March 21, 1933. J. W. WAGSTAFF 1,902,348

CHECKER BRICK AND CHECKER WORK FORMED THEREFROM

Filed Nov. 29, 1930

Fig. 1.

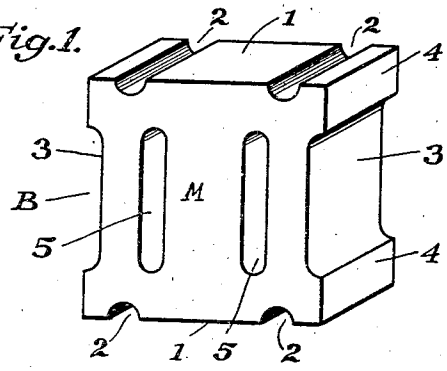


Fig. 2.

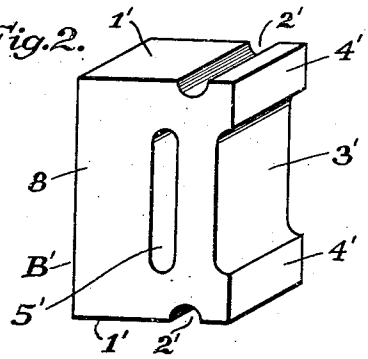


Fig. 5.

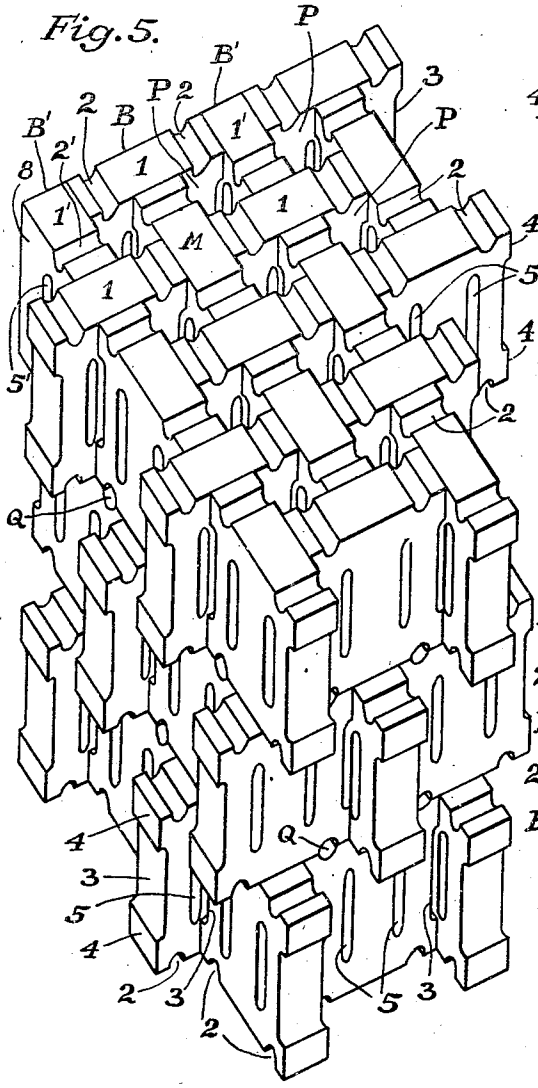


Fig. 3.

