Nov. 17, 1953 P. BLANCHARD 2,659,588

FURNACE

Filed March 23, 1951

Fig.1

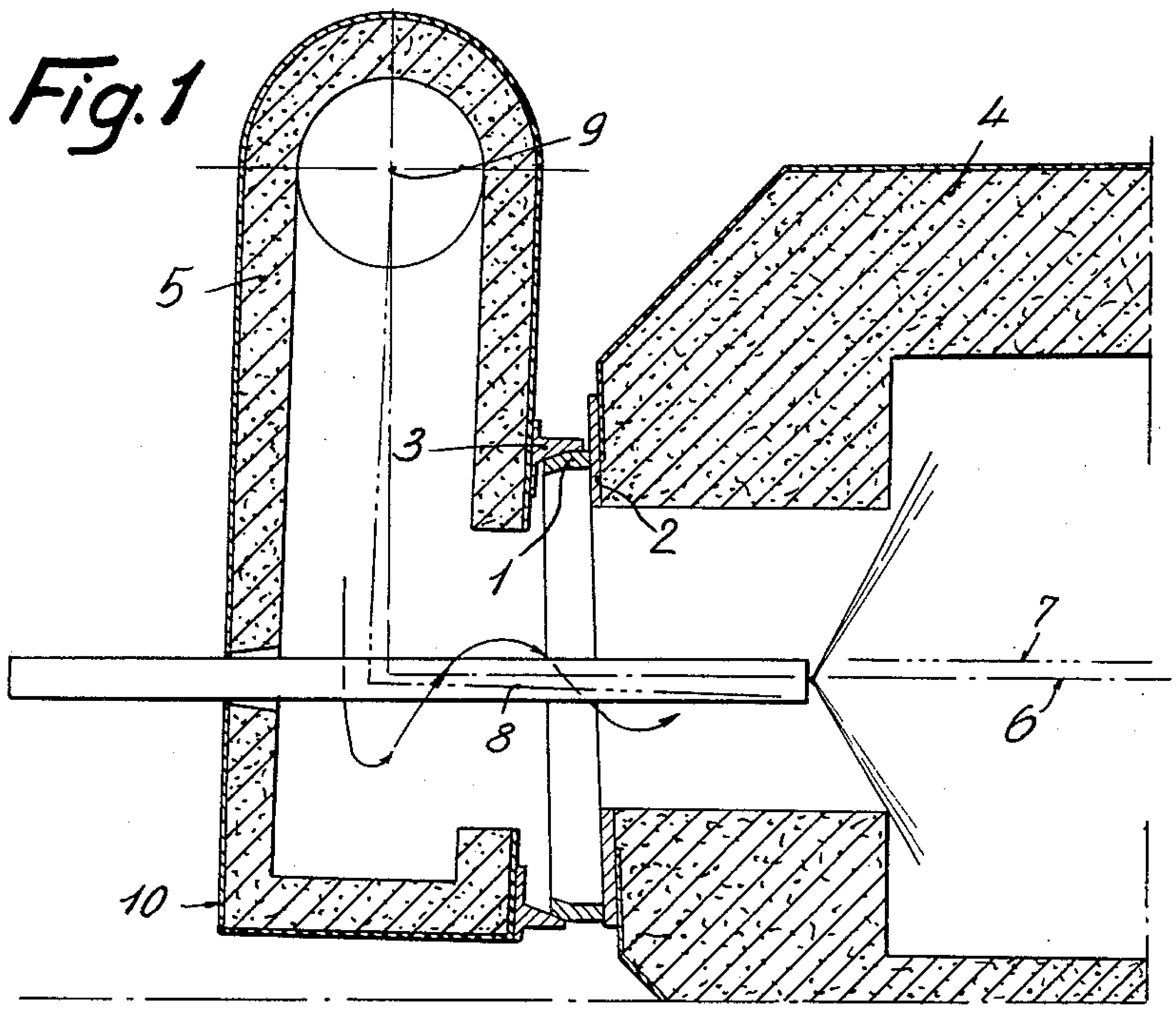


Fig.2

