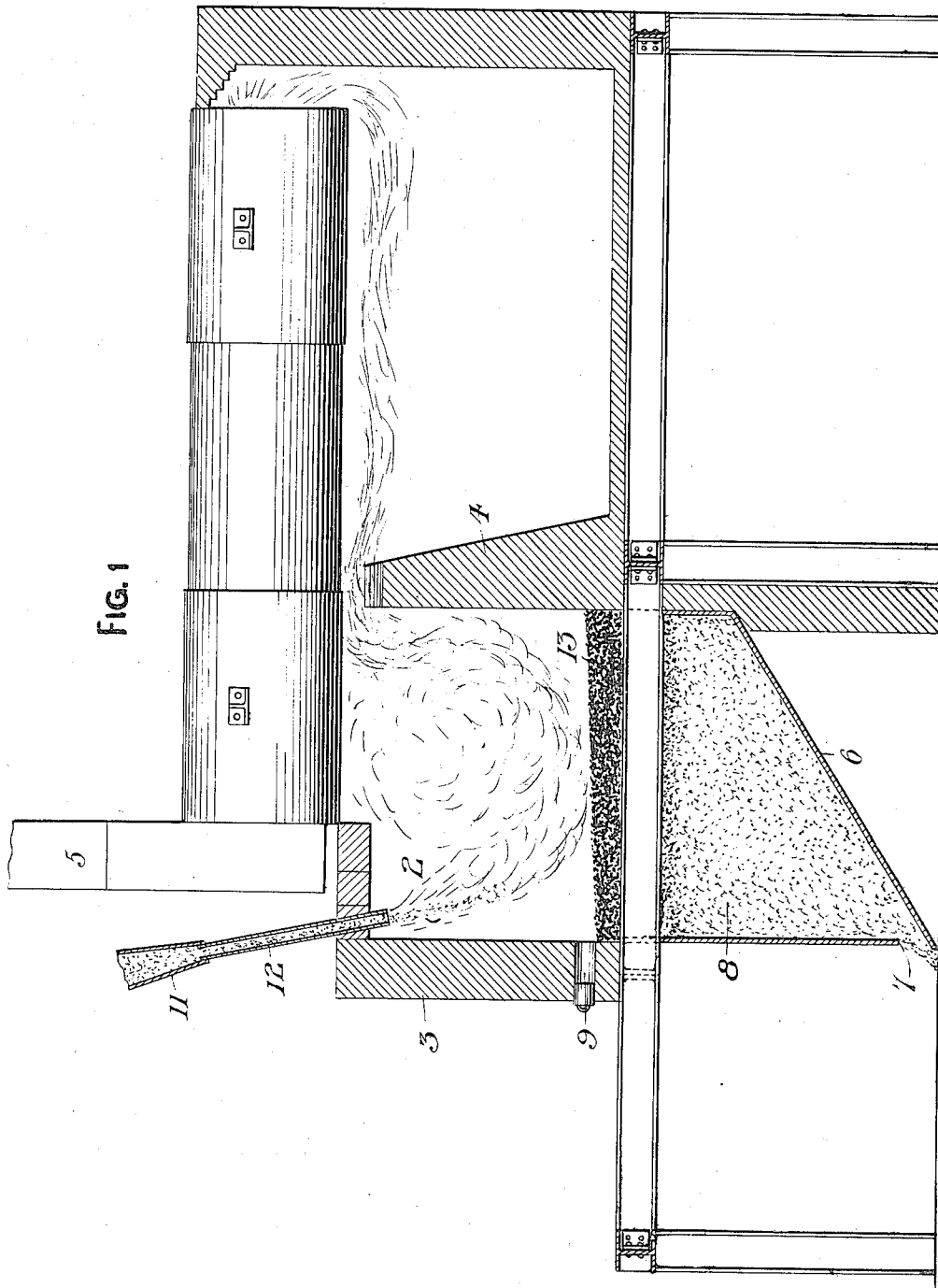


J. E. & H. H. BLAKE.  
FURNACE.  
APPLICATION FILED JAN. 17, 1911.

1,011,312.

Patented Dec. 12, 1911.

2 SHEETS—SHEET 1.



WITNESSES:  
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2 SHEETS—SHEET 2.

