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CYLINDRICAL FURNACES

Filed Feb. 4, 1955 2 Sheets-Sheet 1

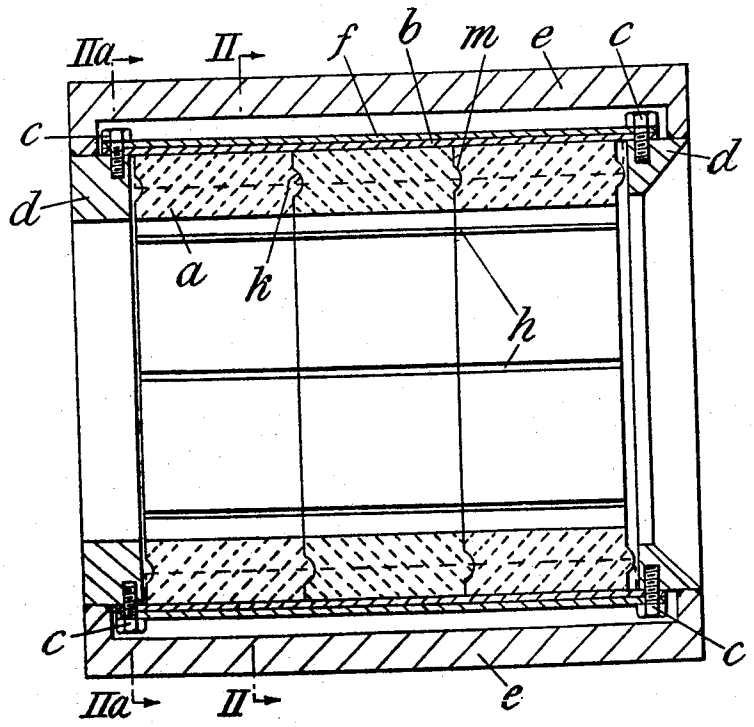

Fig. 1.

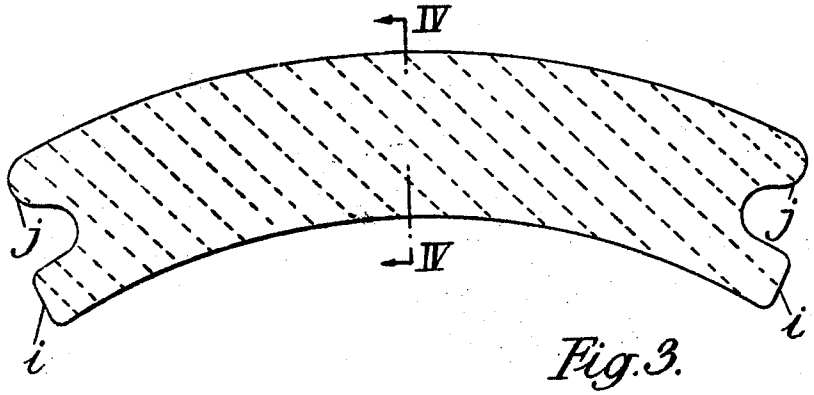

Fig. 3.

