

E. GOBBE.  
 RECUPERATOR FOR HEATING AIR AND GASES.  
 APPLICATION FILED MAR. 14, 1908.

907,336.

Patented Dec. 22, 1908.

3 SHEETS—SHEET 1.

Fig. 1

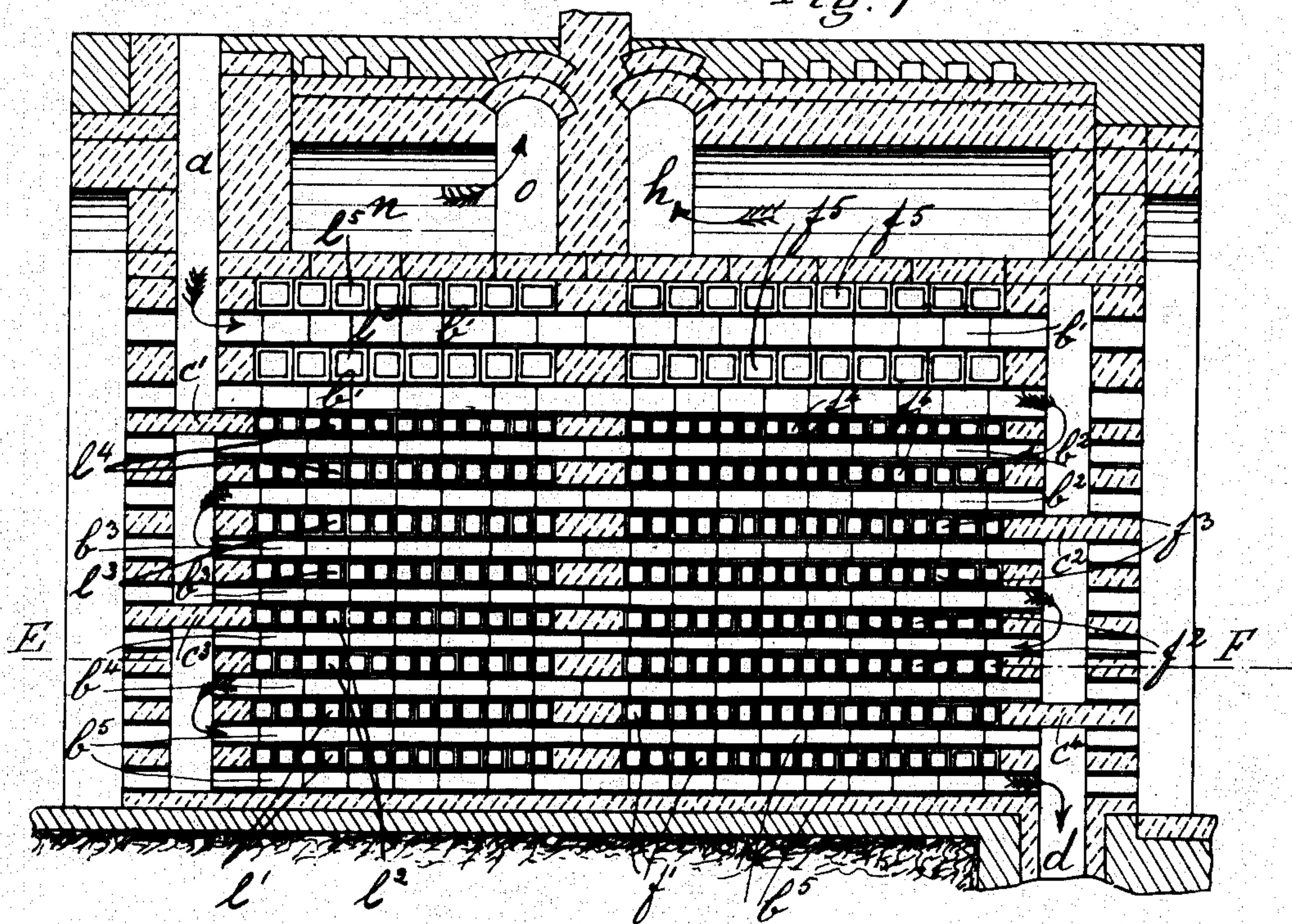
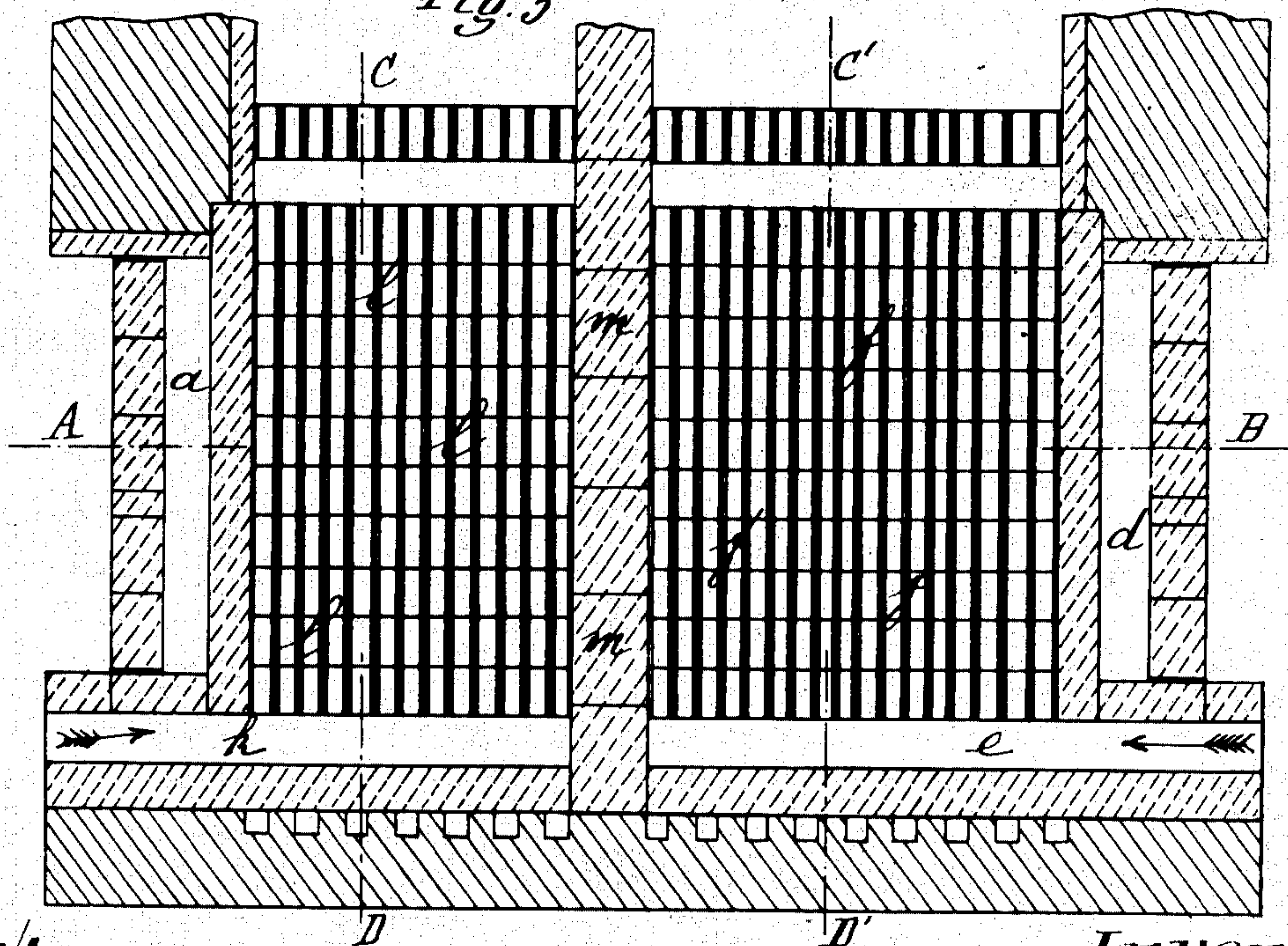


Fig. 3



Witnesses:  
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 L. Douville.