FIG. 3

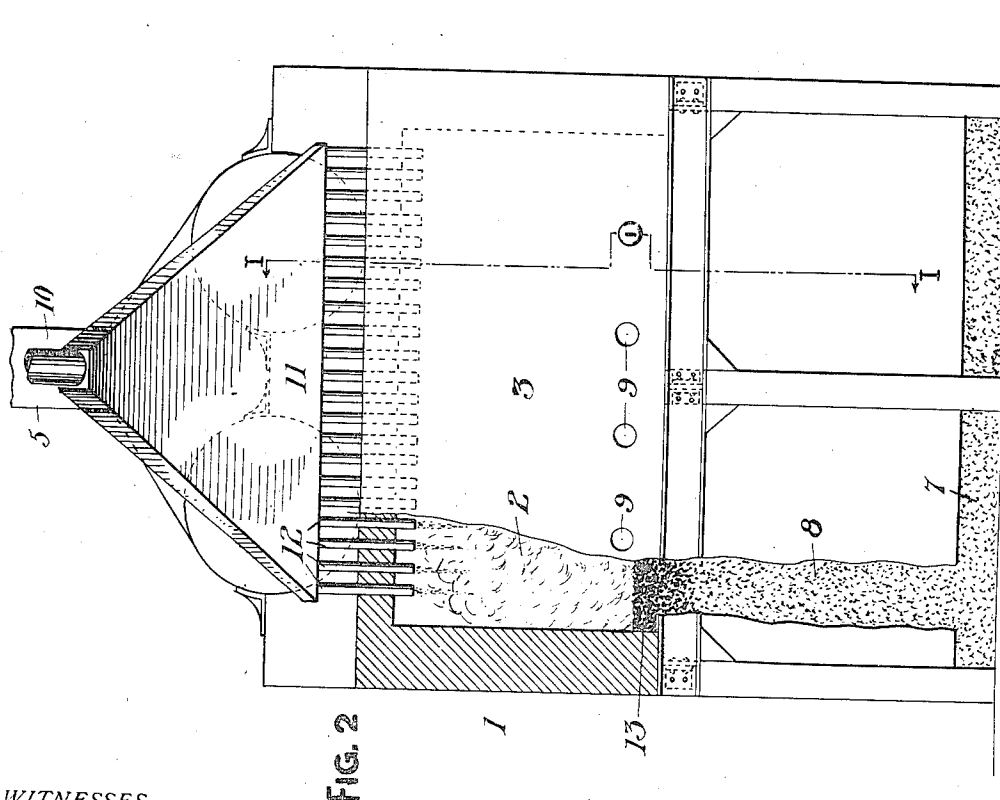
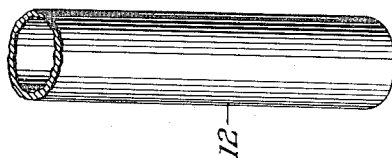


FIG. 2

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# UNITED STATES PATENT OFFICE.

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TO BLAKE CRUSHER AND PULVERIZER COMPANY, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## FURNACE.

1,011,312.

Specification of Letters Patent.

Patented Dec. 12, 1911.

Application filed January 17, 1911. Serial No. 603,100.

*To all whom it may concern:*

Be it known that we, JOHN E. BLAKE and HENRY H. BLAKE, citizens of the United States, and residing in the city of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented or discovered new and useful Improvements in Furnaces, of which the following is a specification.

Our invention consists in certain new and useful improvements in furnaces for use in connection with steam boilers and for other purposes.

It is particularly applicable to the use of finely granulated or pulverized coal, coke or kindred substances.

In the use of granulated or powdered fuel under blast, difficulty has been experienced in preventing the burning out and disintegrating of the brick work, as the combustion is high and the initial impact of the flame very destructive. It has also been found difficult to properly distribute the heat where most needed and to maintain the proper temperature at the front of the boiler. The combustion and consumption of the fuel has also been faulty and the use of granulated or pulverized fuel has not been entirely a success. By means of our novel construction these faults have been corrected and the economical use of such fuel has been made a commercial success.

Generally speaking, we introduce the fuel at the top and front of the furnace combustion chamber and across the entire width thereof, causing the same to impact against the floor of the chamber which consists of a bed of ashes or other non-conducting material. Such particles of fuel which may be precipitated from the flame onto the surface of the ash bed form an incandescent layer or surface of very high temperature which assists in the combustion of the entering fuel instead of retarding the same. Air is admitted to this layer of incandescent fuel to assist in its combustion, so that no heat values are lost but all the combustible elements of the fuel are thoroughly consumed. The burning fuel is reverberated by said bed of ashes rearwardly and upwardly against the bridge wall or rear wall of the combustion chamber which in turn throws the flame upwardly against the forward por-

tion of the boiler, whence it travels rearwardly to enter the boiler flues or other passages on its way to the chimney.

We prefer to admit the fuel at an angle to the vertical, as shown, to assist the rebounding action of the flame as it strikes the ash bed. An eddy of fuel in a state of very high combustion is formed in the combustion chamber under the forward portion of the boiler which intensifies the combustion of the entering fuel and increases the heat under the boiler.

The accumulating ashes are removed from below from time to time to maintain the bed at the proper level. In case the furnace is to be newly placed in commission, and no bed of ashes is available, sand or other non-conducting material may be substituted and gradually removed from below as the ashes accumulate.

In the accompanying drawings, in which our invention is shown applied to a horizontal flue boiler for the sake of clearness, Figure 1 is a longitudinal vertical section through the boiler and furnace along the line I—I in Fig. 2; Fig. 2 is a front elevation of the same mechanism, partially broken away for the sake of illustration, and Fig. 3 is an enlarged detail of one of the fuel inlet tubes preferably used.

