Dec. 10, 1935. W. J. PORTEOUS 2,023,696

NOZZLE FOR BURNING COMMINUTED COAL AND LIKE

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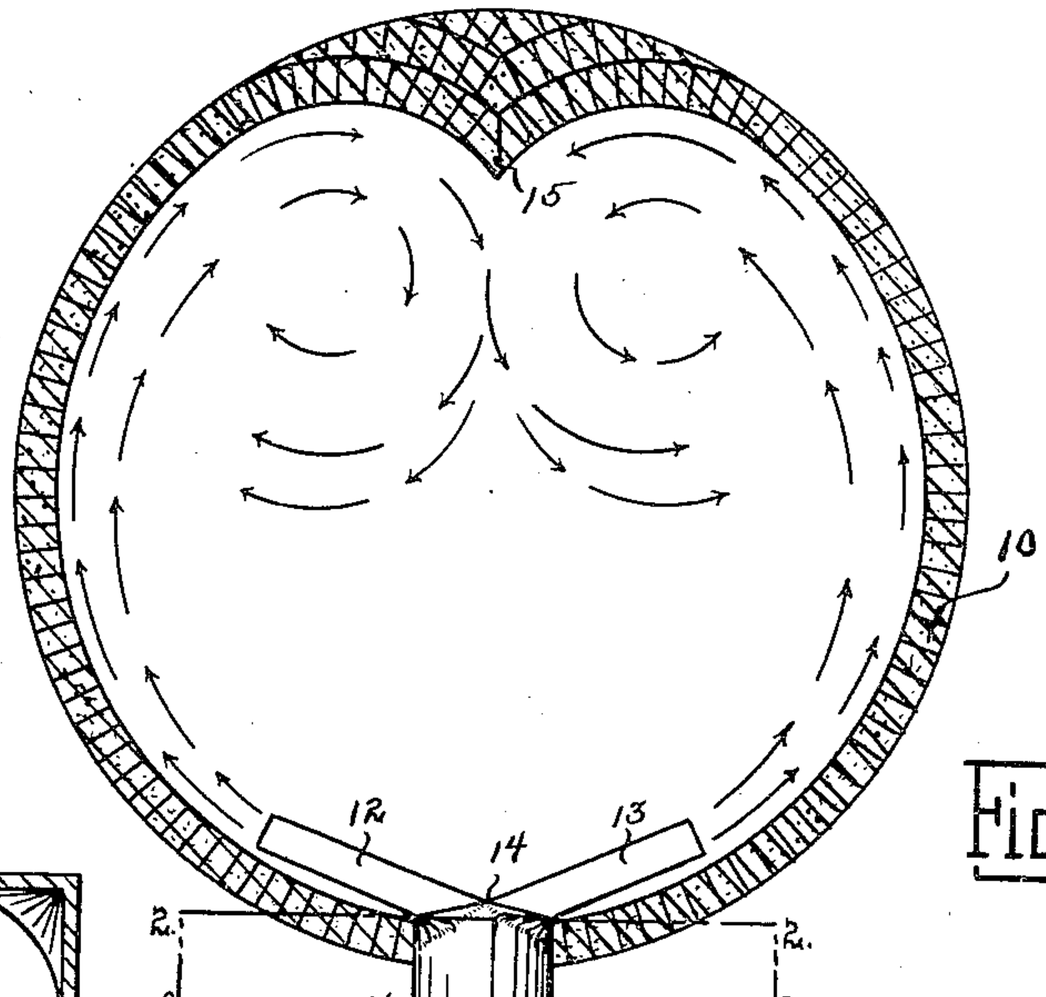

Fig. 1.

