The present invention relates to carburizing or other furnaces, and more in particular to a retort therefor and the closure assembly for said retort.

Among the objects of the present invention is to provide a novel door or plug for retorts used in carburizing or other furnaces.

Hereinafter it has been customary to use a door of one-piece construction, which has certain disadvantages in that the innermost portion of the plug is subjected to exceedingly high temperatures, and as a matter of fact constitutes a working zone against which the products strike during treatment thereof, whereas the outermost portions of the plug are not as hot and accordingly, due to the temperature differential, considerable internal stress and strain are set up in the interior structure of the metal forming the plug or door. Furthermore, the excessive temperatures at the inner end of the plug or door cause rapid deterioration thereof, requiring frequent replacement to secure proper operation of the furnace, thus requiring a replacement of the entire door even though a part only thereof has deteriorated to such an extent as to require such replacement.

It is accordingly an object of the present invention to provide plugs or doors for furnace retorts of multi-part construction wherein the parts are assembled in such relation to one another that each of the parts may expand independently of the other due to temperature changes, yet providing a unitary assembly which may be handled readily and conveniently when manipulation of the same is necessary during the operation of the furnace.

It is another object of the present invention to provide a novel construction for a plug or door for furnace retorts embodying independent inner and outer closure members whereby the inner closure member which is subject to higher temperatures and accordingly deteriorates much faster than the outer closure member, can be replaced independently of the outer member at any time.

Still a further object of the present invention is to provide a novel construction for plugs or doors for furnace retorts embodying a plurality of parts subject to different temperature changes, the said parts being formed independently of one another so that where desired those parts subjected to the high temperatures may be readily made of heat-resistant metal or alloys better able to withstand the effects of such severe temperatures than the less expensive metals of which the remaining parts of the assembly may be formed with satisfactory performance because of the lower temperatures to which the same may be subjected.

Other objects, features, capabilities and advantages are comprehended by the invention, as will later appear and are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a view in side elevation of a furnace and its retort, including a plug or door for said retort made in accordance with the present invention;

Figure 2 is an enlarged fragmentary detached view in section of the plug or door shown in Figure 1 of the drawings;

Figure 3 is a view partly in section and partly in elevation, taken in the plane represented substantially by line 3—3 of Figure 2 of the drawings; and

Figure 4 is an enlarged fragmentary detached view in section similar to Figure 2 of the drawings, but disclosing a modified construction for the plug or door of a furnace retort.

Referring more in detail to Figures 1 to 3 inclusive of the drawings, an embodiment selected to illustrate the present invention is disclosed as comprising a furnace for heat treating or carburizing various materials such as small castings, bolts, pins and the like within the same, this furnace embodying in its construction a heating chamber 1 mounted upon suitable supports for pivotal movement through the medium of trunnions 4 whereby the material within the furnace may be conveniently discharged therefrom upon completion of the heat treatment or carburizing of said material.

As is well known in the art, the heating chamber is provided with burners spaced around the periphery thereof and adjacent the wall of the heating compartment for the purpose of heating a retort 6 mounted within the chamber and adapted to contain the material, such as small castings, bolts, pins and the like, for the heat treating or carburizing process. This retort 6 is mounted for rotation relative to the chamber 2 through the medium of rollers, such as 8. The retort 6 at one end, as at 7, is reduced to provide a fitting for a gas inlet 10 and has an opposite enlarged open end for the ready introduction and removal of the material being treated which is closed by a plug or door 12 removably clamped in position through the clamping means, 14.

As shown in Figures 2 and 3, the plug or door...
2,303,849

12 comprises an outer closure member 16 and an inner closure member 10, the said outer closure member 16 being in the form of a plate provided with an axially extending tubular part 20 reinforced as by means of a plurality of angularly extending webs, such as 22, and which, at its inner end, is formed with a plurality of radially extending locking lugs 24. The inner closure member 18 is constituted by a channeled part 22 having a centrally axially extending wall or web 28 which has a lateral extension or hub 30 telescopically embracing the inner end of the tubular extension 20 when the two members are in assembled relation and being provided with a plurality of axially extending slots 22 adapted to receive the interlocking lugs 24 of the tubular extension 20. The tubular elements of the parts 16 and 18, when disposed in their cooperative relation with one another, provide an axial duct 34 extending from the interior of the retort axially through the plug or door and in communication with a regulated gas outlet 36 for release of the spent gases from the device in any regulated quantity desired. In the embodiment disclosed in Figure 2 of the drawings, adjusting screws 38 are provided extending through the closure member 16 and being engaged in the threaded bosses, such as 40, of the member 18 and being provided with positioning nuts, such as 42, adjacent the closure member 18 for properly positioning the members 16 and 18 with respect to one another and to provide sufficient clearance between the hub 30 and tubular extension 20, as at 44, to permit relative expansion and contraction of the two members 16 and 18 with respect to one another.