The following is a detailed description of the drawings.

1 is the boiler; 2 the combustion chamber of the furnace; 3 the front wall; 4 the bridge wall, and 5 the chimney.

The bottom or floor 6 of chamber 2 is inclined, so as to shunt the ashes toward a front, bottom orifice 7 formed in the front wall. The lower portion of chamber 2 constitutes an ash-pit or ash-hopper 8, which is kept full of ashes, as shown in the drawings; and, level with the top of the ash-hopper, we provide a series of air-inlet holes 9, in the front wall 3 of the combustion-chamber of the furnace. The upper portion of chamber 2 constitutes the combustion-chamber. It will be noted that the peculiar construction of the ash-hopper or ash-pit is important, as the ashes may be removed gradually, by way of the opening 7, keeping the proper level of the ashes in the hopper, without opening up the combustion chamber and thus chilling the fire therein;

the necessary volume of air properly to support combustion being supplied through said air-inlet apertures 9.

The fuel is admitted from the granulator 5 or pulverizer, not shown, by means of a tube 10 which discharges into a distributor 11, preferably fan- or funnel-shaped, and located at the front and above the combustion chamber 2.

10 12—12 represent a series of inlet tubes extending from the bottom of distributor 11 through the top and front of the chamber 2. They are preferably inclined inwardly.

The fuel, as it is admitted, becomes ignited 15 by the heat of the furnace and, in the form of an intensely hot flame, impacts against the bed of ashes, whence, in turn, it is reverberated upwardly striking the bridge wall or rear wall and is thrown upwardly and 20 forwardly against the forward portion of the boiler, an eddy or whirl of fuel, in the state of high combustion, being formed under the forward portion of the boiler, thus superheating the same and also aiding in the 25 combustion of the entering fuel. The flame travels rearwardly and then forwardly through the boiler to the chimney 5.

The layer 13 of unconsumed or partially consumed fuel which is precipitated upon 30 the surface of ash bed 8 is maintained in a state of high combustion and incandescence, aided by the supply of air entering through ports 9—9, providing a heated surface to receive the impact of the flame, thus assisting 35 in the combustion of the traveling fuel instead of chilling the flame, or absorbing its heat.

When the furnace is newly fired and there is no accumulation of ashes in the hopper, a 40 supply of sand or other non-conductor of heat may be introduced and gradually removed as the ashes accumulate. When the fire is to be started in a cold furnace, the fuel may be ignited in the first instance with 45 a torch or gas flame.

We have shown our invention applied to a boiler furnace but it will be readily seen that it may be applied to a re-heating furnace or a furnace of any other character.

50 What we desire to claim is—

1. A furnace having a chamber therein, the upper portion thereof constituting a combustion-chamber and the lower portion thereof an ash-pit, said combustion-chamber 55 being provided with air-inlet apertures to support combustion, the lower front wall of said ash-pit being provided with an outlet-opening for the ashes, said ash-pit being provided with an inclined bottom leading to

said outlet-opening and guiding the ashes 60 thereto, whereby said ash-pit may be kept constantly full of ashes and the proper level of ashes maintained therein by escape of ashes through said outlet-opening, without opening up the combustion-chamber and 35 thereby chilling the fire therein; and means for introducing fuel, under pressure, downward into said combustion-chamber.

2. A furnace having a chamber therein, the upper portion thereof constituting a combustion-chamber and the lower portion thereof an ash-pit, said combustion-chamber being provided with air-inlet apertures to support combustion, the lower front wall of said ash-pit being provided with an outlet-opening 75 for the ashes, said ash-pit being provided with an inclined bottom leading to said outlet-opening and guiding the ashes thereto, whereby said ash-pit may be kept constantly full of ashes and the proper level of ashes 80 maintained therein by escape of ashes through said outlet-opening, without opening up the combustion-chamber and thereby chilling the fire therein; a powdered-fuel distributing-member disposed above said combustion-chamber; and tubes leading downward 85 from said distributing-member and projecting through the upper wall of said combustion-chamber.

3. A furnace having a chamber therein, 90 the upper portion thereof constituting a combustion-chamber and the lower portion thereof an ash-pit, said combustion-chamber being provided with air-inlet apertures to support combustion, the lower front wall of 95 said ash-pit being provided with an outlet-opening for the ashes, said ash-pit being provided with an inclined bottom leading to said outlet-opening and guiding the ashes thereto, whereby said ash-pit may be kept 100 constantly full of ashes and the proper level of ashes maintained therein by escape of ashes through said outlet-opening, without opening up the combustion-chamber and thereby chilling the fire therein; a powdered- 105 fuel distributing-member disposed above said combustion-chamber; and inclined tubes leading downward from said distributing-member and projecting through the upper wall of said combustion-chamber. 110

Signed at Pittsburgh, Penna., this 12th day of January 1911.

JOHN E. BLAKE.  
HENRY H. BLAKE.

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