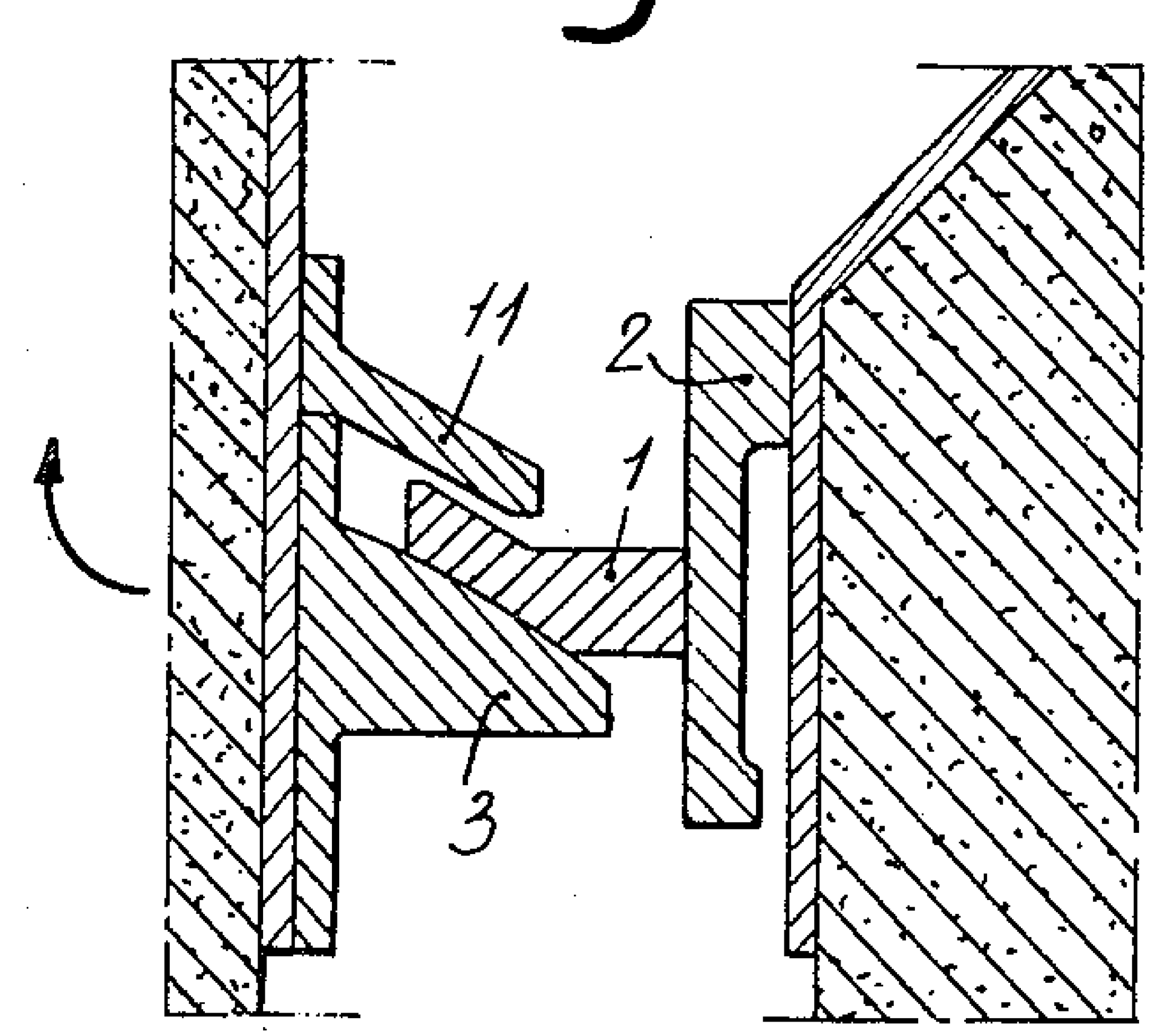


Fig.3

