

March 15, 1932.

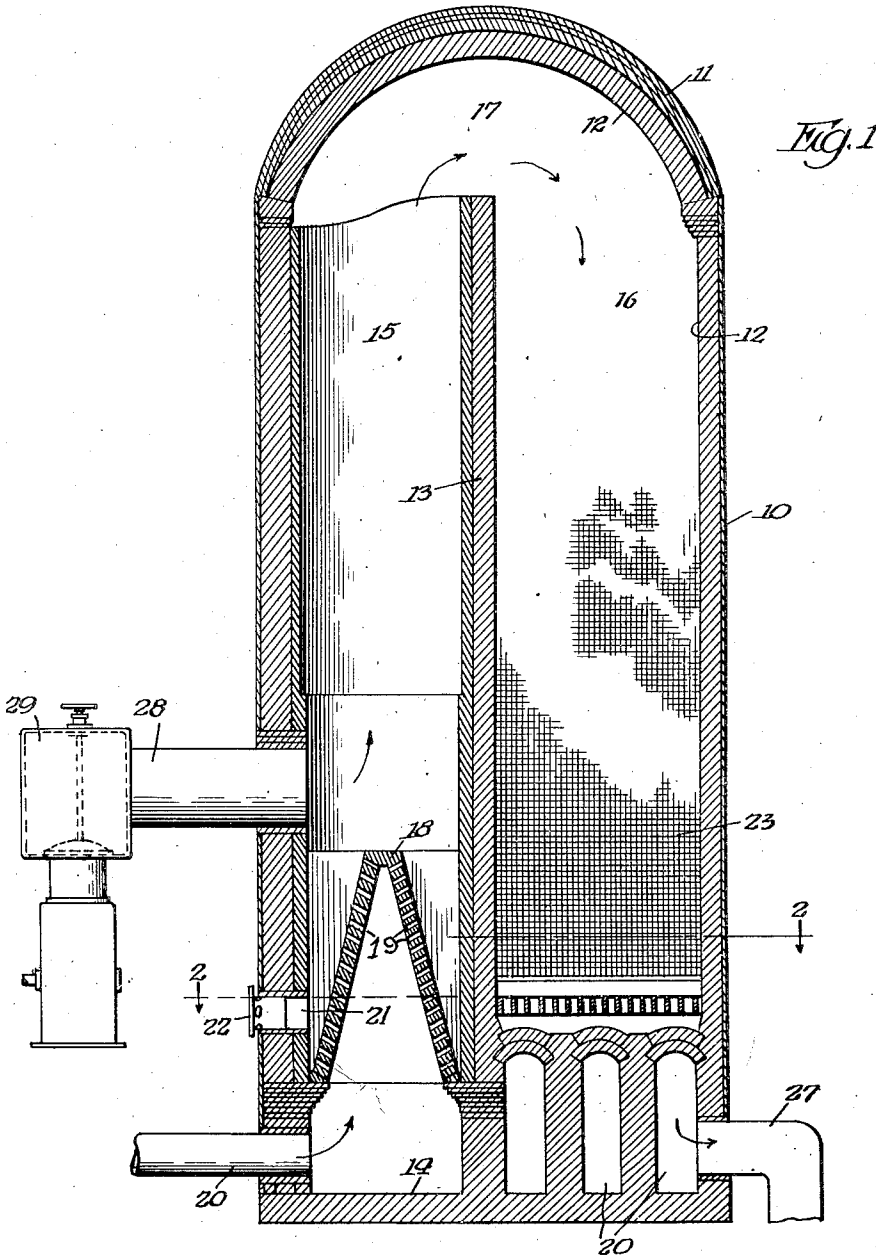
A. J. BOYNTON

1,849,657

HOT BLAST STOVE

Filed April 17, 1930

2 Sheets-Sheet 1



Inventor:
Arthur J. Boynton
By *E. J. G. Schuman* Atty.

