

June 27, 1933.

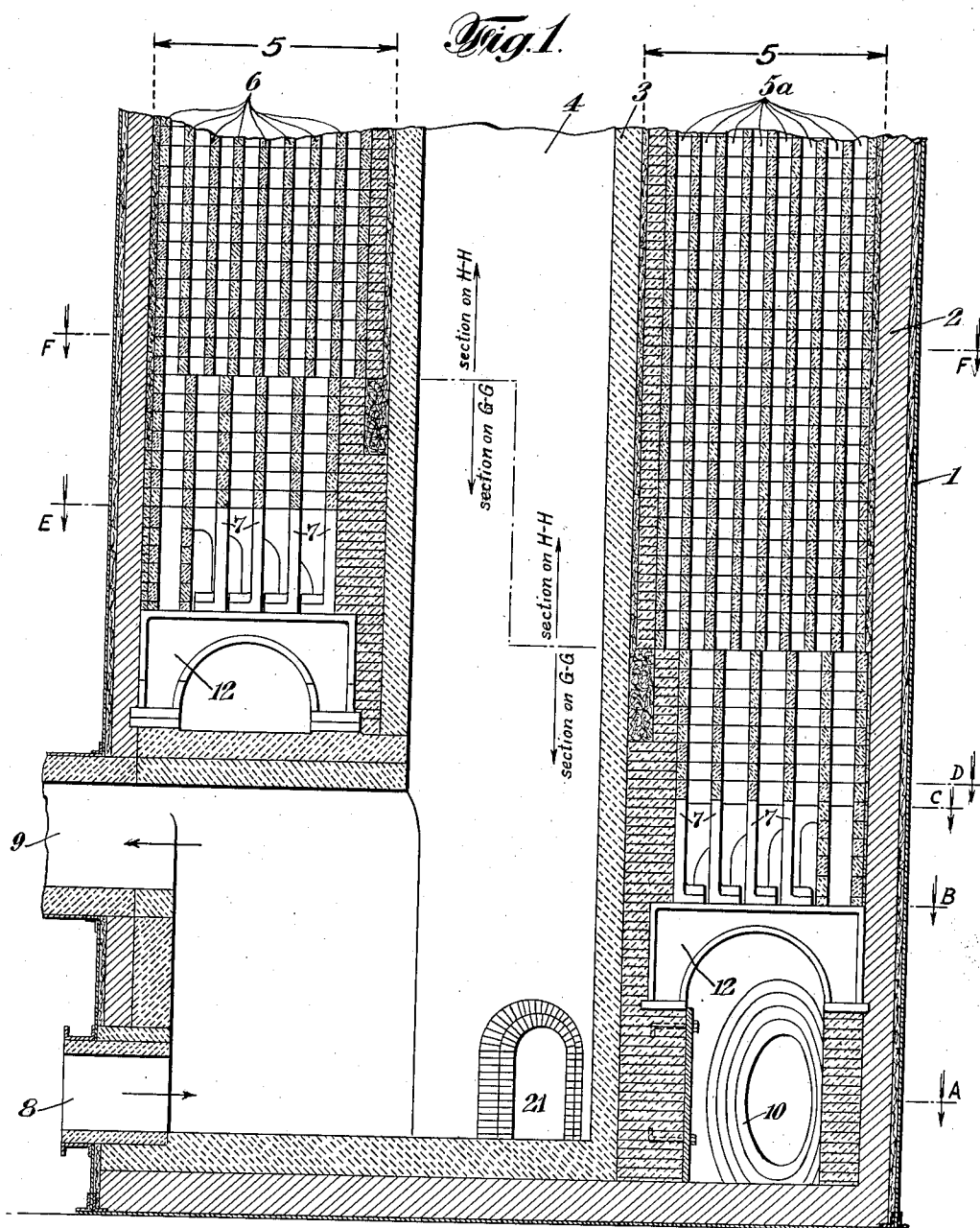
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1,915,880

BLAST FURNACE HOT BLAST STOVE

Filed Dec. 22, 1931

3 Sheets-Sheet 1



INVENTOR
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Usina & Kauter
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June 27, 1933.