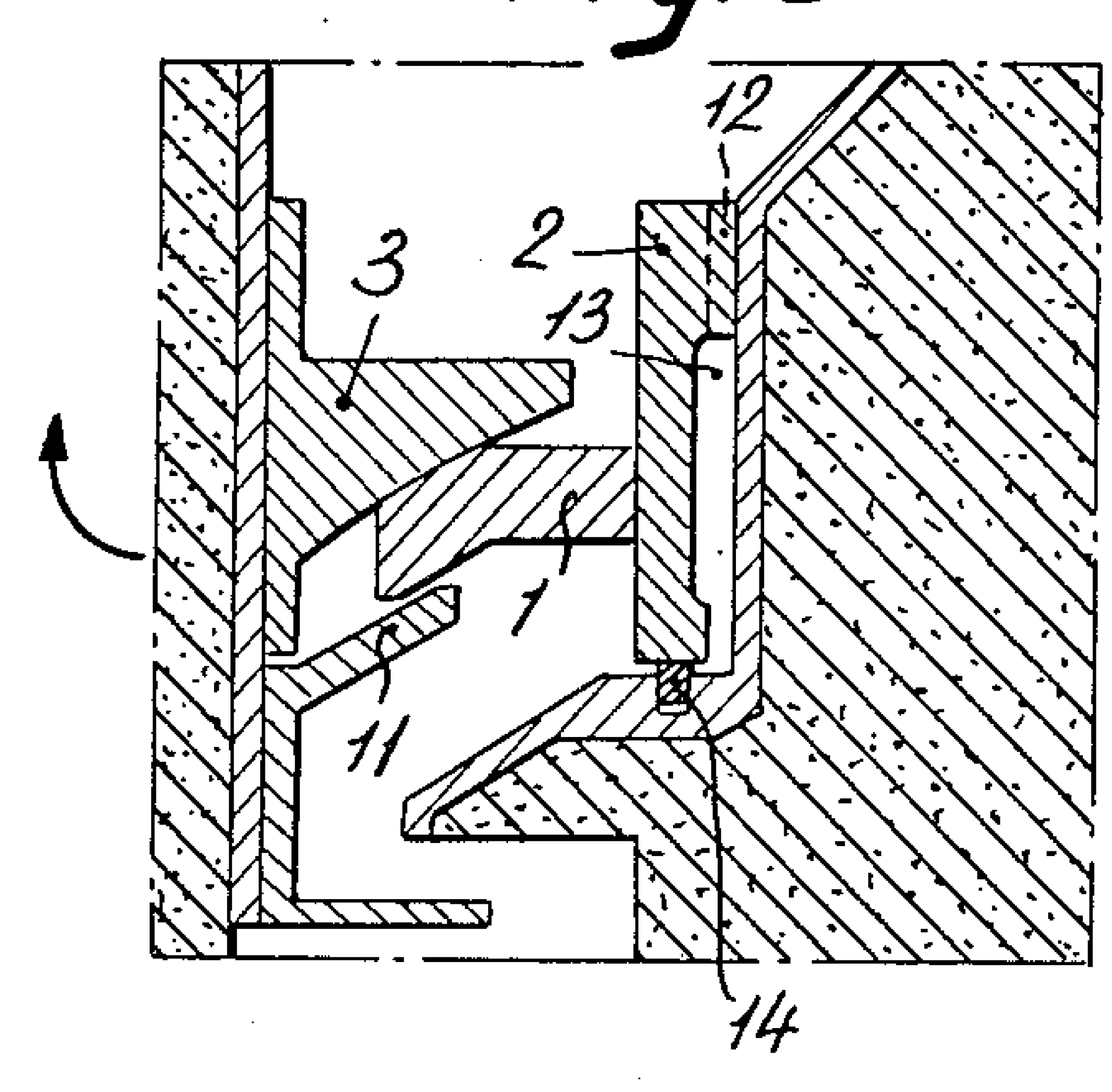
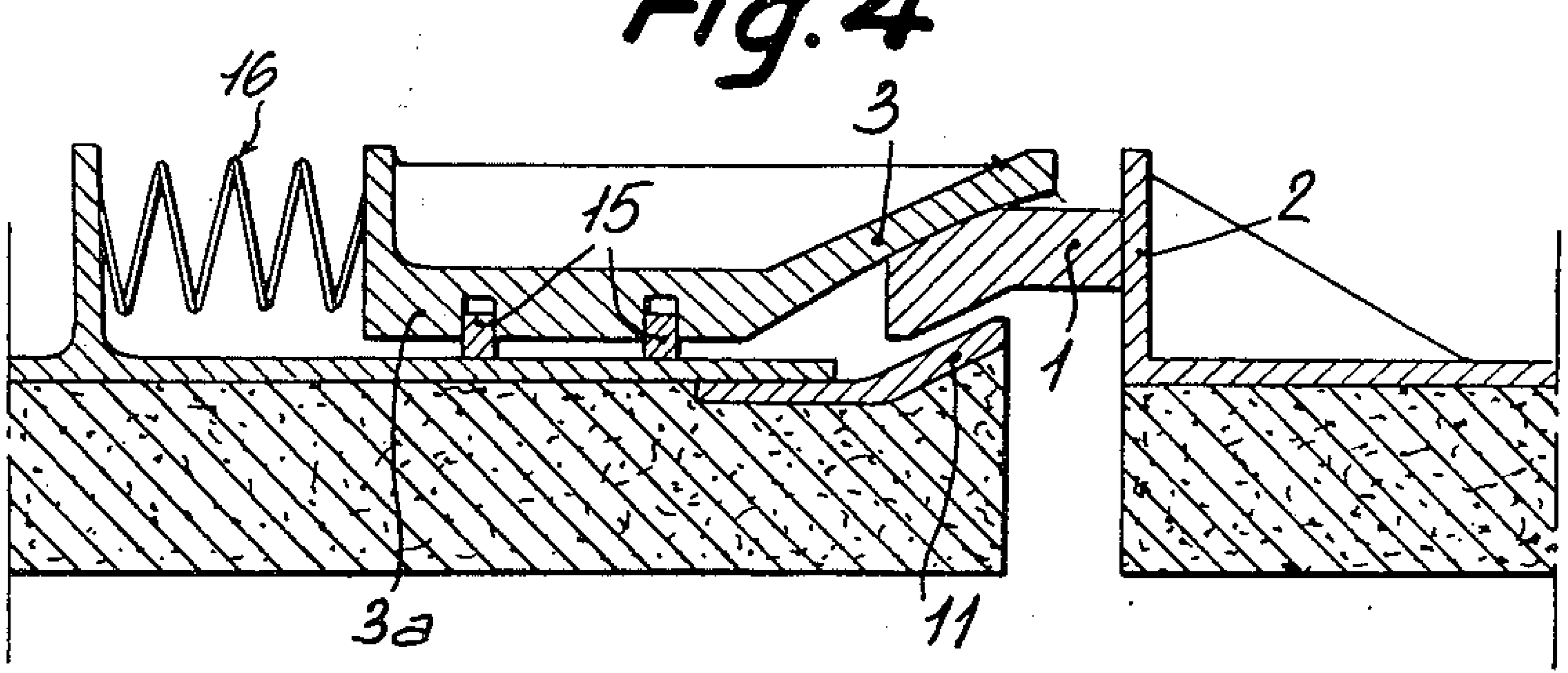