Inventor:  
 Emile Gobbe.  
 By Wiederstein & Fairbanks  
 Attorneys.



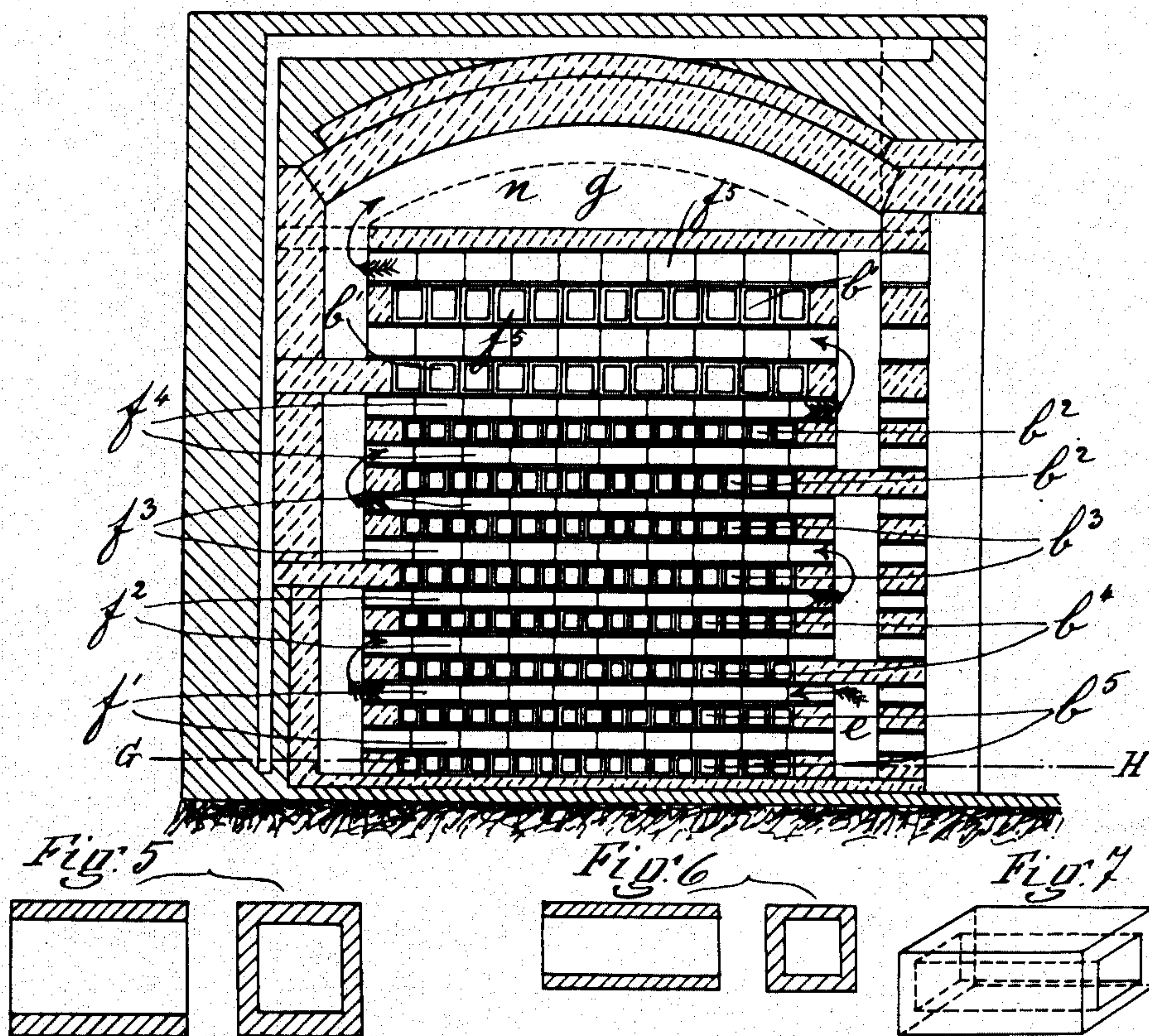
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3 SHEETS—SHEET 2.