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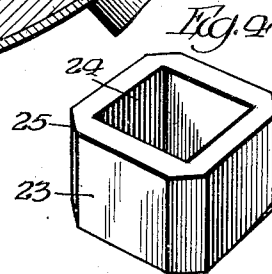
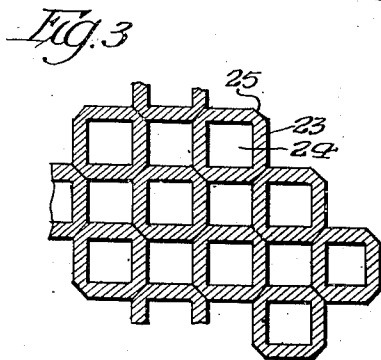
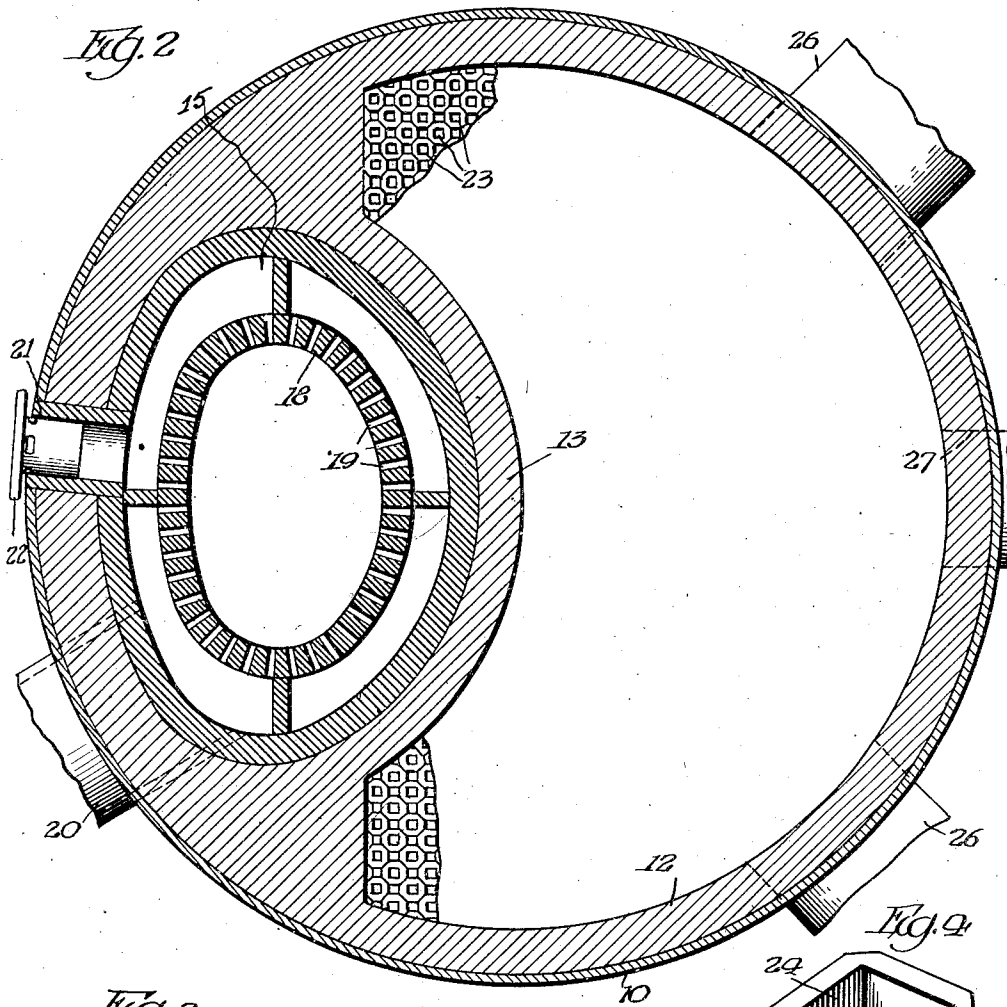
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HOT BLAST STOVE

Filed April 17, 1930

2 Sheets-Sheet 2



Inventor:-
Arthur J. Boynton
By *P. F. Johnson*
Atty.

UNITED STATES PATENT OFFICE

ARTHUR J. BOYNTON, OF WINNETKA, ILLINOIS, ASSIGNOR TO H. A. BRASSERT & COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

HOT BLAST STOVE

Application filed April 17, 1930. Serial No. 444,918.

This invention relates to improved means of combustion of gases within a hot blast stove preferably, though not necessarily limited in its use, in connection with the manufacture of pig iron.

5 This apparatus, of which there are usually four to the furnace, consists of a shell lined with fire brick, and a space within the lining is divided into a combustion chamber and checker space, both divisions extending from the top to the bottom of the stove.