Fig.4



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6 Claims. (Cl. 263—32)

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Rotary or oscillating furnaces are generally formed of a chamber which is either continuously rotated or oscillated about its principal axis, the burner which is placed at one of its ends being practically stationary during the operation of the furnace.

The burner can be fixed, that is to say, rest stationary when the chamber is being relined with refractory material and comprises a removable part to enable the chamber to be changed.

The burner can be movable, that is to say, be brought momentarily away from the furnace either by being pivoted about an axis or by translation along the axis of the furnace whenever it is desired that the entrance opening to the furnace be made accessible.

In both cases, it is difficult to provide a gas tight joint because of imperfections in the mechanical mounting which are inevitable in apparatus subjected to considerable stresses as a result of thermal expansion. Appreciable leakages of combustion air or gas can result from the deformation of the joint and lead to decrease in the efficiency of the furnace and a modification of the setting of the air supply. The gas tightness of the joint has therefore a great influence on the operation of the furnace.

The object of the present invention is to provide a joint for a rotary furnace which provides appropriate gas tightness in the various cases which can arise, namely:

The plane of the end face of the burner is not perfectly perpendicular to the axis of rotation of the furnace.

The plane of the end face of the furnace is not perfectly perpendicular to the axis of rotation of the furnace.

The axis of the burner and the axis of the furnace are not co-incident.

The geometrical axis of the furnace is displaced relatively to its axis of rotation by an amount which is more or less great and which varies in accordance with constructional faults or deformations of the roller tracks.

The joint in accordance with the invention is formed of a circular segment comprising two bearing surfaces, one of which is plane and perpendicular to the axis of the segment, and the other of which is spherical and is preferably centered approximately on that axis, these two bearing surfaces bearing respectively on corresponding plane and spherical bearing surfaces on the furnace and on the burner.

The spherical bearing surface of the segment can be convex or concave at will.

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Preferably, means are provided for maintaining the bearing surface on that part which is mounted on the burner pressed against the furnace when the latter is in operation. Such means can be in the form of a spring device, an hydraulic or pneumatic piston (which can if desired contribute towards the movement of the burner) electric or electro-magnetic means etc. which act on the burner itself or only on the part of the burner on which the bearing surface is mounted which in that case will be mounted to slide on the burner and be subjected to the action of pressing means such as a spring or the equivalent.

Whatever may be the solution which is adopted, the pressure exerted on the segment will preferably be adjustable.

Under the effect of that adjustable or judiciously predetermined pressure the segment, because of the spherical surfaces, always takes up a position allowing perfect contact between the two plane surfaces.

The segment can be insulated to protect it against heat with or without the provision of cooling means.

The segment in accordance with the invention, being free, it is driven in practice sometimes by the spherical surface and sometimes by the plane surface. The surfaces are advantageously designed so that the frictional forces exerted on the two faces of the segment are approximately balanced, account being taken of the coefficients of friction of the materials in contact. In that manner a permanent lapping is obtained which enhances the gas tightness.

In order to assist that lapping, materials of different hardness can be chosen for the surfaces in contact, particularly in the case of the plane joint, the segment being preferably of the harder material.

The joint in accordance with the invention will now be described with reference to the accompanying drawing which is given only by way of example and has no limiting character and in which:

Fig. 1 is a partial axial section through a furnace having a joint in accordance with the invention.

Figs. 2, 3 and 4 are detail sections showing three different embodiments of the invention.

Referring to Fig. 1, it will be seen that the joint in accordance with the invention is formed by a segment 1 comprising two bearing members, one plane and bearing against a plane surface 2 provided on the furnace 4 and substantially per-

pendicular to the axis of the latter or of the segment, and the other spherical and bearing against a corresponding spherical bearing member **3** mounted on the burner **5**.

The burner, which is brought in front of the furnace in the operative position, is maintained in position pressed against the plane face of the furnace. The pressure can be provided by any suitable means; spring, hydraulic or pneumatic piston (which can, if desired, contribute towards the moving of the burner), electrical, etc.

Under the effect of that pressure, which can be adjustable or be judiciously predetermined, the segment always takes up, because of the spherical surfaces, a position allowing perfect contact between the two plane surfaces.

In this way, the gas tightness of the joint and its correct operation are not affected by any departure of the actual axis of rotation from the theoretical axis of rotation of the various parts of the furnace. For example, the theoretical axis of the furnace and burner can be as shown at **6** but the actual axis of the furnace be as shown at **7** and that of the burner be as shown at **8**. The burner can pivot about an axis **9**, in particular for placing the segment **1** in position or for disengaging it without damaging it (in the case of a burner pivoting about an axis **9**, as shown, the maintaining pressure for the segment **1** will, in general, be exerted in the direction of the arrow **10**).

A pivotally mounted burner can take up a slightly skew position. Other mountings can move on ground rails or suspended rails and be moved towards the furnace by translation; when using the joint in accordance with the invention, it is essential only that the burner press against the furnace with such a pressure that the segment takes up its position with its bearing surfaces wholly in contact with the joint surfaces.

When the burner is moved away in the direction of the arrows respectively shown in Figs. 2 and 3, the segment is retained approximately in position either by hooks or by a tapered collar **11** (Figs. 2, 3, 4) which can also serve to protect the spherical surfaces from the heat and from falls of foreign bodies, members **2**, **3** and **1** of Figs. 2 and 3 cooperating with each other in the same way as was described above in connection with Fig. 1.