Fig. 2



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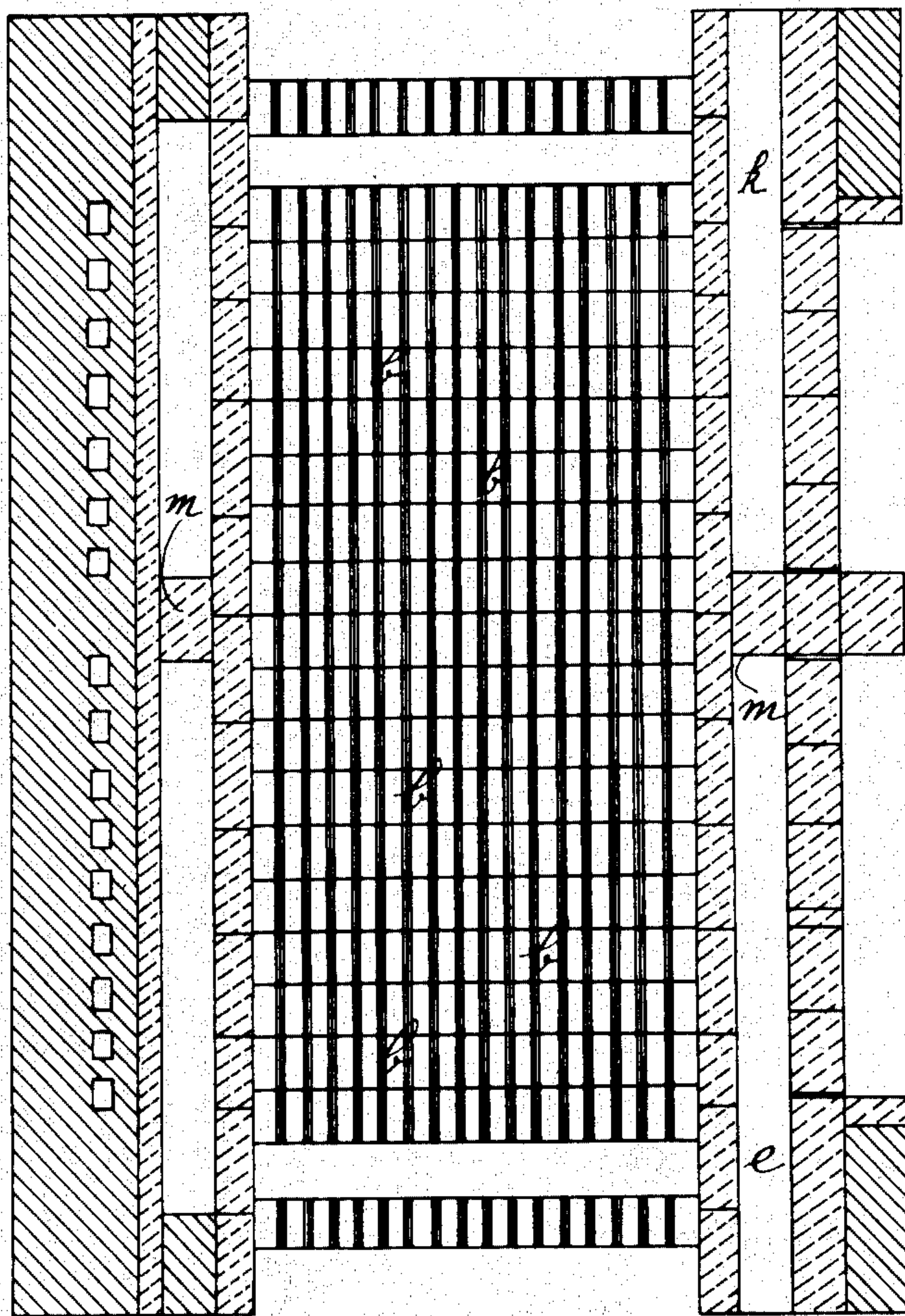
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3 SHEETS—SHEET 3.