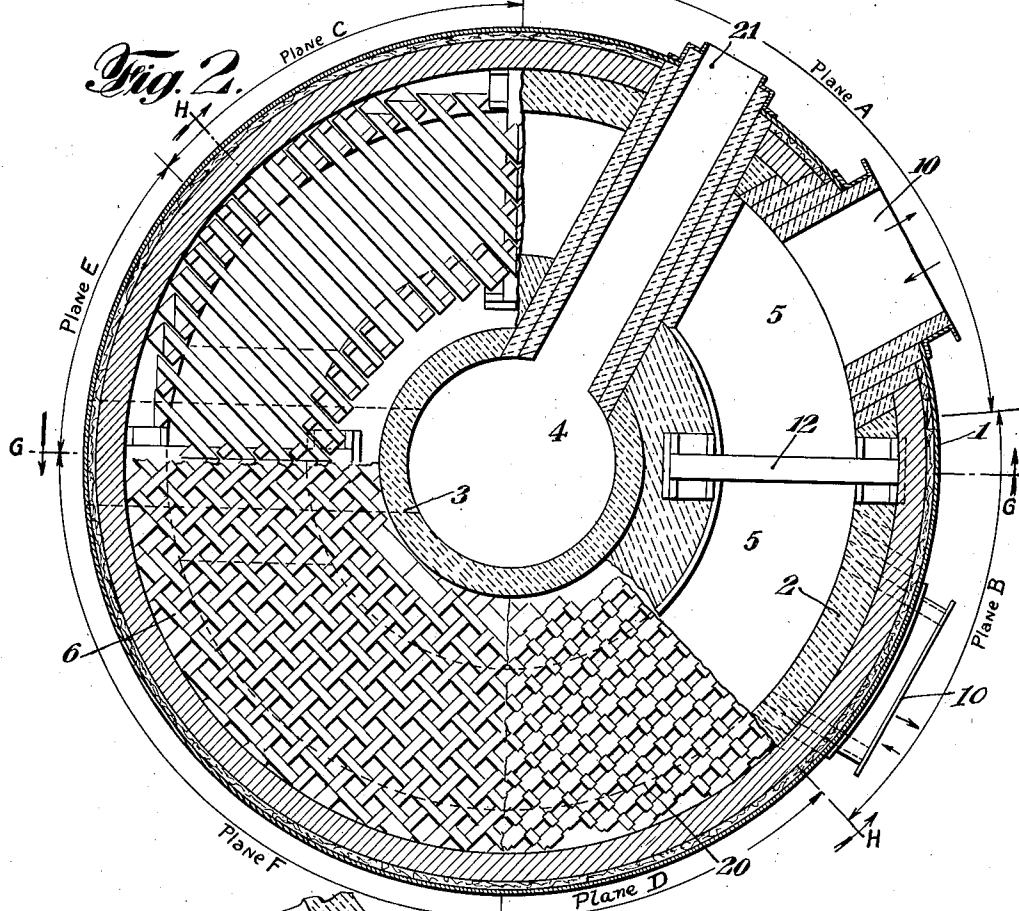
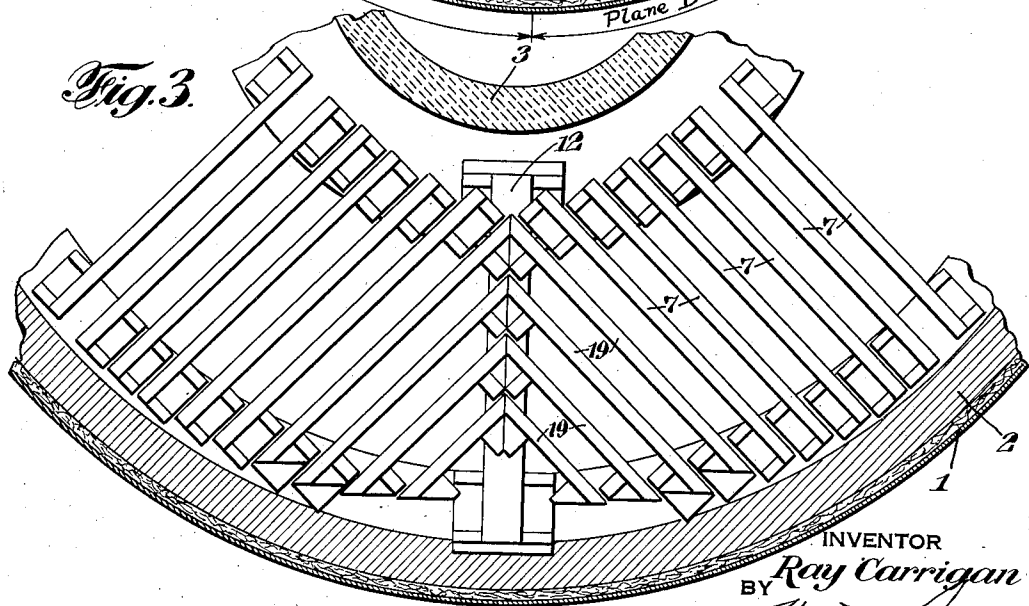
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BLAST FURNACE HOT BLAST STOVE

