b. said shoe being pierced through by a plurality of holes; a first one of said holes being cylindrical and located at the intersection of two bisectors of the angles between mutually intersecting pairs of the equal length sides, and second ones of said holes being generally triangular in shape with arcuate apices that are located on circles concentric to said first hole,
c. one of said arcuate apices having its center located on the perpendicular bisector of a side surface and merging with a recess in one surface of the top and bottom surfaces, with
d. the centers of the arcuate other two apices of said second holes lying on the bisectors of the angles between two of the equal length sides and between the equal length sides and the parallel sides, with
e. the shoe being pierced through by at least one other hole;
f. a one-third hole notch located at the apices formed by the intersection of an equal length side surface and a parallel side surface, and of two equal length side surfaces; and
g. a one-half elongate hole notch in each equal length side surface and in each one of the parallel side surfaces.

11. A checkerwork shoe comprising:
a. five side surfaces and parallel top and bottom surfaces that are perpendicular to said side surfaces, with two of side surfaces being perpendicular to adjacent mutually intersecting side surfaces, and with another side surface being equal in length to one of said two perpendicular side surfaces and connecting said two side surfaces,
b. said shoe being pierced through by a plurality of holes; a first one of said holes being cylindrical and located at the intersection of the bisectors of the angles between said another side surface and said two side surfaces, and second ones of said holes being generally triangular in shape with arcuate apices that are located on circular arcs that are concentric with said first hole, with
c. one of said arcuate apices merging with a recess in one surface of the top and bottom surfaces, with
d. the centers of the other two arcuate apices being situated on extended radii of said first hole that are equiangularly spaced apart,
e. said shoe being pierced through by at least one other hole;
f. a one-third hole notch located at each one of the apices formed by the intersections of said another side surface and said two side surfaces;
g. a one-fourth hole notch located at the apex formed by the intersection of one pair of the mutually perpendicular side surfaces;
h. a one-half elongate notch located at the apex formed by the intersection of the other pair of mutually perpendicular side surfaces; and
i. a one-half elongate hole notch in each one of three of said side surfaces.

12. A checkerwork construction for blast furnace stoves and the like comprising:
a. a first course of metallic shoes including;
1. a plurality of shoes as defined in claims 6—11, with a plurality of the shoes as defined in claim 6 disposed contiguously with other such shoes and with shoes as defined in claims 7—11, all of said shoes being supported on;
b. a grid structure;

c. said shoes being arranged so that the one surfaces of said shoes having no recesses are contiguous with said grid structure;

d. a plurality of courses of checkerwork bricks arranged horizontally in said construction with one such course of bricks being arranged on said course of shoes and comprising;

1. a plurality of bricks as defined in claims 1—5, with the protrusions of such bricks coacting with respective recesses in the shoes in said course of shoes, and with a second course of bricks being arranged on said one course of bricks but with the recesses of the bricks of the one course being in registration with the recesses of the bricks of said second course;

e. means coactive with each pair of registering recesses to interconnect bricks of the second course with bricks of the one course, and with

f. a plurality of third and other courses of bricks arranged so that the recesses of the bricks of the third and other courses coact with the protrusions of the bricks of a contiguous course of bricks immediately below said third and other courses; and

g. all of said bricks and shoes being so arranged that the holes and partial hole notches combine to form a plurality of vertically aligned flues extending from the bottom to the top of said checkerwork construction.

13. A blast furnace stove comprising:

a. a shell within which there is a combustion chamber and a checkerwork chamber;

b. a grid structure within said checkerwork chamber for supporting a mass of checkerwork shoes and checkerwork bricks;

c. a plurality of metallic shoes having differing shapes that are mutually cooperative and are arranged as a first horizontal course on said grid structure, said shoes including a plurality of the shoes defined in each of claims 6—11, and arranged with the recesses not adjacent said grid;

d. a first course of checkerwork bricks having differing shapes that are mutually cooperative and that are arranged on said shoes, said checkerwork bricks including a plurality of the bricks defined in each of claims 1—5, said bricks being arranged so that the protrusions therein cooperate with the recesses in the shoes;

e. a second course of checkerwork bricks having differing shapes that are mutually cooperative and that are arranged on said first course of checkerwork bricks in such a way that pairs of the recesses of the bricks in the first and second courses are in registration;

f. means cooperating with each registering pair of recesses and interconnecting the bricks of said first and second courses;

g. a plurality of other courses of checkerwork bricks having differing shapes that are mutually cooperative and that are arranged on said second course of checkerwork bricks, with the protrusions of said second and each of said other courses of bricks coacting with the recesses of the bricks contiguous therewith and immediately therebelow; and with

h. all of said checkerwork shoes and checkerwork bricks being so arranged in all courses that the holes and notches therein match and form a plurality of vertical flues extending from the bottom to the top of the checkerwork mass.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,591,153 Dated July 6, 1971

Inventor(s) RUSSELL A. POWELL and HENRY Z. SCHOFIELD

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 1, Col. 5, line 4 - delete "triangular shaped"

Signed and sealed this 13th day of June 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents