Oct. 22, 1935. C. OTTO 2,018,224

CONSTRUCTION OF HEAT REGENERATORS

Filed Jan. 20, 1934 2 Sheets-Sheet 1

Fig. 1

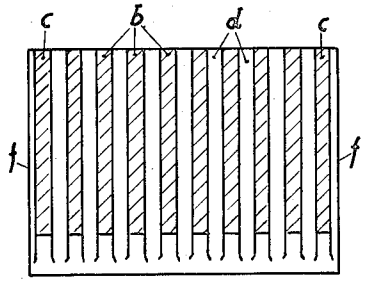


Fig. 2

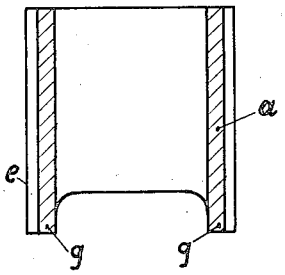
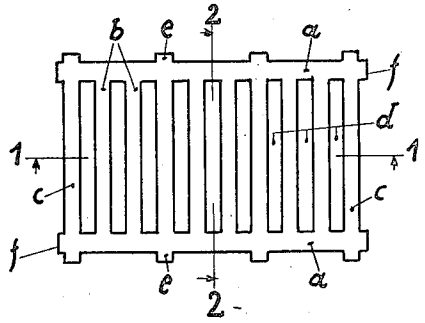


Fig. 3



INVENTOR
Carl Otto
BY
R. J. Critchard
ATTORNEY

Oct. 22, 1935. C. OTTO 2,018,224

CONSTRUCTION OF HEAT REGENERATORS

Filed Jan. 20, 1934 2 Sheets-Sheet 2

Fig. 5

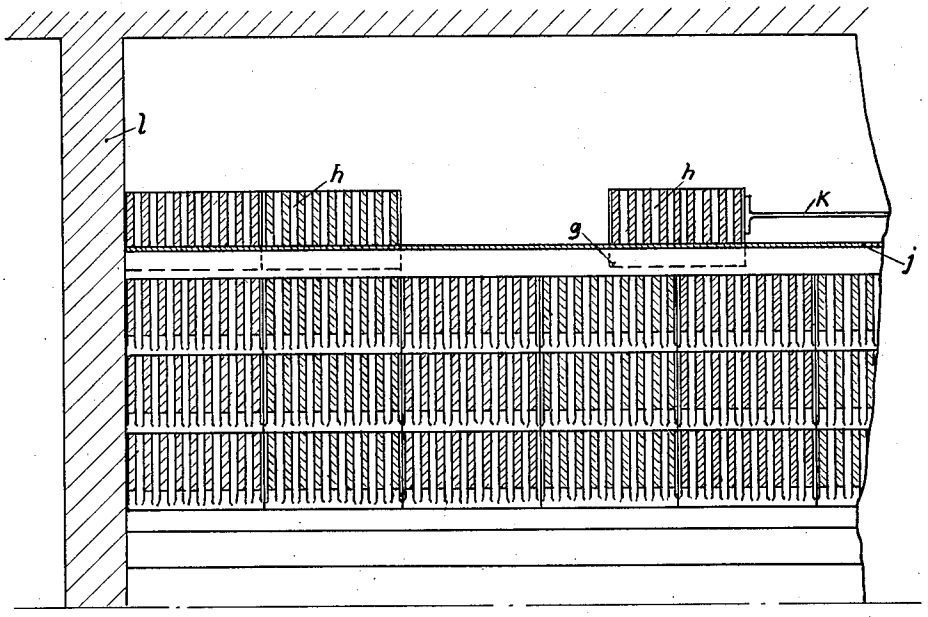


Fig. 4

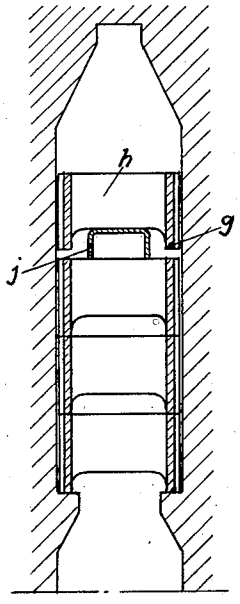


Fig. 6

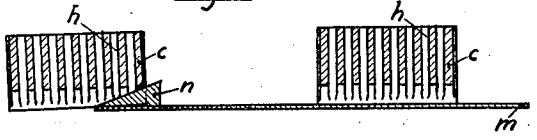


Fig. 7

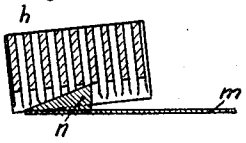


Fig. 8

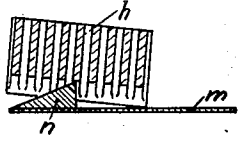


Fig. 9

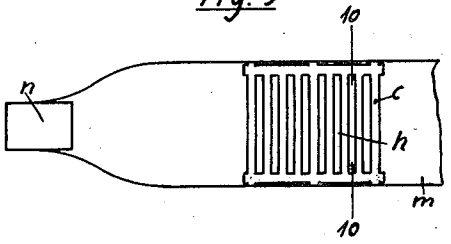
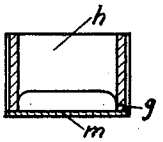


Fig. 10



INVENTOR
Carl Otto
BY R. J. Patchard
ATTORNEY

Patented Oct. 22, 1935 2,018,224

UNITED STATES PATENT OFFICE

2,018,224

CONSTRUCTION OF HEAT REGENERATORS

Carl Otto, Essen, Germany

Application January 20, 1934, Serial No. 707,484
In Germany January 5, 1933

5 Claims. (Cl. 263—19)

This invention relates to a proceeding for constructing by blocks or fillers the chequerwork in the chamber of a heat regenerator of the kind (hereinafter referred to as reversible heat regenerators) wherein the regenerator chamber is traversed alternately by hot gases from which heat is to be withdrawn and by gases to be heated, especially a regenerator of a coke oven.

Moreover matter of invention is a procedure for removing the blocks from the regenerator without pulling down the side walls of the regenerator.

The object of the invention is a construction of a reversible heat regenerator by filling it with blocks of a special kind such that even in the more or less haphazard manner in which heat regenerators are built, the desired gas passages are duly formed, that is to say, improperly placed blocks do not, on the one hand, contract these passages, or, on the other hand, afford an excessively large space in the direction in which the gases have to travel which would detract from the effect of the lattice-like construction. For this purpose a block is used for forming the chequerwork of the regenerator which has on its external surfaces ribs parallel to the direction of the current of gases, whilst its interior is hollow and is subdivided by transverse partitions into a number of chambers, which at right angles to the direction of the current of the gases have an elongated cross-section and retain this throughout the height of the block. The chief function of the external ribs is that of distance pieces between the blocks placed side by side and between the blocks and the enclosing brickwork of the regenerator, whilst the elongated chambers in the block constitute the essential part of the passage for the gases. However, insofar as the external ribs co-operate with the enclosing brickwork to form passages which can be utilized for flow of the gases, they contribute an increased efficiency to the regenerator which, indeed, is not large but is none the less desirable.

In reversible regenerators, especially coke oven regenerators, the extension of which in a horizontal direction corresponds with the breadth of a single rectangular block, I need for the chequerwork a block the external walls of which extending in the longitudinal direction of the regenerator are projected beyond the transverse partitions; it is thereby ensured that even when the blocks are not placed with exactness one upon the other, there is no blocking of the gas passages as a result and that the channels formed by the transverse partitions of the blocks are not blocked when the blocks are placed one above the other; for by the projecting portions there is provided above the partitions a chamber extending throughout the length of the regenerator and serving to distribute the flow by placing all the channels in communication with each other.

The invention may be described in connection with the drawings of which

Figs. 1–3 show a regenerator block which may be used for filling a regenerator chamber in the new manner.

Fig. 1 is a longitudinal section on line 1—1 of Fig. 3, Fig. 2 a transverse section on line 2—2 of Fig. 3 and Fig. 3 a plan.

Fig. 4 is a vertical cross-section,

Fig. 5 a vertical longitudinal section of a regenerator chamber.

Figs. 6–10 illustrate the procedure of removing the blocks from the regenerator.

Figs. 6–8 show different stakes in the passage of the plate serving for removing the blocks.

Fig. 9 is a plan of a part of the plate carrying a block.

Fig. 10 is a cross-section on the line X—X of Fig. 9.

The walls *a* of the block, which are parallel to the direction of the current of the gases, are connected by transverse partitions *b*, which are parallel to the walls *c* and provide rectangular passages *d* in the block for the flow of gases. The walls *a* have external ribs *e* and the walls *c* have similar ribs *f*. When the block is used as filling for a heat regenerator the breadth of which corresponds with the longitudinal extension of the block and whose longitudinal walls are therefore parallel to the wall *c* of the block, there are formed by the ribs *f* between the walls *c* and the longitudinal walls of the regenerator supplementary spaces, through which gases can pass, while the ribs *e* afford further spaces for use as gas passages between the blocks provided with these ribs and placed side by side. For extending the walls *a* there are provided ribs *g* by which the blocks rest upon the next lower layer. There is thus left above and below the partitions *b* a free space through which the gases in the spaces *d* can travel to the next higher block even if the spaces *d* in the two blocks are not in complete register with each other.

The form of these hollow blocks permits a method of constructing reversible heat regenerators which differs completely from the known art. There is provided a plate whose width is

somewhat less than the distance between the projecting ribs *g* and whose thickness is somewhat greater than the projection of the ribs *g* beyond the walls *c* and partitions *b*. This plate having been laid in the regenerator chamber, the blocks are placed on the plate so that the ribs *g* project downwardly on either side of the plate and prevent lateral displacement of the blocks when they are pushed successively along the plate. The outer block of the row is then held fast, the plate is withdrawn and placed on the top of the row, and the procedure is repeated until the desired number of rows has been introduced.

Figs. 4 and 5 show the introduction of a fourth row of the hollow blocks *h*, three rows having already been introduced in the manner now to be described. The plate *j* is laid on the uppermost row of the blocks and a block *h* is placed on it so that the projections *g* extend downwardly on either side of the plate. The block is then pushed along the plate by means of a pusher *k* until it comes to rest against the inner wall *l* of the regenerator chamber. A second block is then introduced in like manner, and so on until the row is complete, whereupon the outer block is then held fast and the plate is withdrawn.

In contrast with the hitherto usual construction of heat regenerators, in which the placing of each block with the greatest possible accuracy was unconditionally necessary in order to produce gas passages of cross-sections as nearly equal as may be, there is obtained by application of this invention an extraordinarily simple and rapid construction of regenerators, which leads to heat absorption and transmission nearly equal to that theoretically obtainable.

In very long regenerators, for example coke oven regenerators arranged beneath the chambers and extending parallel with the latter, it is desirable to undertake the construction from both ends. The construction of the regenerator can, however, be undertaken from one end only, since first only the rear half of the regenerator is filled with the hollow blocks and then the front end. In all cases, however, in like manner there is obtained nearly theoretical efficiency of the regenerator.

The retention of the several layers of blocks during the withdrawal of the support may in most cases be effected by hand. Obviously, however, a simple mechanical holding device may be used.

A regenerator chamber filled with hollow blocks arranged with the projections *g* extending downwardly, as shown in Fig. 4, may easily be emptied by means of a plate of width approximately that of a block and having at one end a projecting wedge whose width is less than the distance between the projecting ribs *g*. The wedge is inserted between the projecting ribs of the outermost block of the upper row of blocks and the plate is advanced, whereby each block is in turn raised by the wedge onto the plate. The plate carrying the row of blocks is then withdrawn.

Referring to Figs. 6–10, the plate *m* of width approximately equal to the width of a block *h* has at one end a wedge *n* of width less than the distance between the projecting ribs *g* of the block and of height somewhat greater than the projection of the ribs *g* beyond the walls *c*. The wedge *n* is introduced between the ribs *g* of the outermost block of the top row and the plate *m* is advanced, whereupon the wedge *n* first engages the transverse walls *c* (see Fig. 6) and then raises the block (see Fig. 7). When the highest end of the wedge has passed beyond the midpoint of the block the block tilts into the position shown in Fig. 8 and, being prevented by the next block of the row from advancing with the plate, then assumes the position shown in Figs. 9 and 10 with the projecting ribs *g* resting on the plate *m*.