10 Gas is burned in the combustion chamber by admission at the bottom through a burner and the products of combustion rise to the top and reverse their direction under the dome. They then pass downwardly through the checkers and exit at the bottom of the stove through suitable chimney valves.

15 By this means the interior of the stove is heated.

20 After this heating has proceeded to a satisfactory extent, a cold blast valve which is on the same side of the stove as the chimney valves, is opened and cold air is admitted to the bottom of the checkers and passes upwardly to the dome, receiving in its passage a large increment of temperature by contact with the hot brick of the checker work. The air then passes downwardly through the combustion chamber and out of the stove through a hot blast valve, thence to the blast furnace tuyères.

25 Heretofore the individual stoves were constructed of a large size to produce the desired heating surface in accordance with the plan of construction, and a large size is necessary to enable the volume of air required by the blast furnace to be heated to a temperature up to 1500° or 1600° F. maximum.

30 The number of stoves provided per furnace has been determined by the conditions of operation where unwashed blast furnace gas is used for heating the stoves, as well as by limitation of the amount of gas which can be burned within a given length of time.

35 The result of these two causes has been a usual provision of four stoves per furnace, thereby permitting the use of three when one stove is off for cleaning.

40 Under the circumstances of operation, it

is consequently permissible to take from two to three times the length of the air period for heating the stove, and the rate of admission of gas for combustion within the stove is correspondingly slow.

45 With the advent of washed gas, the number of stoves may be reduced to three with emergency use of two, one on gas and one on air, and aside from consideration of delay in operation it is now possible to operate continuously with two stoves, excepting for the fact that difficulty has been heretofore encountered in burning the large amount of gas required to be burned where the length of the heating and cooling phases of stove operation are equalized.

50 It is one of the objects of the present invention to provide improved means for increasing the amount of gas which may be burned per stove per unit of time.

55 A definite limitation with regard to the amount of gas which can be burned in a unit of time in a combustion chamber of a given size has been heretofore found in the inability of the means employed to secure a steady and continuous combustion of the gas.

60 With the high rate of influx of gas and air to the combustion chamber and with ignition from the hot walls, combustion takes place in a series of short explosions which result in what is known as "puffing" which is always troublesome and which in some cases results in damage to the structure of the stove lining.

65 The intensity of this "puffing" is increased by the admitting of larger quantities of gas and air to the stove.

70 It is another object of the present invention to overcome these difficulties and objections and to provide improved means for effecting regular and even combustion of large quantities of gas. This is accomplished by providing a combustion chamber in which has been constructed a refractory screen. This screen is in conical form and is situated in the lower portion of the combustion chamber, preferably as shown in Figure 1 of the drawings. The application of the screen in the manner shown has the function of preventing combustion of the gases in the inlet flue 20 and the lower portion of the chamber 100

adjacent thereto. Combustion of the gases is prevented due to the high velocity of the air and gas mixture while passing through the screen openings. Due to its high velocity combustion is prevented in the flue 20 and in the chamber adjacent thereto. After the gases pass through the screen openings combustion is promoted, due to the combination of two effects. First, on account of the lower gas velocity in the combustion chamber above the screen, and second, to the heat obtained from the hot walls of the combustion chamber, combustion takes place at the outer wall of the conical screen. The screen is constructed in a conical shape for two purposes, first, simplicity of construction, and second because any desired area for flow of gases may be obtained by increasing or decreasing the size of the openings and the size of the conical sections.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention and in which

Figure 1 is a vertical, longitudinal, sectional view of a stove of this character constructed in accordance with the principles of this invention.

Figure 2 is a horizontal sectional view taken on line 2—2, Figure 1.

Figure 3 is an enlarged detail transverse sectional view of a portion of the checkers.

Figure 4 is a detail perspective view of one of the checker elements.

Referring more particularly to the drawings the numeral 10 designates generally the shell of the stove having a dome 11, the shell and dome being lined with suitable fire brick lining 12.

Within the shell is arranged a partition 13 which extends from the bottom 14 of the stove towards and terminates short of the dome to divide the stove into a combustion space 15 and a checker space 16 and which spaces are connected by means of a passage 17 adjacent the dome 12.

Arranged within the combustion space, preferably adjacent or in proximity to the bottom thereof is a conically shaped refractory screen 18 provided with openings 19 therethrough and this screen is of any desired configuration in cross section and is hollow so that the gas and air which is admitted into the stove from a mixing burner through a passageway 20 will be delivered beneath the conical screen and will flow through the apertures 19 to be ignited at the outer surface of the screen.