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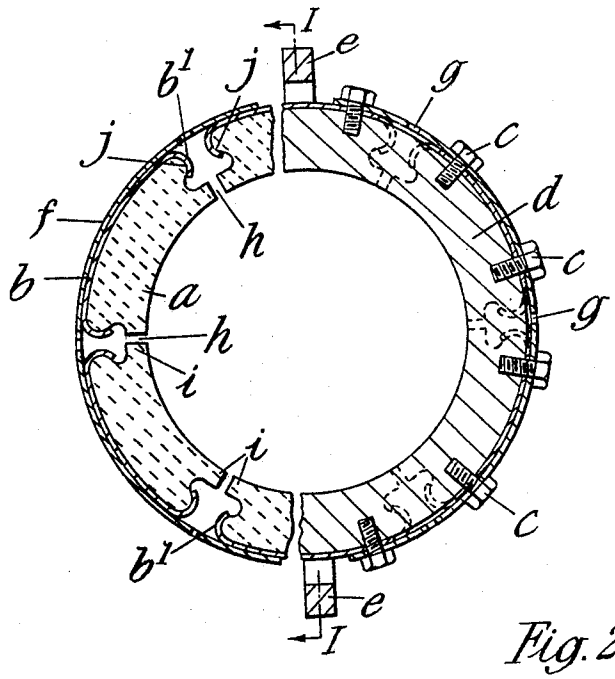
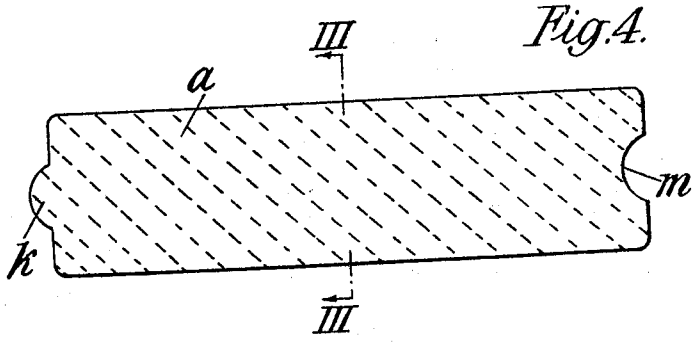


Fig. 2.

Fig. 4.



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By Hauge & Hume

Atty.

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2,915,877

CYLINDRICAL FURNACES

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Application February 4, 1955, Serial No. 486,238

Claims priority, application Great Britain March 3, 1954

5 Claims. (Cl. 60—39.69)

This invention relates to cylindrical furnaces incorporating refractory bricks and has for its object to provide improved or simplified constructions thereof permitting substantial expansion and contraction on heating and cooling.

The invention is applicable particularly, though not exclusively, to flame tubes of gas turbine combustion chambers wherein air pressure on the exterior of the tubes exceeds the pressure within the tubes.

The invention consists in a cylindrical furnace having features as set forth in the claims appended hereto.

Referring to the accompanying diagrammatic drawings:

Figure 1 is a longitudinal section of one convenient construction embodying the present invention.

Figure 2 is a cross-sectional view partly on the line II—II and partly on the line II*a*—II*a* of Figure 1.

Figure 3 is a full sized longitudinal sectional view of one of the bricks on the line III—III of Figure 4.

Figure 4 is a cross-sectional view of one of the bricks on the line IV—IV of Figure 3.

In carrying the invention into effect according to one form illustrated by way of example in the accompanying drawings as applied to the flame tube of a gas turbine combustion chamber wherein the air pressure on the outside of the cylinder is greater than that on the inside, six sets of refractory bricks are provided, each brick *a* being of segmental form and adapted to interlock with adjacent bricks.

The interlocking is conveniently performed by the provision of ridges *k* and grooves *m* at the edges of each brick, these ridges and grooves being adapted to mate as shown in Figure 1 when the combustion chamber is erected.

Each set of bricks is carried in a metal channel plate *b* screwed at each end by bolts *c* to an end metal ring *d*, the bricks being furnished with curved lips *j* which are adapted to be gripped by the channel plates. The cross-section of the channel plates causes them to be rigid in the longitudinal direction but the metal is thin enough for them to be quite flexible in the circumferential direction. The longitudinal edges *b'* of the channel plates engage similarly shaped edges on the bricks and the latter also embody overhanging lips *i* for protecting the metal plates in the completed assembly.

The end rings are rigidly secured to each other conveniently by two or more bridge pieces *e* extending longitudinally and on the outside of the channel plates two or more cover plates *f* are provided which conveniently may be secured in position by the same tap bolts as those holding the channel plates. These cover plates are furnished with perforations *g* in register with gaps *h* separating adjacent sets of bricks and channel plates so that air in passing inwards through the perforations and gaps effects cooling of these regions.