As shown in Fig. 2, the spherical bearing surface of the segment can just as well be concave, and Fig. 3 shows the segment **1** provided with a convex bearing surface.

Experience shows that such a joint remains perfectly tight even in the case of a furnace supplied with air heated at 700° C. However, for greater security, a circulation of cool fluid (cool air, for example) can be provided between the parts **3** and **11** enveloping the segment. The joint can also be protected by insulating from the furnace **4** and from radiant heat the rear face of the plane face **2** by providing for a cushion of air **13** closed by a joint **14**; a circulation of cool air or other cooling fluid being, if desired, arranged through openings such as **12**.

The plane bearing member mounted on the furnace can be reinforced with ribs which give it rigidity. The very slow deformations which can take place are, moreover, compensated by the permanent lapping which takes place between the surfaces in contact. Fig. 3 shows a device similar to that of Fig. 1 in which the joint is protected against any possible radiant heat and in which a segmental joint **14** thermally insulates the rear face of the plane plate, a circulation of cool air being provided, if desired, through openings **12**.

It is to be noted that as the segment is free, it is driven, sometimes by the spherical surface and sometimes by the plane surface. It suffices that the frictional forces exerted on the two faces of the segment be approximately balanced by the design of the surfaces, account being taken of the coefficients of friction of the materials in contact.

For facilitating the lapping referred to above, materials of different hardnesses can be chosen, in particular, for the plane joint, the segment being preferably of the harder material.

Fig. 4 shows an arrangement in which the maintaining pressure is applied directly to the spherical bearing member mounted on the furnace or the burner. In this case, the said bearing member **3** forms part of a sliding joint **3a** on segments **15** and is maintained under pressure by one or more springs such as **16**.

In the foregoing, the plane bearing member is provided on the furnace. The equivalent is to provide the plane bearing member on the burner and the spherical bearing member on the furnace.

The invention is not limited to the particular forms described but can be adapted in the most diverse manners to different applications which may be envisaged.

I claim:

1. A rotary furnace arrangement comprising, in combination, a rotary furnace body having a front wall formed with an opening passing therethrough; burner housing means associated with said opening in said front wall of said furnace body; plate means mounted on said front wall of said furnace body about said opening thereof, said plate means having an outer peripheral portion located against said front wall and an inner peripheral portion in sealing engagement with said front wall, and said plate means being spaced, between said peripheral portions thereof, from said front wall and being formed with at least one passage passing through said outer peripheral portion thereof and communicating with the space between said plate means and front wall; and sealing means located between and contacting said burner housing means and said plate means, whereby a cooling fluid may enter through said passage in said outer peripheral portion of said plate means into said space between said plate means and front wall of said furnace body.

2. In a rotary furnace, in combination, a furnace body portion turnable about a predetermined axis and having a front end; a burner portion facing the said front end of said body portion and being movable toward and away from the same; annular plate means mounted on one of said portions, being located about said axis, and having an outer face located in a plane normal to said axis; a first annular ring fixed to the other of said portions, extending toward said plate means, being located about said axis, and having an annular face forming part of a sphere; a second annular ring fixed to said other portion, being located about said axis, extending toward said plate means, facing said annular face of said first ring, and being spaced from said annular face to form an annular groove therewith, said second ring having opposite end portions located at substantially the same distance from said annular face of said first ring; and a third annular ring located about said axis, having a planar end face normal to said axis and

engaging said outer face of said plate means, and having an annular face forming part of a sphere of the same radius as the sphere of which said annular face of said first ring forms a part, said annular faces of said first and third rings engaging each other, and said third ring extending with clearance through a substantial distance into said annular groove, whereby when said furnace body portion and burner portion are moved away from each other to disengage said third ring from said plate means, said third ring will be engaged by said first and second rings to be prevented from falling.

3. In a rotary furnace as defined in claim 2, said first ring being located within and surrounded by said second ring.

4. In a rotary furnace as defined in claim 2, said first ring being located about the surrounding said second ring.

5. In a rotary furnace as defined in claim 2, said annular face of said first ring being convex

and said annular face of said third ring being concave.

6. In a rotary furnace as defined in claim 2, said annular face of said first ring being concave and said annular face of said third ring being convex.

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