BLAST FURNACE STOVE BOTTOM CONSTRUCTION

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This invention relates in general to improvements in the bottom construction of high pressure furnace stoves, and more particularly, to blast furnace stoves designed to heat the blast for blast furnaces while at a blast pressure in the stove of the order of 50–60 pounds per square inch gauge.

The main object of the invention is the provision of a simpler, more economical, and facile way of anchoring the bottoms of the upstanding, or vertical, shells of the stoves in the main concrete foundation mat, in a manner to resist the upward force on the shells due to this high pressure.

Conventional blast furnace stoves designed for use under normal blast furnace conditions of top pressure of not more than 10 pounds per square inch gauge, are not anchored, but simply rest on a bottom plate on a concrete foundation mat. The checker column of heat regenerative material in the stove is supported by a grid on columns which rest on the top of the concrete foundation mat.

Conventional blast furnace stoves designed for use under higher blast furnace pressure conditions of top pressures more than 10 p.s.i.g., such as 30–40 p.s.i.g., must have their shells anchored to the concrete foundation to resist the upward force on the shell due to the higher pressure of the air in the stoves. This may be done by using a concave head filled with concrete to provide a flat top and embedded in the concrete mat and provided with conventional forms of anchor bolts, or by the use of a flat metallic bottom member on a concrete foundation and anchored by heavy bolts which pass through the bottom and through the reinforced concrete mat or foundation. In each of these instances, with the weight of the checkerwork on the bottoms and the anchor bolts, these arrangements withstand the heavy pressure in the stoves when the blower for the blast furnace is at full pressure. However, as in the case of anchoring other forms of heavy machinery, these arrangements entail the use of anchor bolts set in the concrete with the upper ends of the bolts projecting above the top of the mat for anchorage connection with the shell or bottom when later set in place thereon. This entails the usual time-consuming and tedious labor of precisely locating or adjusting the anchor bolts or heads to the shell after it is set in place to make absolutely sure that the bottom of the stove shell is positively and properly anchored.

According to the present invention, the vertical shell portion of the stove is accurately located in level relation by erection struts in the concrete foundation for the stove, with the lower portion of the bottom section embedded in the concrete of the mat below the top but above the base of the mat, and with the upper portion of the bottom section projecting above the top of the mat in position for welding thereto of the next upper vertical sections of the shell. Anchor rods are welded to the bottom section to terminate at a level below the top of the mat and extend downwardly beyond the lower extremity of the bottom section into the portion of the concrete of the mat below the lower extremity of the bottom section. The anchor rods and the inside and outside of the embedded portions of the bottom section are covered with the concrete of the mat, which concrete extends up inside the bottom section to a top level to form the bottom of the stove chamber on which the checkerwork is surmounted.

Preferably, the lower extremity of the embedded bottom section of the vertical portions of the shell is constituted of steel plate of 1/4 inch greater thickness than the remainder of the steel shell above the bottom section, as a precaution against corrosion, and the top of the concrete on the inside of the bottom section is covered with a flat metallic plate welded to the inside faces of the vertical portions of the bottom section of the steel above the concrete, to provide a gas-tight shell for ultra-high pressure operation.

With this mode of construction, the stove bottom can be installed in a relatively simple manner without fitting of holes is required. The bottom shell ring is easily properly leveled and kept round and then covered with the concrete as it is poured to form the mat foundation. The design is more economical, and the cost of material and labor in construction is materially less than with the conventional anchor bolt arrangement.

The accompanying drawings show, for purpose of exemplification, the best mode of carrying out the invention:

FIGURE 1 is a vertical cross-sectional view of a blast furnace stove embodying the stove bottom invention.

FIGURE 2 is an enlarged view in cross-section of a portion of FIGURE 1 to show in detail the anchorage of the stove shell.

Referring to the drawings, the stove 10, as shown, is one of the conventional types having a checkerwork chamber 11 and combustion chamber 12 with pressure burner inlet 14. The waste gases from the pressure burner 14 leave the checkerwork chamber 11 through chimney valve connections (not shown) during lifting up of the stove, and the cold blast of air to be heated for the blast furnace enters through the connection 15 and leaves through the hot blast connection 16 to enter the blast furnace.

The stove, as shown, is designed for a 60 pound blast, and so, is composed of a vertically elongated cylindrical shell 17 of steel plate, lined with insulation 18 and refractory brick 19.