Arranged at any suitable point above the base of the screen 19 is an opening 21 closed

by a suitable closure 22 and this opening is provided for the purpose of preliminary ignition of the combustible mixture at the outside of the screen 18.

Arranged within the checker space 16 are suitable checkers 23 which are hollow as at 24 and open at both ends. The checkers are preferably rectangular in cross section and the outer corners thereof are cut away to form beveled surfaces 25 so that when a plurality of the checkers are assembled as shown in Figure 3, there will be provided circulating spaces through and between the checkers thereby increasing to a maximum the radiating surfaces within the checker space.

The products of combustion in the chamber 15 will rise therein to the top of the stove and will pass through the passage 17 beneath the dome 11, reversing their direction of flow under the dome and will then pass downwardly through the checkers 23 and exit at the bottom of the stove through suitable passages 26 controlled by suitable chimney valves (not shown).

During the passage of the products of combustion through the checkers the interior of the stove will be heated to any desired temperature.

After the heating has proceeded to a satisfactory extent the supply of fuel through the opening 20 is cut off and a blast of cold air will be admitted through an opening 27 which is located on the same side of the stove as the chimney valves and the outlet passage 26, to the bottom of the checkers 23 in the checker space 16.

This cold air will pass upwardly through the checkers 23 to the dome 11 flowing through the passage 17 into the combustion chamber 15 and will, during such passage receive or absorb a large increment of the temperature by contact with the brick and the checker surfaces.

The air then flows downwardly through the combustion chamber 15 and out of the chamber through a passage 28 through hot blast valves 29 and from thence to the blast furnace tuyères.

By reason of the small apertures in the conical member the mixture of air and gas will be ignited on the outer surface of the cone and propagation of the flame backward through the cone is prevented by the velocity of the air and gas entering the opening and by the relatively low temperature on the under side of the cone which is maintained by the constant passage of cold air and gas.

While the preferred form of the invention has been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts, within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:—

1. In a hot blast stove, a combustion chamber, an apertured refractory screen in said chamber and through which screen the gas and air for its combustion pass, said screen being of a conical formation to provide a maximum outer surface, said surface co-operating with the hot walls of the combustion chamber whereby an intense temperature will be created at the outer surface of said screen and combustion will be promoted, means whereby a mixture of air and gas may be discharged into the combustion chamber below the said screen, and an air door opening into the combustion chamber above the said screen. 70
2. In a hot blast stove, a combustion chamber, a conical refractory screen in said chamber, said screen having comparatively small openings therethrough, and means whereby a mixture of gas and air may be admitted through said screen, combustion in said chamber being initiated at the outer surface of said screen. 80
3. In a hot blast stove, a combustion chamber, an apertured refractory screen against one surface of which combustion is initiated, said surface being of an area considerably greater than the transverse area of the portion of the combustion chamber in which said surface is located, and a gas supply inlet below said screen. 85
4. In a hot blast stove, a combustion chamber, an apertured conical refractory screen located in the lower portion of said chamber and against one surface of which combustion is initiated, said surface being of an area considerably greater than the transverse area of the portion of the combustion chamber in which said surface is located, and an air door opening into said combustion chamber above said screen. 90
5. A hot blast stove embodying a shell lined with refractory material, a partition dividing said shell into a combustion chamber and a checker space, said partition terminating short of the top of the shell, an apertured refractory screen in said combustion chamber and through which screen gas and air for its combustion pass and against one surface of which screen combustion is initiated, said surface being of an area considerably greater than the cross sectional area of the portion of the combustion chamber in which said screen is located, and means whereby a mixture of gas and air may be introduced into said combustion chamber beneath said screen. 95
6. A hot blast stove embodying a shell lined with refractory material, a partition dividing said shell into a combustion chamber and a checker space, there being a communicating passage between said chamber and said checker space adjacent the top of said shell, an apertured conical refractory screen in said combustion chamber across the path of flow of the air and gas mixture in the combustion chamber, and means whereby a mixture of gas and air may be introduced into the combustion chamber at a point below said screen. 100

In testimony whereof I have signed my name to this specification on this 15th day of April, A. D. 1930.

ARTHUR J. BOYNTON. 105

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