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C. G. BIGELOW

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CHECKER CONSTRUCTION

Filed Feb. 27, 1931

Fig. 1

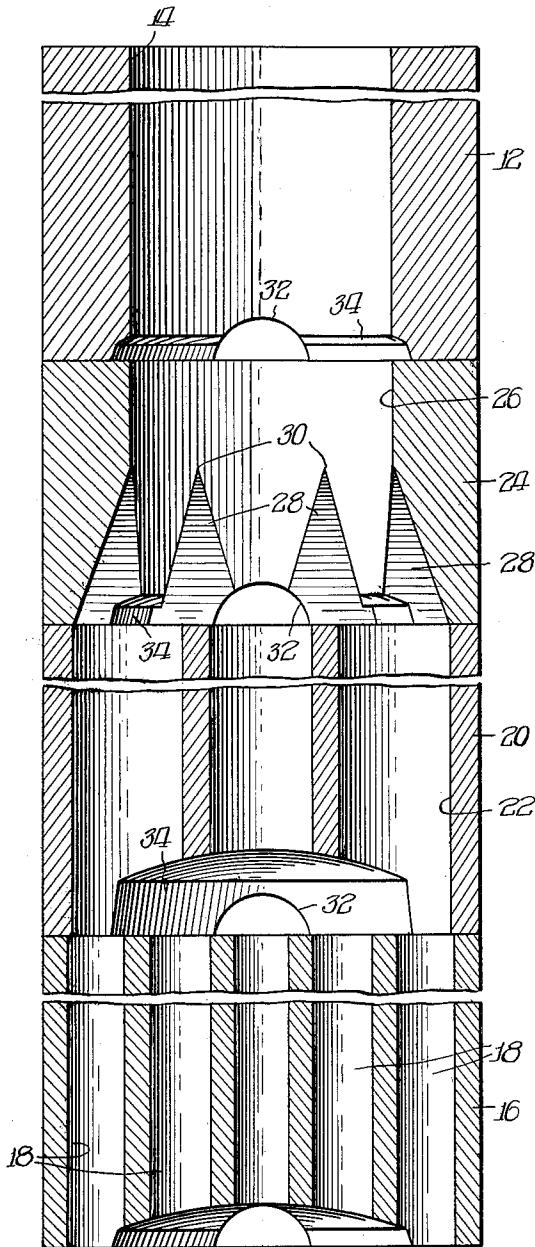


Fig. 2

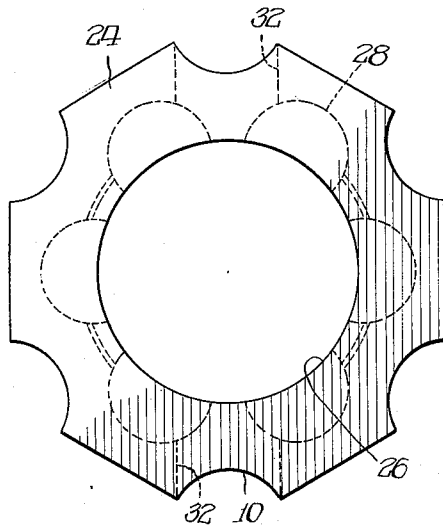
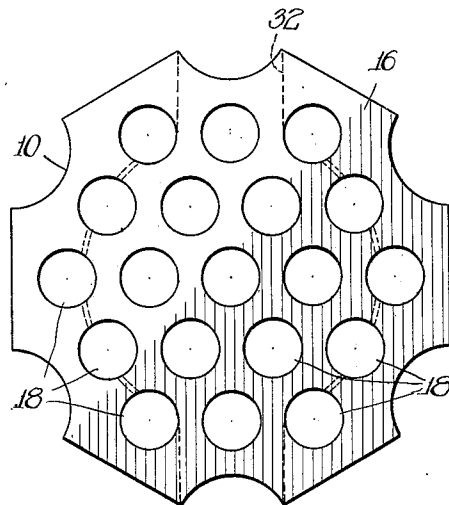


Fig. 3



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CHECKER CONSTRUCTION

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The invention relates to a heat-exchanging structure for abstracting heat from furnaces or fire gases, accumulating it and transmitting it later on to air in order to heat the same intensely. More particularly the invention relates to refractory blocks for use with air-heaters and to an improved type of block over that shown in the patent to Strack #1,679,993, August 7, 1928.

