

Sept. 5, 1933.

W. P. BREWER ET AL

1,925,519

CUPOLA

Filed June 29, 1932

3 Sheets-Sheet 1

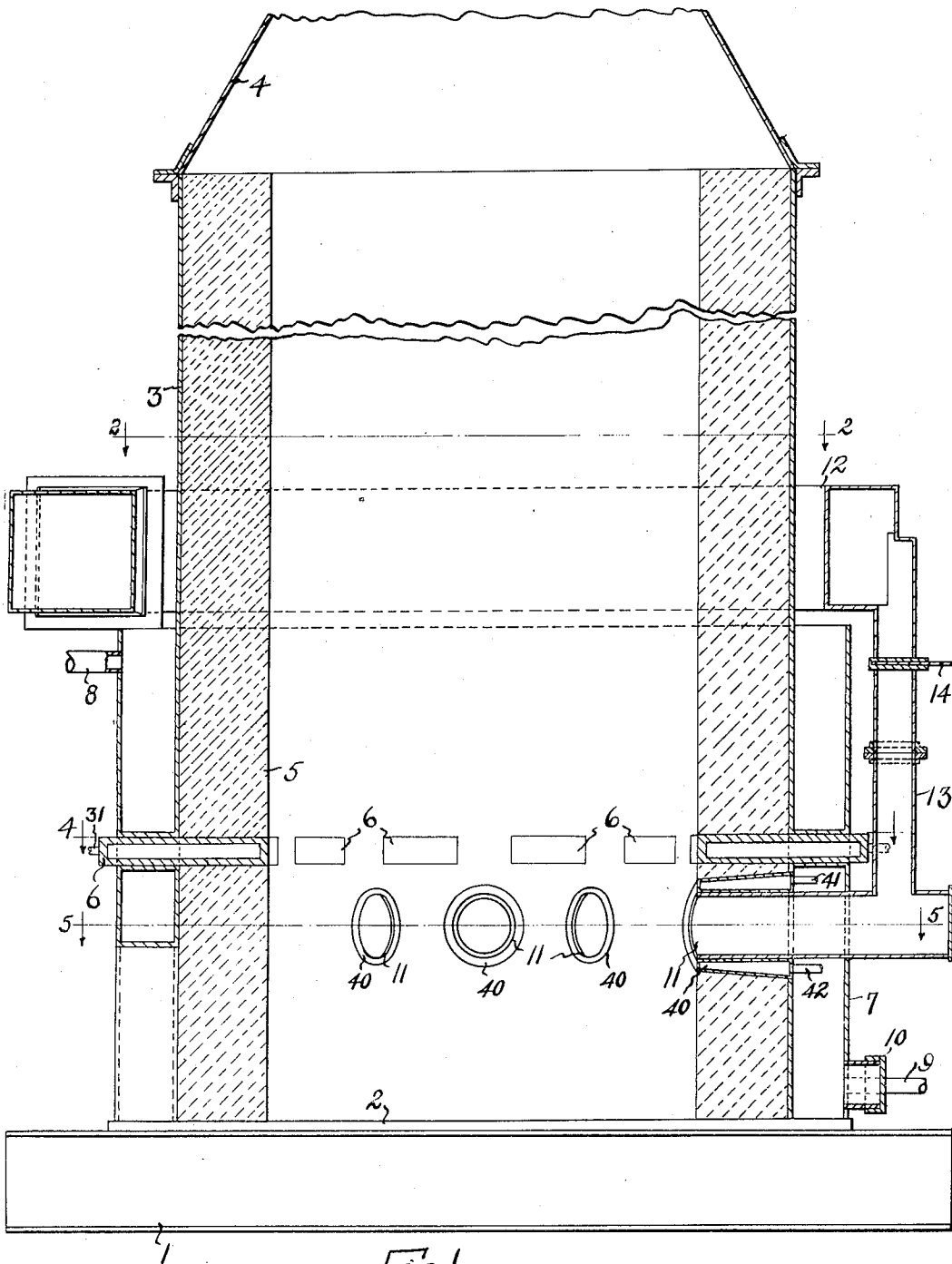


Fig. 1.