The checkerwork of heat regenerative material 20 is mounted on a grid 21 supported by girders 22 and columns 23 which rest on the top of a concrete foundation mat 24.

In accordance with the invention, the bottom section of steel plate 25 of the shell 17 is partially embedded in the concrete of the mat 24 in level relation by means of erection struts 26 which rest on a sub-level pad of concrete 27. The struts 26 are adjusted, as by shims, to have the upper portion 28 of the bottom section 25 at a level above the level of the top of the foundation mat, for attachment of the rest of the upper steel plate sections of the shell, as by welding. The lower embedded portion of the bottom plate section 25 then terminates at a level above the base of the foundation 24 and is provided with an annular series of plain steel anchor rods 29 which are welded to the bottom plate section 25 so as to terminate at their upper parts at a level below the top of the concrete mat 24 and extend a spaced distance below the base of the bottom steel plate section 25. The rods 29 are bent 90° to provide a lateral portion 30 which, with a vertical portion 31, is embedded in the concrete mat 24. These rods 29 are of sufficient size and number, about 80, to resist the upward force of the shell 17, due to the 60 pounds pressure of the entering cold blast for the blast furnace.

The mat is as conventional, provided with reinforcing steel 32, and its top is covered with a metal plate 33 inside the bottom plate section 25 and welded thereto at 34.

In assembling the foundation, for ease of construction,
the sub-foundation pad 27 is poured first at a lower level to have the top of the sub-foundation pad 27 at an elevation conforming to the bottom of the main stove foundation 24. The lower layer of reinforcing steel 32 is then laid. The erection struts 26, welded to the bottom ring 25, are then set on the top of the sub-pad 27 and shimmed as required for proper leveling of the bottom ring steel plate 25. The upper layer of reinforcing steel 32 is then set in place, and the main foundation pad 24 is poured. After this, the upper steel plate ring sections 28 of the shell 17 are welded in place, and the top covered with the metal plate 33. The bottom ring section 25 is made ¼ inch thicker than the thickness of the remainder of the sections 28 of the shell 17 as a precaution against corrosion. The installation, thus, is relatively simple. No fitting of holes is required for anchoring. The bottom ring 25 is properly leveled and kept round before the concrete is poured. The design is economical, costing less in material and labor to fabricate.

The invention as hereinafore set forth is embodied in a particular form of construction but may be variously embodied within the scope of the following claims:

We claim:
1. A blast furnace stove bottom construction comprising: a concrete foundation mat for the bottom of a blast furnace stove, a steel plate bottom section for the vertical shell portion of a checkerwork containing stove with the bottom section accurately leveled in the concrete foundation mat for the stove, the lower portion of the bottom section being embedded in the mat below the top but above the base thereof and the upper portion of the bottom section projecting above the top of the mat in position for the uniting therewith of the next vertical section of the shell, and anchor rods rigidly integral with the bottom section terminating at their upper ends below the top of the mat and extending downwardly into the portion of the mat below the lower extremity of the bottom section therein and anchored there in the concrete of the mat.
2. A construction as claimed in claim 1 in which the bottom section is mounted on subadjacent erection struts covered by the concrete of the mat.
3. A construction as claimed in claim 2 in which the struts are supported by a subfoundation concrete pad below the foundation mat.
4. A construction as claimed in claim 1, in which the concrete of the mat inside the embedded portion of the bottom section extends up to a top level below the top of the upper portion of the bottom section and is covered by a metal plate covering the mat inside the bottom section and united with the section to form the bottom of the stove chamber in which the checkerwork of the stove is to be mounted.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent</th>
<th>Inventor</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>996,262</td>
<td>Kurtz</td>
<td>June 27, 1911</td>
</tr>
<tr>
<td>1,051,721</td>
<td>Ford</td>
<td>Jan. 28, 1913</td>
</tr>
<tr>
<td>1,611,107</td>
<td>Doherty</td>
<td>Dec. 14, 1926</td>
</tr>
<tr>
<td>2,045,478</td>
<td>Kuehn</td>
<td>June 23, 1936</td>
</tr>
<tr>
<td>2,187,191</td>
<td>Younglove</td>
<td>Jan. 16, 1940</td>
</tr>
</tbody>
</table>