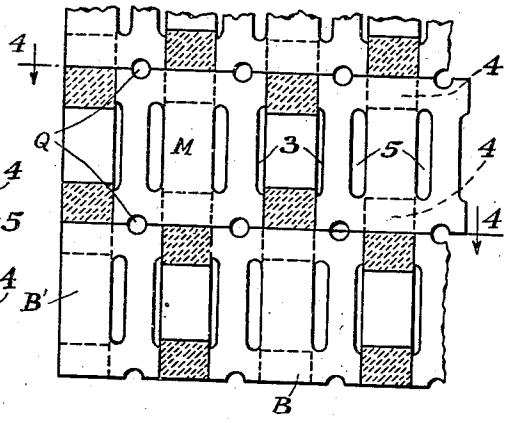
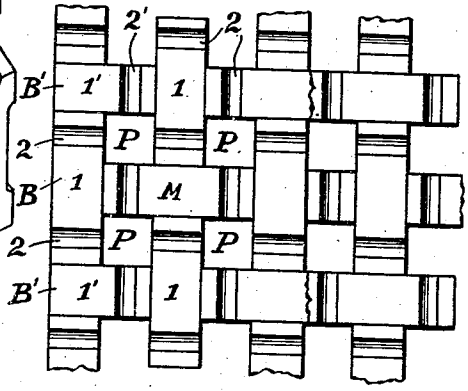


Fig. 4.



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UNITED STATES PATENT OFFICE

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CHECKER BRICK AND CHECKER WORK FORMED THEREFROM

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My invention relates to checker work such as is employed in blast furnace stoves, open hearth furnace regenerative chambers and the like.

It is desirable that such checker work shall present a large surface area for contact with the heated gases which are passed through the checker chambers in which the checker work is disposed and that it shall also contain a relatively large volume or mass of heat absorptive material, in order to absorb and retain as much heat as possible from the gases, so that maximum amounts of heat may be conserved and later transmitted to incoming air or fuel gas which is ordinarily passed through the checker chambers in the opposite direction after the checker bricks have been highly heated by the outgoing gases. In various forms of checker brick which have heretofore been proposed large surface areas have been attained by the provision of fins, ribs and the like, but bricks of this character are not only difficult and relatively expensive to manufacture but are also uneconomical for use due to breakage in handling and use resulting from lack of strength in the fins or ribs or because of relatively weak or thin zones in the bodies of the bricks. Furthermore, bricks of the class just referred to are usually so formed that when built up in a checker chamber the areas of contact between adjacent bricks are required to be relatively widely spaced so that the checker work as a whole is relatively unstable and the individual bricks therefore frequently become displaced or broken when in use.

A principal object of my invention, therefore, is to provide a checker brick adapted for the construction of checker work which is of relatively great strength, is devoid of ribs, fins, or the like, and is of such form and embodies such comparatively large masses of material that it is less likely to be broken in handling or in use than the bricks heretofore used for like purposes but which, nevertheless, presents peripheral surfaces of relatively large aggregate area for contact with the gases passing through the checker chamber in which it is operatively disposed.

A further object of my invention is to provide a checker brick so formed that when a plurality thereof are erected to form the checker work a plurality of adequate passages for the gases both in vertical and horizontal directions are provided and the areas of contact between adjacent bricks are so spaced and disposed as to provide a durable and stable construction in which the bricks are not likely to become displaced or broken when in use.

A further object of my invention is to provide a checker brick of the character aforesaid which may be readily and cheaply manufactured by extruding the material while plastic from a suitable die and cutting it off in proper lengths to form bricks.

A still further object of the invention is to provide a novel form of checker work, desirably constructed from bricks formed in accordance therewith, which is stable, presents a plurality of passages of adequate size for the passage of the gases yet affords a large mass or body of heat absorptive material for the retention of the heat thereof, which is durable, easily erected and presents a maximum extent of surface for contact by the gases in their traverse therethrough.

Other purposes, objects and advantages of my invention will hereinafter be more particularly referred to or will be apparent from the following description of one embodiment thereof in which reference will be had to the accompanying drawing.

In the said drawing, Fig. 1 is a perspective view of a preferred embodiment of my improved checker brick; Fig. 2 is a similar view of a brick which I may employ at certain parts of checker work erected principally from bricks such as are shown in Fig. 1; Fig. 3 is a fragmentary vertical section through a body of checker work constructed from bricks such as are illustrated in the preceding figures and showing certain of the bricks in each course in elevation and others, extending perpendicularly thereto, in section, Fig. 4 is a horizontal staggered section

of the checker work shown in Fig. 3 on line 4—4 in said figure, the planes of section being coincident with the joints between the courses, and Fig. 5 is a fragmentary perspective view of said checker work. In the several figures like characters are used to designate the same parts.