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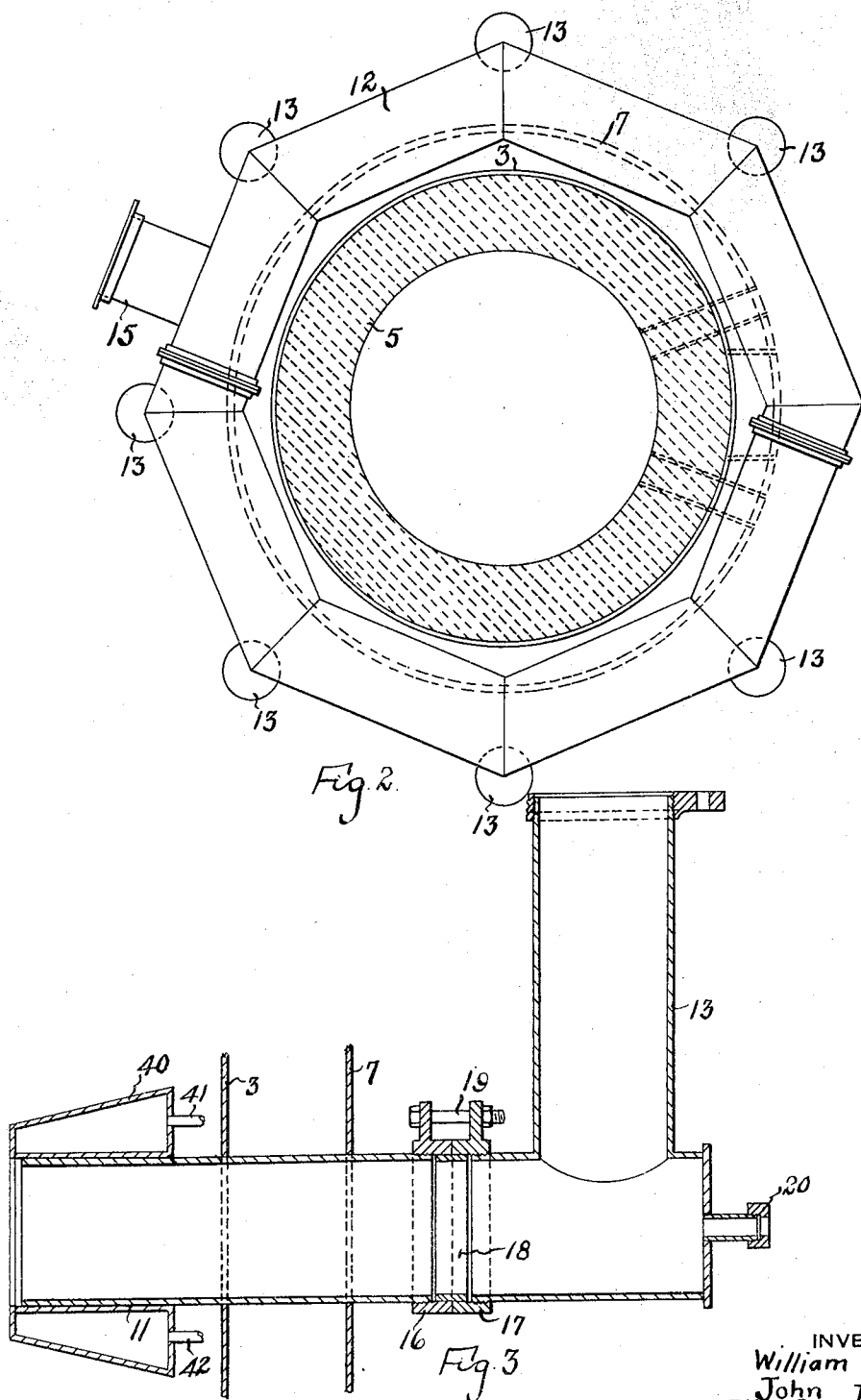
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3 Sheets-Sheet 3