Filed Dec. 22, 1931

3 Sheets-Sheet 2



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BLAST FURNACE HOT BLAST STOVE

Filed Dec. 22, 1931

3 Sheets-Sheet 3

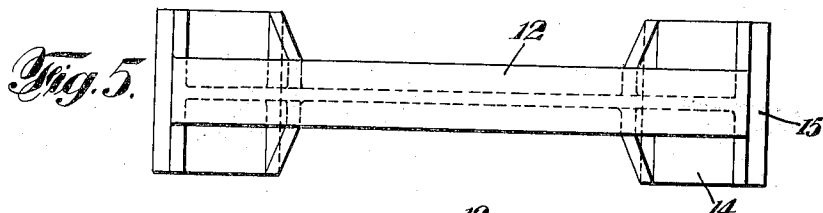
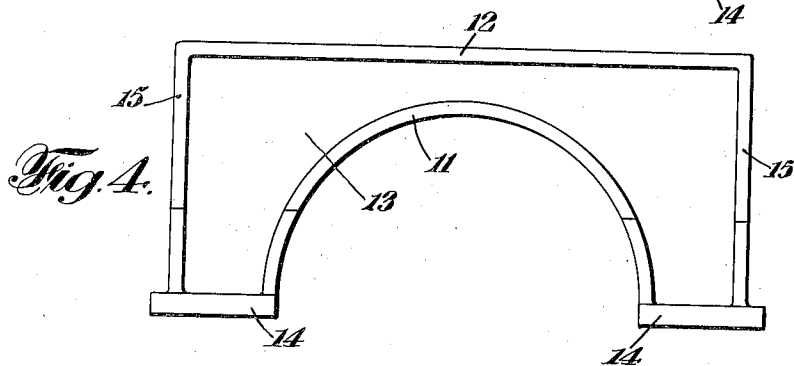


Fig. 6.