The blocks with which the present invention is concerned are characterized by the similarity of their exterior and by the number and diameter of the vertical passages provided in them as well as by the thickness of the refractory material present between these passages or channels. In use the hot gases pass downwardly through the passages whereby the heat is abstracted by and accumulated in the brick material, the gases being cooled and leaving the structure formed by the blocks at what is known as waste gas temperature. Thereafter air is passed upwardly through the passages for the purpose of absorbing the heat from the blocks and thus it will be observed that the same are subjected to various temperatures in the process of heat-accumulating and air-heating which accordingly subjects the refractory material to different strains. As a result of the above the capacity of the blocks to stand extreme changes in temperature, and their strength after heating highly, changes correspondingly.

An object of the present invention is to provide a refractory block which will withstand extremes of temperature and which will provide clear passages for both air and gases thereby materially reducing the draft losses.

A still further object is to provide refractory blocks for use as above described which will lessen the manufacturing costs thereof and meet effectively all requirements of service.

A still further object is to provide a refractory block of special design for location intermediate the structure and which will function to receive the air from a block having a passage and deliver the same to a block of several passages or vice versa, and which will be high in efficiency and structural

strength. In the illustrated embodiment the refractory block of special design has a single passage connecting with a lower block having a plurality of passages. Obviously, the novel features of the special design will also be applicable to refractory blocks formed with a plurality of passages and accordingly it may be stated that the invention is particularly concerned with the transfer of the gases from adjacent sections of the heat exchanging structure where those sections have different characteristics.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawing and claims appended hereto.

In the drawing, which illustrates an embodiment of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a vertical section taken substantially through the center of a column of refractory bricks the same being constructed in accordance with the present invention;

Figure 2 is a top plan view of one of the intermediate bricks the same having a single passage; and

Figure 3 is a top plan view of the bottom brick.

The bricks or checkers as they are commonly called are all of hexagonal shape with vertical grooves 10 provided along the meeting lines of the surfaces. When located in operative position with columns side by side the grooves of the various checkers form passages for more efficiently permitting travel through the structure of the hot gases and air. Particularly referring to Figure 1 it will be seen that the upper checkers 12 are provided with one passageway 14 while the lowermost checker 16 of the column is provided with nineteen passages as 18, the cross sectional area of the latter passages combined being equal to that of the single passageway. In this manner the draft losses are reduced to a minimum. The top and bottom surfaces of the checkers are made flat

so that one may be positioned upon and thus supported by the lower adjacent checker.

Intermediate of the column are positioned a checker 20 having seven openings extending therethrough as 22, the combined sectional area of which are equal substantially to the areas of the openings in checker 16. To the same effect is the construction of checker 24 provided with opening 26. As will be noted in Figure 2 the single opening 26 intersects the dotted lines defining the openings 22 in checker 20 at points located inwardly so that about one-third of six of the passages 22 are exposed, while the remaining two-thirds are covered by the walls of the checker 24. Covering or obstructing of the openings to such an extent would materially reduce the efficiency of the structure as the gases in their travel through the structure would be obstructed causing unequal distribution and thus unequal heating.

To obviate the above disadvantage in those checkers which act as intermediates between the uppermost checkers and the lower checkers provided with a larger number of openings, the passage in the intermediate checkers is formed with oblique curved surfaces 28 beginning at a point 30 slightly above the center of the checker and extending to the bottom of the same. As the surfaces 28 are curved they define semi-circular openings of a diameter equal to those of passages 22 so that the passages merge gradually into the opening 26. In those intermediate checkers having a number of passages, the same character of flaring opening is provided for each passage so that no restriction of any kind is positioned in the path of the gases during their travel through the heat exchanging structure. As a result the gases and air encounter no definite obstruction and the draft losses are reduced to a minimum.