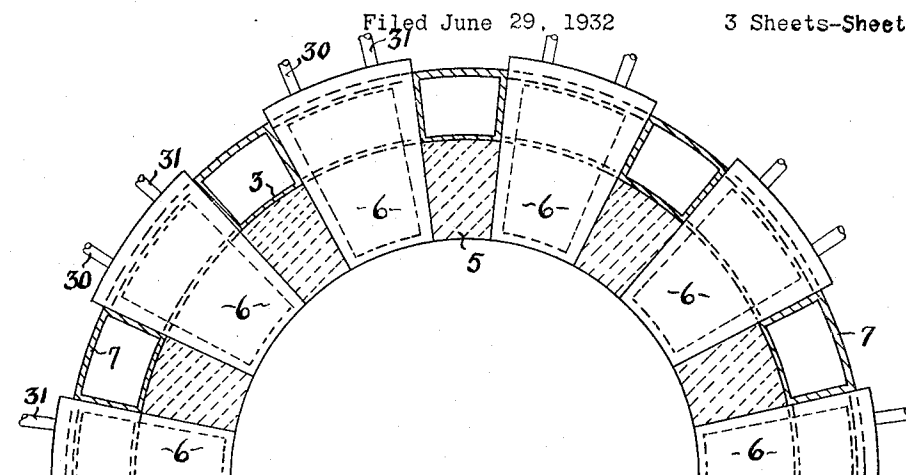


Fig. 4

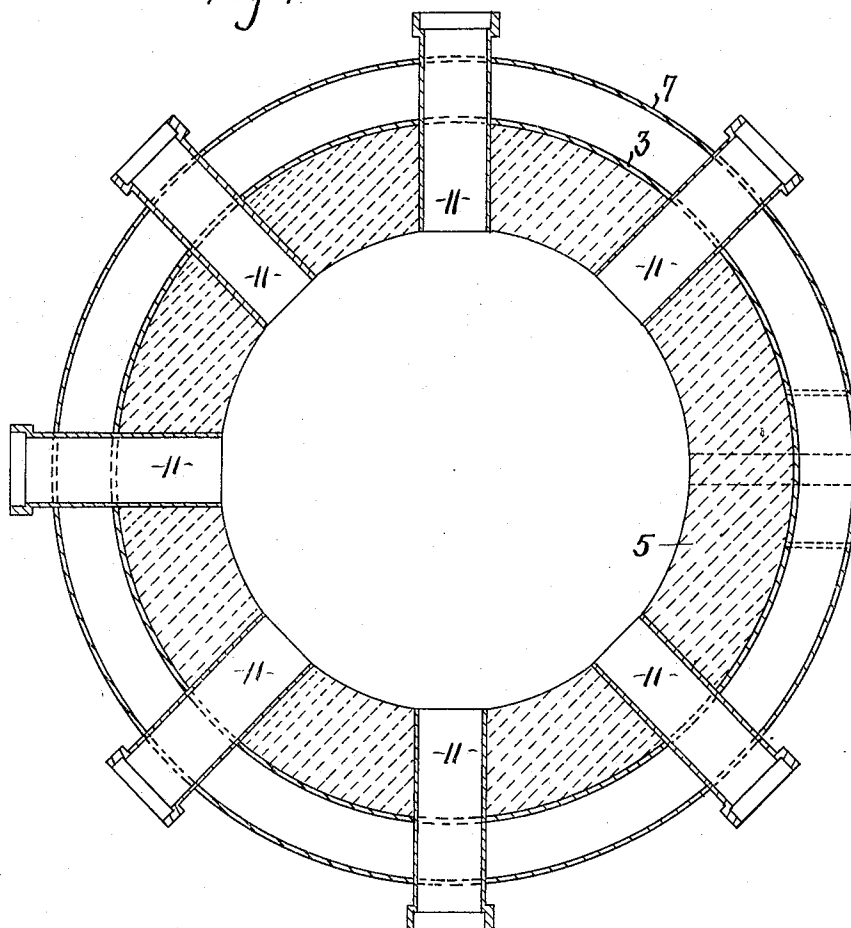


Fig. 5

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UNITED STATES PATENT OFFICE

1,925,519

CUPOLA

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Application June 29, 1932. Serial No. 619,848

8 Claims. (Cl. 266—32)

This invention relates to improvements in cupolas.