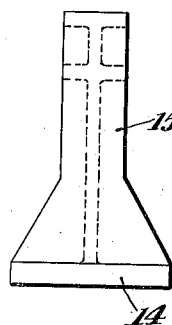
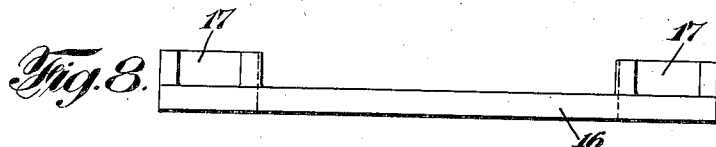
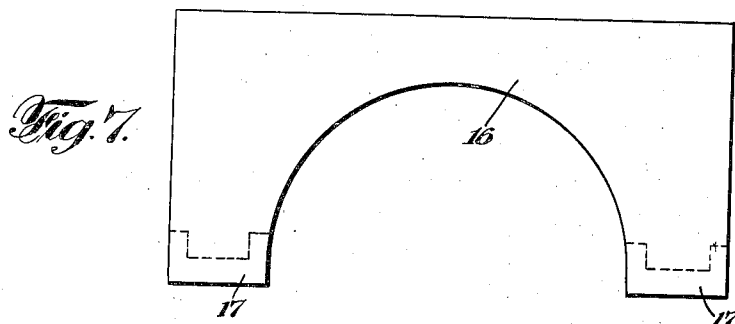


Fig. 9.

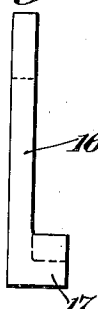
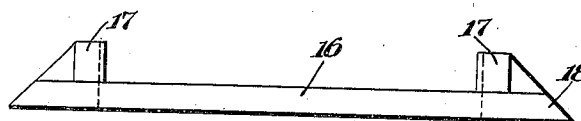


Fig. 11.

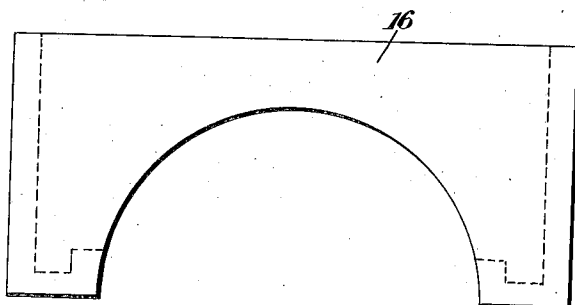


Fig. 10.

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UNITED STATES PATENT OFFICE

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BLAST FURNACE HOT BLAST STOVE

Application filed December 22, 1931. Serial No. 582,601.

This invention relates to hot blast stoves for use in preheating air for blast furnaces. In particular it relates to that type of hot blast stove known in the art as a fire brick stove which comprises substantially an arrangement of fire brick and a backing of other brick within a cylindrical, vertical, air tight, steel tank, the dimensions of the steel tank and the arrangement of fire brick within it varying greatly according to capacities desired and according to the varying ideas of different designers. The main idea, however, in this type of hot blast stove is to burn a mixture of air and gas within a certain portion of the brick work known as the combustion chamber, passing the hot gases of combustion therefrom through flues formed in a certain other portion of the brick work known as the checker chamber or checker chambers and when the brick forming these flues become sufficiently hot to then stop burning the mixture of gas and air and by means of suitable doors, valves, etc. to close the stove, thereby causing the stove to become part of the air conduit leading from the blowers to blast furnace. The air while passing through the stove absorbs the heat from the checker brick that form the flues of the checker chamber and also from the walls of the combustion chamber and becomes highly heated thereby. When the stove is cooled off by the air, the air is then cut off from the stove and the stove is again heated as before. Usually three or four stoves are provided for a blast furnace, so that several stoves may be heating while one is being used to preheat the air for the furnace.

Since they form no part of this invention it is unnecessary herein to describe in detail the various valves, cleaning doors, connections to cold blast mains and to hot blast mains and this invention is not concerned with the design of these parts, but only with the material and manner of supporting the checkers. For the purpose of illustration we later herein refer to that type of fire brick stove known as the center combustion two pass type, it being understood the invention is also applicable to side combustion fire brick type stoves with two or more passes as well as to

the center combustion two pass type of stove.

Heretofore, it has been customary to support the brick forming the flues of the checker chambers by arches made of refractory material, but this method in view of modern requirements is now unsatisfactory.