Referring now more particularly to Fig. 1 of the drawing, there is shown therein a brick B of generally rectangular form which may, for example, desirably be about 7½ inches long by 7½ inches high by 2½ inches thick and provided at spaced points on its top and bottom faces 1—1 with semi-cylindrical transversely extending grooves 2, the centers of which are preferably spaced about one-sixth the length of the brick from the ends thereof, and in a brick of the dimensions to which I have just referred may be about one-half inch in radius. At the ends of the brick and spaced from its top and bottom faces, I also provide grooves or depressions 3, preferably about one-half inch in depth in a brick of this size, and curving outwardly at their ends to meet end faces 4 along lines spaced from the top and bottom corners a distance equal preferably to about one-fifth the height of the brick. Additionally, my improved brick is desirably provided with transverse passageways 5 which may be about three-fourths of an inch in width and respectively symmetrically spaced on each side of the vertical center line of the brick about one-half the length of the brick therefrom.

In Fig. 2 I have shown a brick B′ which is particularly adapted for use at the ends of courses where the space between the bricks and the wall of the checker chamber is insufficient for a full sized brick, as shown in Fig. 1, and the brick B′ is therefore preferably about two thirds of the length of the brick B but of substantially the same height and thickness and is provided with only one end groove or depression 3′ and but a single transverse opening 5′ adjacent thereto while the top and bottom 1′—1′ each have but one semi-cylindrical groove 2′ spaced from the grooved end of the brick a distance equal to the spacing of the grooves 2 in the brick B from the adjacent ends thereof. Thus the brick B′ presents a solid rectangular body 8 adapted to be fitted against the wall of the chamber or to be suitably broken away to enable it to be snugly fitted therein.

In use, my improved bricks are built up edgewise to form the checker work and when disposed in a hot blast stove checker chamber or the like, where the gases passing therethrough are relatively clean and free of entrained solids, I prefer to employ bricks of the dimensions previously stated and to arrange the respective courses of bricks in staggered relation so that each joint between adjacent bricks of any course is spanned by one face of a brick in the superjacent course, thus avoiding vertical alignment between the joints of the bricks in adjacent courses as shown in Figs. 3, 4 and 5. In each course I also prefer to arrange bricks extending perpendicularly to each other in interrupted rows so that each end face of each brick abuts against a lateral face of another brick approximately at its midpoint and each lateral face is contacted by an end face of an adjacent brick. When the bricks are so arranged each receives lateral support in all directions thereby providing a rigid and stable construction affording substantially equilateral vertical passageways P through which the gases may pass. The bricks being arranged in staggered relation, with each course of bricks offset from the courses below and above it a distance equal to one-half the length of one brick in each direction, the passageways P through the checker chamber are uninterrupted and the semi-cylindrical grooves 2 of the adjacent course of bricks are brought into registry with each other so as to provide transverse cylindrical passages Q at spaced intervals along the joints between the courses, half bricks B′ being employed at the ends of some of the rows and at such other points as may be found desirable. As each end of each brick abuts the central face of an adjacent brick, the central mass M of each brick is substantially entirely surrounded by open spaces, and thus presents a large surface for contact by the gases since the openings 5 extend transversely of the brick on each side thereof and the abutting bricks provide for access of the gases to the said central masses through the grooves 3 at their ends. As will be understood from an inspection of Figs. 3, 4 and 5, when the bricks are arranged as just described the said central masses M included between the openings 5 in each brick are vertically aligned in all the courses so as to form a plurality of substantially continuous columns of brick work from top to bottom of the checker work, the said columns being substantially exposed to the action of the gases on all sides, while the vertical and substantially square passageways P all intercommunicate through the cylindrical openings Q, the openings 5 and the grooves 3 in all the bricks, thus uniformly exposing large areas of brick work to the gases while forming a stable and rigid construction in which each of the bricks is supported in all directions.