Since the member 18 forms the end closure for the retort, the same is subjected to rapid deterioration due to the rubbing and tumbling of the material being treated within the retort over its surface, and also because of the high temperatures prevailing within said chamber of the retort. According to the present assembly, the said closure member 18 may be formed of special heat-resisting steel or alloys, whereas the closure member 16 may be made of less expensive material since this closure member 18 is subjected to the severe conditions to which the member 18 is subjected, and accordingly this less expensive material will withstand such conditions. In case replacement of either one or both of these members becomes necessary, this can be easily and readily accomplished in view of the manner of assembly shown in the drawings.

Replacement of the closure member 18 can be effected without discarding the entire plug or door, which has heretofore been necessary because of their integral formation, thus avoiding the necessity of scrapping the entire assembly when replacement of a portion thereof only becomes necessary.

The embodiment shown in Figure 4 of the drawings conforms generally to that shown in Figure 2 of the drawings in that the same is of multi-part construction wherein the parts are assembled for renewal independently of one another when that becomes necessary and to provide for relative movement of respect to one another due to temperature changes.

In this embodiment of a modified assembly, the outer closure member 46 is constituted by a face plate having an inwardly and axially disposed tubular part 48 reinforced with the plate by the diagonal webs 50, and which axially disposed tubular extension 46 has mounted thereon ad-
outer closure assembly including spaced closure members with an interconnecting axially disposed tube, one of said closure members being of double wall construction, a separately formed inner closure member having an axially disposed tube telescopically arranged with respect to said first-named tube, and means for securing said members together.

3. A door for a furnace retort, comprising an outer closure assembly including spaced closure members with an interconnecting axially disposed tube, one of said closure members being of double wall construction, a separately formed inner closure member having an axially disposed tube telescopically arranged with respect to said first-named tube, and means for securing said members together, said means including means provided to cooperate with said telescopically arranged tubes to prevent relative displacement of said inner closure member with respect to said outer closure assembly.

4. A door for a heat treating furnace retort, comprising an outer closure member having an axially disposed tube, an inner closure member axially spaced from said first-named closure member and having an axially disposed tube telescopically arranged with respect to said first-named tube, said tubes having means interlocking to permit relative axial movement due to expansion and contraction thereof but preventing relative rotation therebetween, and adjusting means extending between and connected to said closure members for securing the same together.

5. A door for a heat treating furnace retort, comprising an outer closure member having an axially disposed tube, an inner closure member axially spaced from said first-named closure member and having an axially disposed tube telescopically arranged with respect to said first-named tube, one of said tubes having a plurality of radially disposed lugs, and the other of said tubes having a plurality of radially disposed slots to receive said lugs to prevent relative rotation of said tubes but permitting relative axial movement therebetween due to expansion and contraction, and adjusting means extending between and connected to said closure members for securing the same together.

6. A door for a heat treating furnace retort, comprising an outer closure member having an axially disposed tube, an intermediate closure member connected to said tube, a separately formed inner closure member having an axially disposed tube telescopically arranged with respect to said first-named tube and having positioning means abutting said intermediate closure member, and means for connecting said members together.

7. A door for a heat treating furnace retort, comprising an outer closure member having an axially disposed tube, an intermediate closure member connected to said tube, adjusting means connecting said outer and intermediate closure members, a separately formed inner closure member having an axially disposed tube telescopically arranged with respect to said first-named tube and having positioning means abutting said intermediate closure member, and means for securing said tubes together.

8. An assembled door for a furnace retort, comprising separately formed axially spaced closure members, each of said members having axially disposed ducts telescopically arranged with respect to one another and providing a fluid passage through said door, means for maintaining proper spacing relation of said closure members in said door assembly, and means providing a connection between the telescoping ducts to permit expansion and contraction and to prevent rotation therebetween.

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