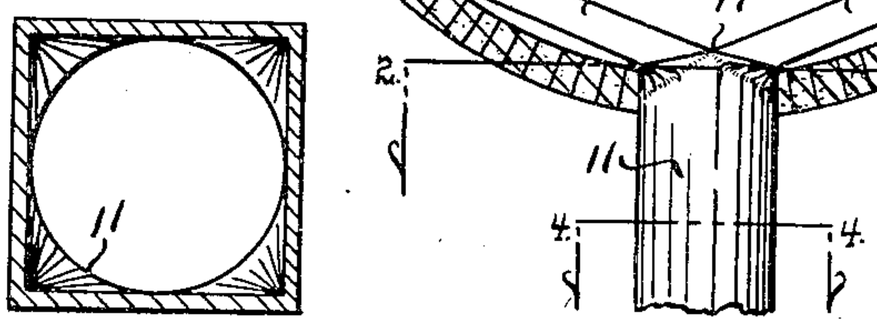

Fig. 2.

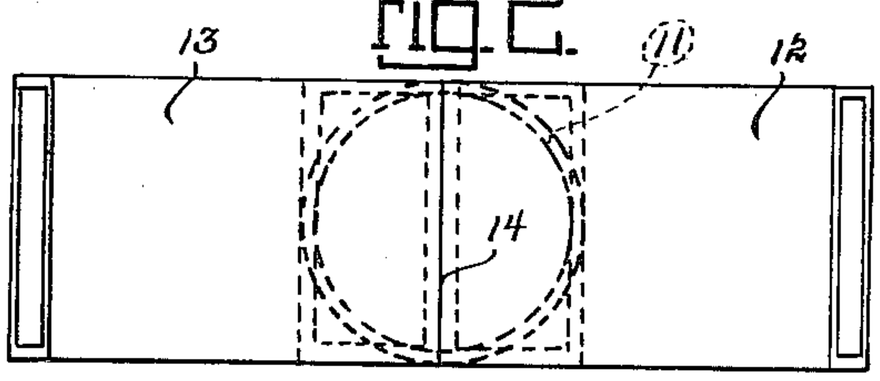

Fig. 3.

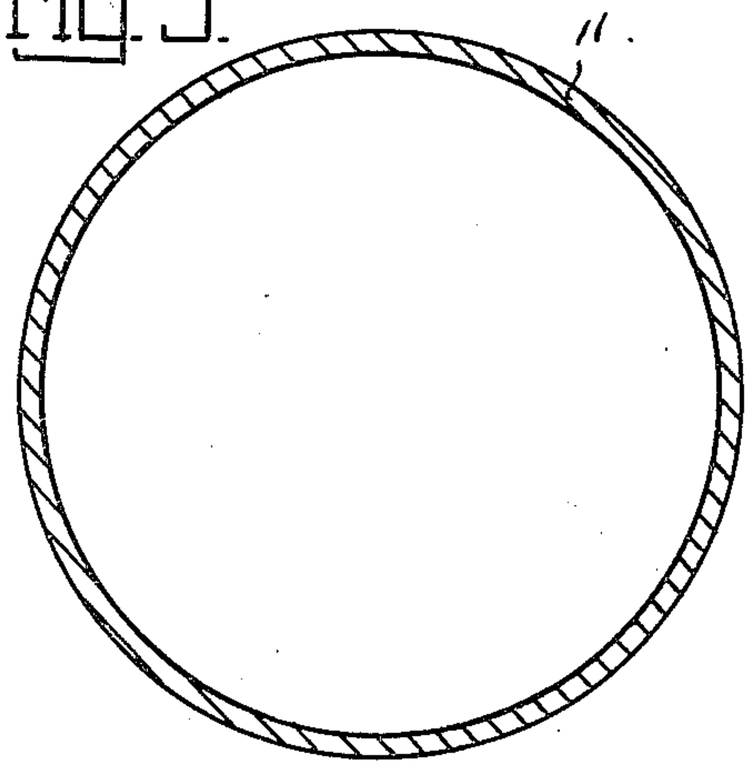

Fig. 4.