One of the main objects of this invention is to provide a new form of construction for devices of this nature in which, even at the high temperatures encountered therein, the refractory lining will be protected against too rapid deterioration.

More specifically the object of this invention is to provide in combination a cupola lined with refractory material having a water jacket in heat exchange relation therewith and a plurality of heat conducting members or cooling blocks associated with the lining and the water jacket, and particularly in the neighborhood of the tuyères for the purpose of protecting the lining and tuyères.

These and many other objects, as will appear from the following disclosure, are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement, and relative location of parts, all as will be described in connection with the attached drawings.

Referring to the drawings—

Figure 1 is a vertical cross-sectional view through the cupola of this invention;

Fig. 2 is a cross-sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged vertical cross-sectional view through one of the tuyère connections showing its association with the water leg;

Fig. 4 is a cross-sectional view of half of the cupola taken on the line 4—4 of Fig. 1; and

Fig. 5 is a cross-sectional view taken on the line 5—5 of Fig. 1.

In the operation of retorts, cupolas, and furnaces, particularly in the treatment of some materials, it is necessary to attain very high temperatures within the retort, cupola, or furnace in order to reduce the materials to a molten state. In the operation of retorts and the like it is usual to employ some form of forced draft in order to attain the desired temperatures, with the result that the refractory lining employed therein is quickly eaten away. In addition, the tuyères which project through the lining because of the high temperatures attained are rapidly destroyed. This, of course, requires frequent relining of the furnace and renewal of the tuyères, resulting in not only keeping the retort out of use during repair but causing economic waste. The purpose of this invention is to provide a novel form of construction in which the heat in the refractory lining, particularly in the combustion zone ad-

jacent the tuyères, is conducted away with sufficient rapidity to materially increase the life of the lining and tuyères without seriously interfering with the efficiency of the operation of the retort.

The construction by which these objects are attained is shown in detail in the drawings. The cupola is shown mounted on a suitable base or support 1 having a bottom 2, which is diagrammatically illustrated as any suitable form of bottom for a device of this type. The cupola itself comprises a casing or outer wall 3 provided with a hood 4, as shown.

The shell 3 is provided with a suitable refractory lining of fire brick and the like of a nature depending upon the types of material to be treated therein. Surrounding the lower portion of the cupola, and particularly in the neighborhood of the combustion zone, is an outer casing 7 which, in conjunction with the lower portion of the shell 3, provides a water jacket or leg. At 8 is the inlet water pipe which delivers the cooling water to the jacket, which water may be withdrawn through the discharge connection 9. In operation water continuously flows through the water jacket in sufficient quantity to abstract heat at the necessary rate to protect the lining while reducing to a minimum the abstraction of useful heat from the combustion zone.

At 10 is a cleanout manhole for the water jacket. Distributed around the cupola in accordance with the usual practice are the tuyères 11 which are connected by means of vertical pipes 13 with a common gas pipe 12 through which air or other suitable gases to support and aid combustion may be delivered. Each of the connections 13 is provided with a damper valve 14 by means of which the amount of gas flowing to any tuyère may be controlled. Projecting through the water jacket and the refractory lining are a plurality of hollow cooling blocks 6 fitted with water connections 30, 31 to provide circulation of water preferably positioned in the lining so as to be in the neighborhood of the hottest points of the combustion zone. These cooling blocks 6 are also located with respect to the tuyères 11 so as to aid in absorbing heat from the vicinity thereof to protect them. The tuyères are also equipped with coolers 40 made of bronze, copper, brass or tuyère metal and fitted with water connections 41, 42 to provide circulating water which protects them (see Figs. 1 and 3).