The tap bolts *c* are located some way in from the longitudinal edges of the channel plates to enable the

portions of these plates outboard of the tap bolt to be free to flex as the bricks expand and contract.

When the structure is erected, a refractory-lined cylinder is produced wherein the channel plates *b* are protected from the flame inside the cylinder by the overhanging lips *i* on the edges of the bricks. The edges of the channel plates are also protected by the flow of cooling air through the perforations *g*. Portions of the flame tube upstream and downstream of the refractory-lined cylinder may conveniently be attached to the end rings, e.g. by means of further tap bolts.

What I claim is:

1. In a cylindrical combustion chamber, at least two axially spaced fixed supporting rings, a series of longitudinally extending, circumferentially spaced plates secured to said rings, said plates having their opposite longitudinal edges turned inwards towards one another so as to define retaining channels, the cross section of said plates being such in relation to their longitudinal extent and their extent in the circumferential direction that the plates are stiff in the longitudinal direction but flexible in the circumferential direction, and refractory bricks having longitudinally extending grooves on opposite lateral sides thereof accommodated in said retaining channels.

2. In a cylindrical combustion chamber, at least two axially spaced fixed supporting rings, a series of longitudinally extending, circumferentially spaced plates, the opposite longitudinal edges of said plates being turned inwards toward one another throughout the major extent of the plates so as to define retaining channels terminating short of the opposite longitudinal ends of the plates, said plates having such cross section in relation to their longitudinal extent and their extent in the circumferential direction as to be rigid in the longitudinal direction, but flexible in the circumferential direction, refractory bricks having longitudinally extending grooves on opposite sides thereof accommodated in said retaining channels and securing means connecting the portions of the plates extending beyond the retaining channels to said rings.

3. In a cylindrical combustion chamber, at least two axially spaced fixed supporting rings, a series of longitudinally extending plates, securing means connecting said plates to said rings so that the plates are disposed in circumferentially spaced relationship, the opposite longitudinal edges of the plates being turned inwards toward one another so as to define retaining channels, the cross section of said plates in relation to their extent in the longitudinal direction and their extent in the circumferential direction being such that the plates are rigid in the longitudinal direction but flexible in the circumferential direction and said securing means being disposed inwards from the longitudinal edges of the plates so that those portions of the plates laterally outwards of the securing means are free to flex as the bricks expand and contract.

4. In a cylindrical combustion chamber, at least two axially spaced fixed supporting rings, a series of longitudinally extending, circumferentially spaced plates secured to said rings, said plates having their opposite longitudinal edges turned inwards toward one another so as to define retaining channels, the cross section of said plates being such in relation to their longitudinal extent and their extent in the circumferential direction that the plates are stiff in the longitudinal direction but flexible in the circumferential direction, refractory bricks having longitudinally extending grooves on opposite lateral sides thereof accommodated in said retaining channels, cover plates extending over a plurality of said longitudinally extending plates and said cover plates being perforated at points in register with the longitudinally extending spaces between said first-mentioned plates so as to permit

air to flow through said spaces, thus affording further protection to the edges of the longitudinally extending plates to minimize the danger of overheating.

5. In a cylindrical combustion chamber, at least two axially spaced fixed supporting rings, a series of longitudinally extending, circumferentially spaced plates secured to said rings, said plates having their opposite longitudinal edges turned inwards toward one another so as to define retaining channels, the cross section of said plates being such in relation to their longitudinal extent and their extent in the circumferential direction that the plates are stiff in the longitudinal direction but flexible in the circumferential direction, refractory bricks having

longitudinally extending grooves on opposite lateral sides thereof accommodated in said retaining channels, and further including at least two metal bridge pieces rigidly holding said supporting rings and forming a rigid skeleton on to which the channel plates, with their bricks, can be bolted so as to form a complete cylinder.

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