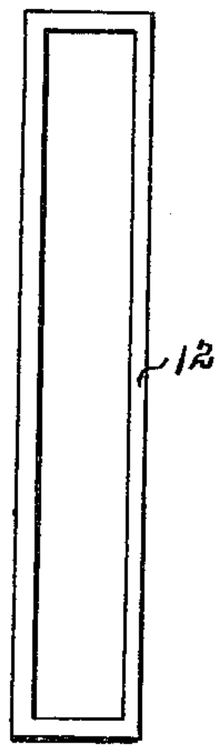

Fig. 5.

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NOZZLE FOR BURNING COMMINUTED COAL AND LIKE

Walter J. Porteous, Saginaw, Mich.

Application January 2, 1934, Serial No. 704,815

1 Claim. (Cl. 110—28)

The principal object of my invention is to provide a device that will properly and successfully project powdered coal or like into a combustion chamber and especially into a combustion chamber having a dividing ridge construction forward of the powdered fuel inlet pipe.

A further object of this invention is to provide a powdered coal burner nozzle that so distributes and projects the flame that the walls of the combustion chamber will not be damaged.

A still further object of my invention is to provide a powdered coal nozzle burner that may be used in a relatively small combustion chamber.

A still further object of this invention is to provide a powdered fuel nozzle burner that is highly efficient and projects two vertical narrow flames inside the combustion chamber.

A still further object of my invention is to provide a nozzle for burning comminuted coal that is economical in manufacture and durable in use.

These and other objects will be apparent to those skilled in the art.

My invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claim and illustrated in the accompanying drawing, in which:

Fig. 1 is a top plan view of my nozzle installed in a fire box and ready for use, with arrows showing the fire travel.

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

Fig. 3 is a front view of my nozzle with dotted lines showing the relative position of the fuel inlet pipe.

Fig. 4 is a cross-sectional view of the fuel inlet pipe taken on line **4—4** of Fig. 1.

Fig. 5 is an end view of one of the two nozzle outlets of the device.

In describing my device, I will hereinafter use the words "forward" and "rear", and in this connection I have in mind that my nozzle will extend through the rear side of the combustion chamber housing, but will of itself extend forwardly therethrough and that the portion of the combustion chamber diametrically opposite from the point of entrance of the nozzle will be the forward side of the combustion housing.

Combustion engineers agree that fuel is consumed with the highest efficiency when it is reduced to a powdered state and combined with the proper proportions of air. Machines for pulverizing fuel such as coal have been perfected to such an extent that comminuted fuel can be economically obtained for both commercial and domestic purposes. The difficulty, however, desires in the means for projecting this fuel into the furnace, as such means are usually very crude and inefficient, usually consisting of nothing more than a pipe leading into the combustion chamber through which the coal is blown by an air blast.

The peculiarities found in the burning of powdered fuel in suspension are not compatible with such a nozzle means inasmuch as the heat from the powdered fuel is so intense that a relatively large combustion chamber is necessary in order to prevent the burning down or damaging of its walls. However, if a relatively large combustion chamber is used difficulty is experienced in the initial igniting of the powdered fuel and keeping it burning once it is ignited. In this connection, it will be appreciated that the burning particles of fuel in suspension must be sufficient to ignite the incoming particles of fuel and therefore by the use of a mere fuel pipe extending into the combustion chamber the burning of the powdered fuel at all times must be on "high flame". Furthermore, if a relatively large combustion chamber is used as has been necessary herebefore many of the particles of fuel fall to the bottom of the combustion chamber without being ignited, thereby resulting in fuel and heat losses. I have overcome such objections by the providing of a novel powdered fuel nozzle that permits installation in comparatively small combustion chambers and makes possible the burning of the powdered fuel either on "low flame" or "high flame" without material heat and fuel losses.

Referring to the drawing, I have used the numeral **10** to designate a combustion housing or fire box designed to have a fuel inlet opening in its rear side wall. It is in such a fire box that my fuel nozzle is installed and which I will now describe. The numeral **11** designates the powdered fuel supply inlet pipe of the device. This pipe **11**, when installed, has its forward end portion extending radially through the wall of the combustion chamber, as shown in Fig. 1. The rear end of this pipe **11** is designed to be in communication with a suitable supply of powdered fuel and air pressure.