*Fig. 4*



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# UNITED STATES PATENT OFFICE.

EMILE GOBBE, OF JUMET, BELGIUM.

## RECUPERATOR FOR HEATING AIR AND GASES.

No. 907,336.

Specification of Letters Patent.

Patented Dec. 22, 1908.

Application filed March 14, 1906. Serial No. 305,966.

*To all whom it may concern:*

Be it known that I, EMILE GOBBE, a subject of the King of Belgium, residing at 28 Rue Leopold Jacqmain, Jumet, in the Kingdom of Belgium, engineer, have invented certain new and useful Improvements in Recuperators for Heating Air and Gases, of which the following is a specification.

The numerous recuperators that have been devised for heating air or gas are generally hermetically tight when they are new, but after some months of service the air which travels in the opposite direction to the products of combustion escapes to a large extent through the leaks that have been produced in the apparatus, and this defect assumes such proportions that after from five to six months of use the leaks are so large that it becomes impossible to use the recuperator. This could not be otherwise because the differences of temperature which arise frequently cause a succession of contractions and expansions. Now during the contraction small fissures are produced and into these fissures small refractory particles fall so that the constituent parts of the apparatus are no longer able to return to their initial position. As these effects are frequently repeated, the fissures progressively increase and soon render the apparatus unfit for use.

The recuperator which forms the object of this invention has been devised for the purpose of obviating these defects.

Figure 1 is a sectional longitudinal elevation on the line A—B of Fig. 3. Fig. 2 is a cross section on the line C—D or the line C'—D' of Fig. 3. Fig. 3 is a sectional plan on the line E—F of Fig. 1. Fig. 4 is a sectional plan on the line G—H of Fig. 2. Figs. 5, 6 and 7 represent in detail a hollow brick of two different sizes.

This apparatus is constructed with hollow bricks, all of the same shape. These bricks are formed with one or a number of holes. First of all a course of hollow bricks is laid, being placed one against the other, turning them all in the same direction, then a layer of mortar is spread on this first course and a second course is laid in the same manner, all the hollow bricks being directed at right angles to those of the first course, however, care being of course had to appropriately stagger the joints. A fresh layer of mortar is then applied in order to correct the imperfections of the bricks and a third course is laid, the bricks being directed in the same

way as in the first course; and so on in succession to the top of the apparatus, all the bricks in the courses of even number being perpendicular to those in the courses of uneven number. In addition there are formed cleaning holes opposite each horizontal conduit, the same hollow bricks being utilized for forming these apertures which are closed with solid plugs not shown in the drawings.

In the apparatus represented in the drawing the hollow bricks of the upper courses are larger than those at the bottom in order to facilitate the passage of the air and products of combustion at this place; because their volume is then greater owing to their high temperature. These larger bricks also afford greater facilities for the cleaning of the upper conduits where the deposits of dust are larger than elsewhere.

I separate the recuperator into two parts by the wall *m* in order to show that it may be used for heating air on one side and gas on the other side, without any great complication.

The manner in which the air, the gas and the smoke circulate in this apparatus is as follows: Assuming that the recuperator is connected to a furnace of any appropriate kind in such a manner that the vertical conduit *a* is able to receive the products of combustion of the furnace, immediately after their discharge, while they still have a high temperature. The products of combustion descend through the conduit *a* enter the horizontal passages *b* of the first upper courses, then return in the inverse direction through the passages *b*<sup>2</sup>, following the path made for them by the partitions *c*<sup>1</sup> and *c*<sup>2</sup>. They continue to descend to the bottom of the apparatus, successively traversing in zig-zag all the horizontal courses *b*<sup>2</sup>, *b*<sup>3</sup>, *b*<sup>4</sup>, *b*<sup>5</sup> finally entering the passage *d* which conducts them to the chimney. The air that it is desired to heat enters at the bottom through the opening *e*; it first of all passes into the conduits of the lower transverse courses *f*<sup>1</sup> and ascends in a zig-zag path towards the top, successively traversing the transverse courses *f*<sup>2</sup>, *f*<sup>3</sup>, *f*<sup>4</sup>, *f*<sup>5</sup> entering the collector *g* in a hot condition; from the collector it passes to the furnace through the conduit *h*.