The various checkers are all provided with a cross-over flue 32 located in the bottom surface of the same and connecting with a cavity 34. With the members in operative position it is seen that the flue and cavity are disposed adjacent the flat top surface of the lower checker. The flues help in facilitating the distribution of the gases since if any of the passageways become clogged or partly obstructed the gases can be by-passed through the flue and vertical opening formed by the grooves 10 with which the flues connect. By providing the cross-over flue and cavity in the same end of the checkers a manufacturing advantage is obtained which not only lessens their cost but expedites their production as well.

From the above it will be appreciated that the refractory members are designed with a wall thickness depending on the strain to which they are subjected. The hottest gases are delivered to the uppermost checkers where the walls of the same are thickest and as the

gases cool the lower checkers, although made of substantially an equal amount of refractory material are provided with thinner walls, but the heating surface is correspondingly increased. The provision of an intermediate checker having oblique curved surfaces functions efficiently to eliminate draft losses by providing clear unobstructed passages for both gas and air.

It is to be understood that I do not wish to be limited by the exact embodiment of the device shown, which is merely by way of illustration and not limitation, as various and other forms of the device will of course be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. A heat-exchanging structure, comprising sets of superposed refractory bodies having vertical passages extending therethrough, the number of which passages increases from the uppermost bodies to the lowermost ones, and certain of said bodies located intermediate the structure being provided with oblique curved surfaces merging into a passage, and a cross-over flue provided in the bottom surface of said bodies.

2. A heat-exchanging structure for air heaters and the like, comprising sets of superposed refractory bodies, each set including uppermost bodies having a single passage and lower bodies provided with a plurality of passages, and an intermediate refractory body having a single passage, said passage having a flaring lower portion formed by a plurality of spaced oblique curved surfaces.

3. A heat-exchanging structure for air heaters and the like, comprising sets of superposed refractory bodies, each set including uppermost bodies having a single passage and lower bodies provided with a plurality of passages, said bodies having flat top and bottom surfaces, a cross-over flue provided in the bottom surfaces of each of said bodies, and an intermediate refractory body having a single passage, said passage being provided at its lower portion with oblique curved surfaces to form a flaring opening.

4. A refractory body for heat-exchanging structures having a single passage extending therethrough, the top and bottom surfaces of said body being flat with one of said surfaces having a groove therein forming a cross-over flue, and oblique curved surfaces located at intervals in said passage forming a flaring opening.

5. A heat exchanging structure comprising sets of superposed refractory bodies having vertical passages, the number of which passages increases from the uppermost bodies to the lowermost bodies, certain bodies intermediate the structure serving to facilitate the travel of the gases from sections of different characteristics, said intermediate bodies hav-

ing a passage provided with a flaring lower end formed by a plurality of spaced oblique curved surfaces, the curved surfaces defining semi-circular openings for coinciding with the contour of certain passages in the lower adjacent body thereto.

6. A heat-exchanging structure comprising sets of superposed refractory bodies, certain of said bodies having a single vertical passage, the remaining bodies having a plurality of vertical passages, and a refractory body for location intermediate the structure, said body having a passage provided with a flaring lower end formed by a plurality of spaced oblique curved surfaces.

7. A heat-exchanging structure comprising sets of superposed refractory checkers, each set including uppermost checkers having a single passage, lower checkers provided with a plurality of passages, and intermediate checkers having a passage provided with a

flaring end adjacent one end of the checker, all of said checkers having flat top and bottom surfaces, and a cavity formed in one end of each checker centrally thereof.

8. A heat-exchanging structure comprising sets of superposed refractory checkers, each set including uppermost checkers having a single passage, lower checkers provided with a plurality of passages, and intermediate checkers having a passage with a flaring end adjacent the bottom of the checker, all of said checkers having flat top and bottom surfaces, a cavity formed in the bottom surface of each checker centrally thereof, and a cross-over flue provided in each checker and having communication with the cavity and vertical passage or passages in the checker.

Signed at Chicago, Illinois, this 25th day of February, 1931.

CHARLES G. BIGELOW.