As is well understood in the art, in the erection of checker chambers for open hearth regenerative furnaces and the like it is desirable to have relatively large passageways in the checker work, due principally to the fact that the exhaust gases from open hearth furnaces often contain considerable quanti-

ties of entrained solids, such as slag and tar, which are deposited in the checker chambers and eventually cause obstruction of the passageways therethrough. When erecting checker work of this type in accordance with my invention, I prefer to employ checker bricks generally similar to those hitherto described but substantially twice as great in each horizontal dimension whereby I am able to provide a more open arrangement in which each passage P is of substantially four times the cross-sectional area of the corresponding passages formed by the shorter bricks and the size of the horizontal openings Q, 3 and 5 also enlarged.

It will thus be understood that when my improved bricks are employed in erecting checker work, as shown in Fig. 5, vertical passageways are provided which permit the gases to travel with a minimum of resistance, while the intercommunication of these passageways through the medium of the various horizontal openings results in the maintenance of uniform pressures throughout the checker chamber, the turbulence of the gases created as they traverse the openings and passageways enhancing the transfer of heat between the gases and the checker work.

Furthermore, as the top, bottom and ends of the bricks extend perpendicularly to the lateral faces thereof, it will be apparent that the bricks may be easily and cheaply made in large quantities by extruding the material while in plastic state through a die of suitable form and then cutting it off in properly spaced planes to form the lateral faces of the individual bricks.

While I have herein referred with considerable particularity to certain embodiments of the checker bricks and checker work of my invention, I do not thereby desire or intend to confine or restrict myself thereto as the dimensions of the bricks may be varied and other modifications, such as will readily occur to those familiar with the art, made therein if desired without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. In checker work of the class described, a plurality of superposed courses formed of individual bricks defining vertical passageways extending from top to bottom of the checker work, adjacent passageways being interconnected through horizontal openings defined by aligned grooves respectively in the top and bottom faces of bricks in adjacent courses, the bricks in each course having their ends respectively abutting lateral faces of adjacent bricks and having grooves in their said ends respectively cooperating with said lateral faces to form other transverse openings between adjacent vertical passageways, each of said bricks also having transverse openings extending through its body from one lateral face thereof to the other, said openings communicating respectively with vertical passages defined by said lateral faces and the respective lateral faces of adjacent bricks.

2. In checker work of the class described, a brick having transverse openings extending through its body, spaced semi-cylindrical grooves in its top and bottom faces extending substantially parallel to said openings and depressions in its end faces extending substantially in horizontal alignment with said openings, three other like bricks disposed below and providing support for said first mentioned brick, the grooves in the bottom face of the latter registering respectively with corresponding grooves in the top faces of two of said supporting bricks to thereby form substantially cylindrical transverse openings through the checker work, and other bricks disposed in horizontal alignment with said first mentioned brick respectively abutting the end faces thereof whereby said abutting bricks cooperate with the depressions in said end faces to form relatively elongated transverse openings through the checker work, three additional like bricks supported from the top face of said first mentioned brick, and semi-cylindrical grooves in the bottom faces of two of said bricks registering with the semi-cylindrical grooves in the top face of the first mentioned brick to form other substantially cylindrical transverse openings through the checker work, the said checker work having substantially square vertical passages extending from the top to the bottom thereof each of which is interconnected with adjacent passages through said openings.

3. A checker brick of the class described comprising a refractory body having substantially rectangular faces, the end faces thereof each having an elongated depression extending between the adjacent lateral faces spaced from the top and bottom faces, and each of the top and bottom faces having a pair of spaced semi-cylindrical grooves extending between said lateral faces, said body also having a pair of relatively narrow elongated spaced openings extending transversely therethrough and providing intercommunication between areas adjacent the respective lateral faces of the brick.

In witness whereof I have hereunto set my hand this 26th day of November, 1930.

JAMES W. WAGSTAFF.