Gas that it is desired to heat follows the same path as the air, but in the adjacent compartment; it enters at the lower part of the apparatus through the opening *k* and ascends in a zig-zag path in the transverse con-



duits  $l^1$   $l^2$   $l^3$   $l^4$   $l^5$  entering the collector  $n$  in a hot state; from this collector it passes to the furnace through the conduit  $o$ .

It will be readily understood that leakages are impossible in an apparatus of this kind, as there are always three partitions separating the air or the gas from the products of combustion; two partitions are constituted by the walls of the hollow bricks and one by the layer of mortar that unites them. Further, as the hollow bricks are laid one against the other without any free space between them, the whole forms what may be termed a monolith in which the expansions and contractions take place readily without being capable of causing any crack or crevice, so that the apparatus retains its tightness indefinitely.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A recuperator for heating air and gases, composed of hollow bricks all arranged horizontally one above the other in courses of even and uneven order or number and made inelastic in horizontal direction, one course of bricks serving for the passage of the products of combustion and the two adjacent courses serving for the passage of the gases to be heated.
2. A recuperator for heating air and gases, composed of hollow bricks all arranged horizontally one above the other in courses of even and uneven order or number and made inelastic in horizontal direction, one course of bricks serving for the passage of the products of combustion and the two adjacent courses serving for the passage of the gases to be heated, the joints between the bricks being without interengaging members.
3. A recuperator for heating air and gases, composed of hollow bricks all arranged horizontally one above the other in courses of even and uneven order or number and made inelastic in horizontal direction, one course of bricks serving for the passage of the products of combustion and the two adjacent courses serving for the passage of the gases to be heated, the joints between the bricks being without interengaging members, the bricks of each alternate course being disposed at right angles to each other.
4. In a hermetically tight recuperator comprising alternate layers of apertured members, the apertures in alternate layers extending in a transverse direction, means for deflecting the air or gases from one layer to

the next corresponding layer, the courses being of even and uneven number or order, one course serving for the passage of the products of combustion, and the courses immediately above and below the same serving for the passage of the gases to be heated, the air and gas passing through the recuperators in different directions, conduits for conducting air and gas to said apertured members, the joints of the bricks in one layer being out of register with the joints of the bricks in an adjacent layer and conduits for leading air and gas from said members after said air and gas has passed therethrough, the upper layers being of larger members than the lower ones to compensate for the increased volume of air and products of combustion resulting from their higher temperature.

5. A recuperator for heating air and gases comprising alternate layers of apertured bricks without interengagement and forming a hermetic whole and a constructional artifice cemented together, the joints formed by abutting bricks in one layer being out of alinement with the joints formed by the abutting bricks of an adjacent layer, the apertures in the bricks of each layer extending in the same direction and the bricks in one layer being angularly inclined to the bricks in the adjacent layer, the upper layers being of larger members than the lower ones to compensate for the increased volume of air and products of combustion resulting from their higher temperature.

6. A recuperator of heat having provision whereby the air or gas to be heated and the products of combustion pass through passages arranged in superposed horizontal rows, one row serving for the products of combustion and arranged between a lower row and an upper row for air and gas, the passages for the products of combustion having a direction at right angles to that of the air passages, the rows being separated by two horizontal faces of hollow bricks and of mortar between such faces, the vertical faces serving only as stays avoiding the necessity of a tight joint therebetween.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses this twenty fourth day of February 1906.

EMILE GOBBE.

Witnesses:

T. DULLUM FLENNERT,  
JULES MONART.