The tendency of modern hot blast stove construction is to obtain increased capacities by using greater stove heights and diameters with higher air pressures and temperatures. As a result it is difficult to design refractory masonry arches of sufficient strength to carry the weight of the checker brick comprising the flues and at the same time leave sufficient passages therebetween for the gas and air to pass freely to and from the checker brick flues.

One of the objects of the present invention is to provide a new type of arch for checker brick flue supports in blast furnace hot blast stoves.

Another object of the present invention is to improve the means of supporting checker brick forming flues in hot blast stoves.

Another object of the present invention is to provide an improved type of hot blast stove.

These and other objects will become apparent as the invention is more fully disclosed.

In accordance with the objects of the present invention, I have designed an arched type of checker brick support comprised of corrosion resistant metal, preferably of great structural strength, such as cast iron. This type of arched support simplifies and facilitates the construction of hot blast stoves and provides means to increase the output capacity of the stove.

Before further disclosing the nature and scope of the present invention reference should be made to the accompanying drawings wherein—

Fig. 1 is an elevational sectional view of the lower part of a typical blast furnace hot blast stove, taken along planes G—G and H—H (lower and upper parts respectively) of Fig. 2 illustrating the application of the present invention;

Fig. 2 is a cross-sectional view of the same divided into staggered plane sections A, B,

C, D, E and F to illustrate the building up of the flues in the outer or checker chamber;

Fig. 3 is an enlarged plan view of a quarter section of Fig. 2 on plane C illustrating the method of setting up the arched supports of the present invention; and

Figs. 4 to 11 inclusive, are side elevational, top and end views of the arched checker brick supports of the present invention.

Referring to the drawings, the blast furnace hot blast stove is comprised of an outer cylindrical steel casing 1, a refractory brick lining 2, a center cylindrical refractory brick wall 3 dividing the interior of the stove into two chambers 4 and 5, chamber 4 being open to convey products of combustion from the bottom thereof to the top of chamber 5, and chamber 5 being filled with a plurality of checker brick flue openings identified by numeral 5a, the checker brick walls 6 forming the flues being supported on arched supports 7 in the manner shown. The usual openings for the gas burner, the hot blast output, cold air input and for cleaning numbered 8, 9, 10 and 21 respectively, are provided but need not be described in detail.

The arched support members 7, in accordance with the objects of the present invention, are comprised of corrosion resistant metal such as cast iron. Heretofore in the art checker brick have been supported by arches comprised of masonry and brickwork of various types and sizes. In addition to the disadvantages heretofore set forth masonry and brick arches are subject to deterioration during the operating life of a stove and require repeated rebuilding and replacement at each cleaning of the stove. When such a brick or masonry arch gives way the entire height of checker brick supported thereby is affected and often requires complete replacement.

By the use of cast iron arched supports, in accordance with the present invention, a number of advantages are obtained which are not inherent in brick or masonry. One decided advantage is greater strength to support the weight of checker brick, thereby giving an opportunity to increase the height of the flues. Another advantage is that the strength of the cast iron arched support permits the use of supports having a thickness substantially that of the width of the checker brick, thereby providing for an unrestricted flue channel from the top to the bottom of the checker chamber. This greatly facilitates not only the flow of gas through the flues, but also the cleaning out of the flues.

Another advantage in the use of arched supports comprised of cast iron, is that the base of the supports may be widened out where they rest upon the supporting walls, thereby better distributing the load.

Another advantage is that for the same height of stove a relatively greater number

of checker brick may be installed by using cast iron instead of masonry arches, due to the fact that a cast iron arch requires less height than masonry to obtain the same supporting strength. Cast iron having a lower specific heat ratio and more weight than fire brick, an increase in the rate of heat transfer from the gas to the support and from the support to the cold air blast is obtained.

Time in constructing and time in repairing is also an important item in hot blast stove construction and maintenance. By the use of cast iron arches a material saving in each is obtained.

The cast iron arched support of the present invention and the manner of utilizing the same in a hot blast stove construction is fully set forth in the figures of the drawing. Figs. 1, 2 and 3 show the method of incorporating the supports in a stove and Figs. 4 to 11 inclusive, show various views of the supports.