The numerals **12** and **13** designate two nozzle conduits integrally formed on the forward end of the pipe **11**. These two nozzle conduits extend forwardly and outwardly from the forward end of the pipe **11** and at an angle to each other to roughly conform with the inside circular wall of the combustion chamber, as shown in Fig. 1. It will also be noted that these two nozzle con-

duits are each rectangular in cross-section and as they have a combined outlet area substantially that of the area of the pipe 11, and a height substantially equal to the diameter of the pipe 11, as shown in Fig. 2, the outlet opening of each of the conduits will be in the form of a vertical slot. This construction is important as it makes possible the projection of a relatively thin vertical flame to each side of the interior of the combustion housing, as shown by the arrows in Fig. 1. By the two nozzle conduits 12 and 13 being integrally formed on the forward end of the pipe 11 and extending at an angle to each other the joining of their two forward walls will provide a vertical dividing line 14 for guiding the powdered fuel and air passing through the pipe 11, evenly and uniformly into the two nozzle conduits. With the two nozzle conduits conforming roughly to the interior wall of the combustion housing and extending opposite to each other, the flame protruding from them will not strike a direct blow on the interior wall of the combustion housing, but will only strike the combustion chamber wall a glancing blow, as shown by the arrows. In other words, the circular wall of the combustion housing will gently guide the flames in a circular path toward the forward side of the combustion chamber, thereby eliminating damaging of the walls of the combustion chamber by a direct blast of the fire, which would occur if a mere pipe extended into the combustion chamber and threw the flame directly across the combustion chamber against its forward wall.

With two separate flames going in opposite directions around the inside wall of the combustion housing they will naturally strike each other at the forward side of the combustion housing. This is highly desirable, as it makes possible the igniting of many of the particles of fuel that would not ordinarily otherwise be ignited. It is necessary that these unignited particles be returned in some manner into the flame to be ignited and this is accomplished successfully by my nozzle, as shown by the arrows in Fig. 1. If a single conduit were used or if the pipe 11 were extended into the combustion housing at an angle thereto the flame would have to follow the complete inside circle of the interior of the combustion chamber before the unignited particles would again enter the original flame. This construction would be undesirable, as many of the particles would fall to the bottom of the combustion chamber by gravity before they completed the complete circle. By the use of two nozzles, however, the fire travel is not only reduced one-half, but the two flames collide with each other as herebefore explained. By the use of my powdered fuel burner of dual nozzle construction, a comparatively small combustion chamber may be used and with such a small combustion chamber the ignition of the powdered fuel is facilitated and the regulating of the fire therefrom from "low flame" to "high flame", or vice versa, may be easily and successfully accomplished.

The construction and design of the interior of the combustion housing may vary as desired, but I recommend the double vortex type, as shown in Fig. 1. In this connection I have used the numeral 15 to designate the vertical dividing ridge formed in the forward side of the combustion chamber. This ridge is positioned diametrically opposite from the discharge end of the fuel inlet pipe 11 and extends to each side in a curved path. The purpose of this ridge is to gently guide the two flames into a double vortex and bend them back upon themselves, as shown in Fig. 1.

Although I have described my device as particularly adapted to the burning of powdered coal it may be used to equal advantage for the burning of other materials such as oil, and like.

Some changes may be made in the construction and arrangement of my improved nozzle for burning comminuted coal and like, without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claim any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

In combination with a cylindrical vertical combustion chamber having a curved sharp dividing ridge on its forward inner side, a fuel nozzle comprising a fuel supply pipe designed to be in communication with a source of fuel supply and extending radially into and through the rear side wall of said combustion chamber, and two conduit outlet nozzles on and communicating with the discharge end of said pipe having their lengths extending forwardly and outwardly in straight lines relative to said pipe and at an obtuse angle to each other; said nozzles each having a vertical discharge slot and positioned in close proximity to the inside wall of said cylindrical combustion chamber.

WALTER J. PORTEOUS.