According to the amount of play between the blocks of the row, it may happen that the blocks are simply raised vertically by the wedge *n* instead of being tilted in the manner shown in Figs. 6–8. The block adjoining the inner wall *l* (Fig. 5) of the regenerator chamber will be raised onto the plate provided that the length of the wedge *n* is less than half the length of a block.

Instead of introducing a single row of blocks at a time as shown in Figs. 4 and 5, two or more adjacent rows can be introduced simultaneously by means of a support consisting of a number of plates *j* connected by thin connecting pieces. So also, two or more adjacent rows of blocks can be withdrawn simultaneously in the manner described with reference to Figs. 6–10 by means of a correspondingly wider plate *m* having for each row of blocks a projecting wedge-shaped portion of width less than the distance between the projecting ribs of a block.

What I claim, is:—

1. In providing a horizontally elongated regenerator chamber with a checker brick filler, the method which consists in forming said filler of superposed sections, each consisting of a row of hollow blocks arranged end to end and each formed with a wide open-ended groove in its bottom face extending longitudinally of the block, by extending into the chamber preparatory to the formation of each section, a bar-like support having its upper side shaped to enter and engage the roofs of the bottom grooves of said blocks and supporting said support on the subjacent portion of the regenerator, sliding blocks into the chamber on said support to form a row of blocks above the support, and withdrawing the support from the chamber by a longitudinal movement of the support while preventing the blocks from sharing in said movement, and thereby transferring the weight of the blocks from the support to the subjacent portion of the regenerator.

2. In removing from a regenerator chamber hollow blocks arranged in said chamber end-to-end in a horizontally elongated row and each formed with a wide open-ended groove in its bottom face extending longitudinally of the block, the method which consists in moving a bar like support in the longitudinal direction of said row into said chamber beneath and into supporting relation with the blocks in said row, said support comprising an upper portion successively entering and engaging the roof of and thereby raising each of the blocks in the row as the support is moved into supporting relation therewith, and thereafter withdrawing said support with the said blocks supported thereon.

3. In the construction and repair of a regenerator comprising a regenerator chamber and hollow blocks arranged end to end in horizontal rows superposed in a stack in said chamber, each of said blocks being formed with a wide open-ended groove in its bottom face extending longitudinally of the blocks, the method of successively arranging in place the blocks forming the

stack rows at successively higher levels, by sliding the blocks forming each row into place on a bar-like support extending into the chamber at the underside of the row and entering and engaging the roofs of blocks therefor supported on and guided for sliding movement along said support and then withdrawing the support from the chamber by a longitudinal movement of the support while preventing the blocks from sharing in said movement, and in successively removing from the chamber the stack rows at successively lower levels by advancing into the chamber in the direction of and beneath, and in supporting relation with the blocks in the row to be removed, a bar-like member which as it is advanced successively enters and engages the roofs of the groove of the different blocks in the row and thereby successively raises said blocks and thereafter withdrawing said member and the blocks above and supported by it.

4. In the construction and repair of a regenerator comprising a regenerator chamber and hollow blocks arranged in said chamber end to end in a horizontally elongated row, and each supported by a subjacent portion of the regenerator and each formed with a wide open-ended groove in its bottom face extending longitudinally of the block, the method of adjusting the positions of said blocks in said chamber which consists in moving them horizontally in the direction of the row while supporting them on a bar-like support beneath the blocks and movable in the direction of the row into and out of the chamber, and in giving each block a vertical movement between one position in which it is supported by said subjacent portion and a more elevated position in which the roof of the block is engaged and the block thereby supported by said support, moving said support horizontally relative to said block.

5. In providing a horizontally elongated high and narrow regenerator chamber with a chequer brick filling, the method which consists in forming said filling of superposed rows of blocks placed end to end in each row, and each of a width but little less than the width of said chamber, and each formed to provide vertical flow passages and formed at its bottom with a wide open-ended groove extending longitudinally of the block, and in successively placing in position in said chamber the blocks forming the rows at successively higher levels, by mounting the blocks forming each row on a bar-like support extending into the chamber at one end of the latter and having an upper portion entering and engaging the roofs of the grooves of the blocks mounted on the support, and sliding the blocks mounted on said support along the latter into the chamber and then withdrawing the support from the chamber while preventing the blocks on the support from movement with the latter out of the chamber.

CARL OTTO.