Referring to Figs. 4 to 11 inclusive, the cast iron support element of the present invention is made in several structural modifications so that the same may be adapted to be positioned in different locations in the stove structure. One modification is shown in the side elevational, top and end plan views of Figs. 4, 5 and 6, which is designed to be a main supporting arch for the flue checker brick and respective arched support members. This type of support substantially comprises an arch 11, a relatively wide horizontal plate flange 12, supported by the arch through an interconnecting body or rib portion 13 and flanged feet portions 14 extending either side of the arch 11 and rib portion 13. Flanged ends 15 are provided to strengthen the structure.

The type illustrated in the side elevational top and end plan views of Figs. 7, 8 and 9 respectively, is designed to be utilized as arched supports for the flue checker brick and comprise an arched body portion 16 of substantially the same thickness as the checker brick to be supported thereby, and flanged feet members 17 shown as extending to one side only of the arched body portion.

The type of arched support member illustrated in side elevational end top plan views of Figs. 10 and 11, is the type utilized to key in one quarter section of the checker brick supports with another and is substantially the same as those shown in Figs. 7, 8 and 9, except that the flanged feet are cut off as illustrated at 18, at an angle of substantially 45 degrees, to provide means to key in the supporting arches. As illustrated in Fig. 3, this type of arched support is of varying lengths depending upon its contemplated position in the supporting structure.

Referring to Fig. 3, the main supporting arch identified therein as numeral 12 is built into the refractory brick walls 2 and 3 in a

manner as is illustrated with more particularity in Fig. 1. The flue brick arched supports 7 are thereafter bridged across the walls 2 and 3 in the manner illustrated, the main supporting arch 12 supporting the key arched supports identified as numeral 19 on one end in the manner shown.

Across the supports 7 and 19 is built up the checker brick flue structure 5a and 6 (Figs. 1 and 2) substantially in the manner illustrated, the finished structure looking in cross-section substantially as shown in section 20 of the cross-sectional view in Fig. 2.

The resulting structure thus obtained is characterized by being more rugged than the all masonry construction heretofore employed, and resistant to deterioration with use. Cast iron is much more resistant to wear and tear and erosion under the operating conditions in a stove than is masonry. By the specific type of structure shown a free unrestricted flow of air and gas through the flues is obtained, and for any given height of stove a greater contacting surface of brick to the gases is provided, thereby obtaining a greater efficiency in stove operation.

It is apparent that many types and modifications may be made of the cast iron arched support of the specific embodiment herein described without departing essentially from the nature and scope of the present invention as may be set forth in the following claims.

What I claim is:

1. A hot blast stove comprising inner and outer walls defining respectively a combustion chamber and a checker chamber, a plurality of main supporting arches of metal spanning said walls in the lower part of the

stove, supplemental metal arched members in a plane above the main supporting members and disposed obliquely thereto, some of said supplemental members being supported in part directly on said main supporting arch, and checker brick directly engaging the oblique supplemental arched members.

2. A hot blast stove comprising inner and outer concentric circular walls defining respectively a combustion chamber and a checker chamber, a plurality of main radial metal members spanning the space between said inner and outer walls, each having an arched opening whose radial width is substantially equal to the distance between said inner and outer walls at the lower part of the stove, supplemental metallic arched members disposed above and obliquely to the main members, and courses of checker brick supported directly on the supplemental arched members.

3. A hot blast stove comprising inner and outer circular walls, a plurality of radial main supporting metal members having arch openings therein providing unobstructed passages therethrough in the lower part of the stove, supplemental metal arches disposed obliquely to and located above the main supporting members, some of said supplemental arches having their inner ends resting on the main supporting members and their outer ends resting on the outer walls of the stove, and a plurality of courses of checker brick supported directly on the supplemental arches.

In witness whereof I have hereunto signed my name.

RAY CARRIGAN.