The cooling blocks and tuyère coolers may be made of any suitable heat conducting material,

such as cast iron, brass, copper, tuyère metal, and the like. It should be noted that they are also associated with the water jacket passing through same so that the heat conducted through them may be readily transferred in part to the water moving through the jacket to conduct it away. The relative position of the various parts will be readily apparent from Figs. 1, 2, 4 and 5.

In Fig. 3 a detail is shown of the connection from the tuyère to the main air or gas conduit 12. The tuyère and the horizontal portion of the connecting pipe 13 are provided with the lugged rings 16 and 17, respectively, which may be held together by means of nuts and bolts 19. A sealing ring 18 fits between the ends of the pipes to aid in forming a good joint which may be readily taken apart. A sight or peep opening 20 is provided by means of which the interior of the cupola in the neighborhood of the combustion zone may be observed.

At the points where the tuyères and the inlet and outlet pipes 41 and 42 pass through the water jacket the surfaces may be welded to provide a watertight joint. Instead of welding, if desired, the water jacket may be formed to provide a closed container through which these pipes project in a manner similar to that shown in Fig. 1 at the points where the cooling members 6 pass through the water jacket.

The other details of construction of such a device have not been shown in the drawings since this invention is not concerned with them.

It is, of course, apparent to those skilled in the art that this invention resides in certain principles of construction and association of parts which accomplish results capable of being effected within the scope of this invention by other constructions and associations. We do not, therefore, desire to be strictly limited to the disclosure, as given for purposes of illustration, but rather to the scope of the appended claims.

What we seek to secure by United States Letters Patent is:

1. A cupola as described comprising a shell, a refractory lining for said shell, a plurality of tuyères mounted in said shell and lining so as to open into the interior of the retort, a water jacket surrounding the shell in heat exchange relation therewith and with the lining and tuyères, and a plurality of heat absorbing members projecting through said shell, lining and jacket and exposed to the interior of the cupola.

2. A cupola as described comprising an outer shell having a fire brick lining, a casing surrounding at least a portion of the shell and forming a water leg, a plurality of tuyères projecting through the water leg, shell and lining and opening into the interior of the retort, and a plurality of heat absorbing members passing through the water leg, shell and lining.

3. In a cupola, the combination with a shell having a fire brick lining and a plurality of tuyères for supplying air or gas to the interior of the cupola, of a plurality of hollow cooling blocks passing through the shell and lining and separated from but positioned in heat exchange relation to the tuyères.

4. A cupola as described comprising a shell, a refractory brick lining for the shell, means forming a water jacket surrounding said shell, a plurality of water cooled tuyères opening into the interior of the cupola, a main air or gas supply connection, a plurality of branch connections from the main connection to the tuyères, and a plurality of water cooled heat conducting and radiating members passing through the shell and lining adjacent the tuyères, said tuyères and members being positioned in heat exchange relation with the jacket.

5. A cupola as described comprising a shell, a fire brick lining for said shell, a plurality of tuyères passing through said shell and lining for supplying gas to the interior of the cupola, and a plurality of heat conducting and radiating blocks passing through the shell and lining and positioned adjacent the tuyères but spaced therefrom so that the inner ends of the blocks are exposed to the interior of the cupola.

6. A cupola as described comprising a steel shell, a fire brick lining for said shell, a plurality of water cooled tuyères passing through said shell and lining for supplying air or gas to the interior of the cupola, a plurality of water cooled heat conducting and radiating members passing through the shell and cupola adjacent the tuyères so that the inner ends of the members are exposed to the interior of the cupola, and a water jacket in heat exchange relation with said shell, tuyères and members.

7. In a cupola the combination with a shell having a refractory lining and a plurality of tuyères extending to the interior thereof, of a plurality of hollow heat absorbing blocks passing through the shell and lining adjacent the tuyères but spaced therefrom, and inlet and outlet water connections for the hollow heat absorbing blocks.

8. In a cupola the combination with a shell having a refractory lining and a plurality of tuyères extending to the interior thereof, of a plurality of hollow heat absorbing members passing through the shell and lining adjacent the tuyères, inlet and outlet water connections for the hollow heat absorbing members, and a water jacket surrounding the tuyères and members having connections for circulating a cooling fluid therethrough.

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