(No Model.) 2 Sheets—Sheet 1.

R. DEISSLER.

SMOKE CONSUMING FURNACE.

No. 577,424. Patented Feb. 23, 1897.

Fig. 1.

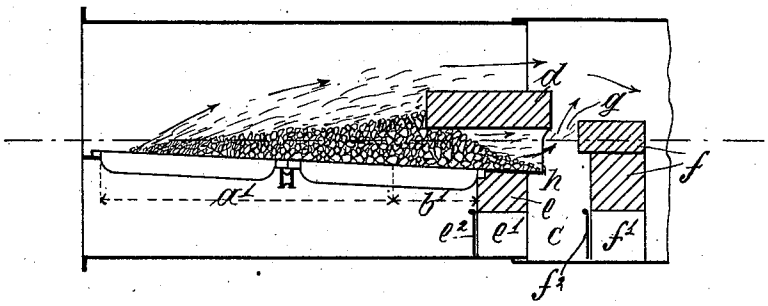


Fig. 2.

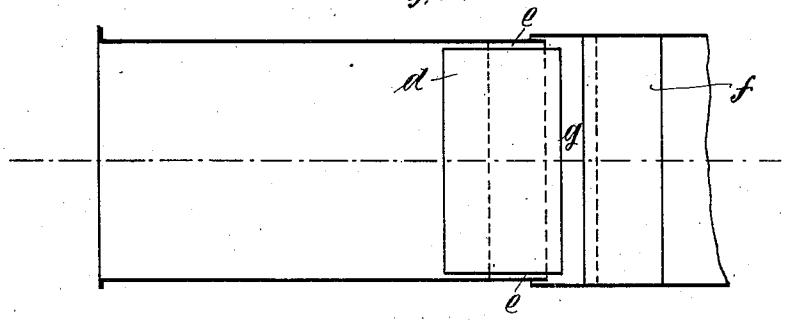
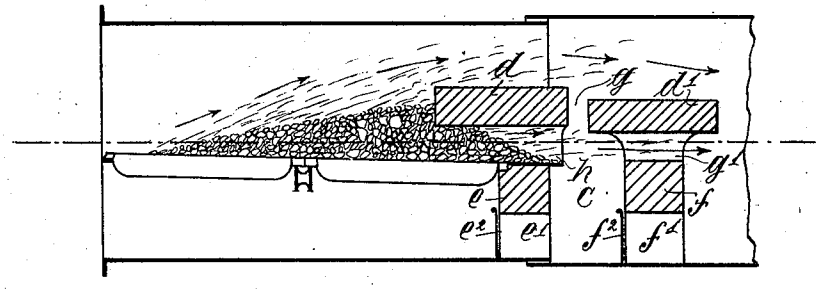


Fig. 3.



Witnesses:
Emil Kayser
Max Lorhelt

Inventor:
Robert Deissler

(No Model.) 2 Sheets—Sheet 2.

R. DEISSLER.

SMOKE CONSUMING FURNACE.

No. 577,424. Patented Feb. 23, 1897.

Fig. 5.

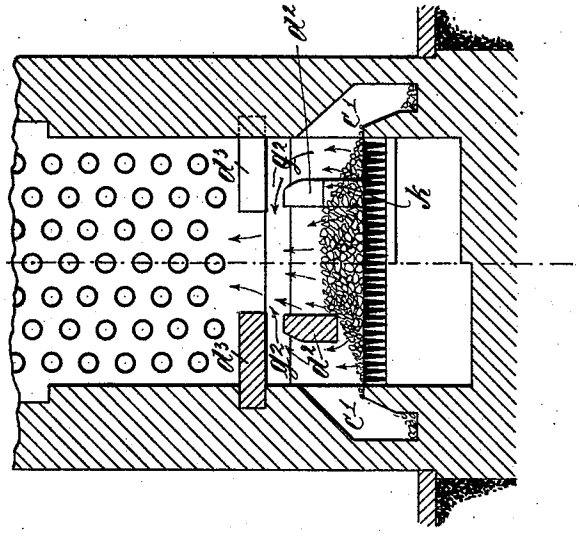


Fig. 4.

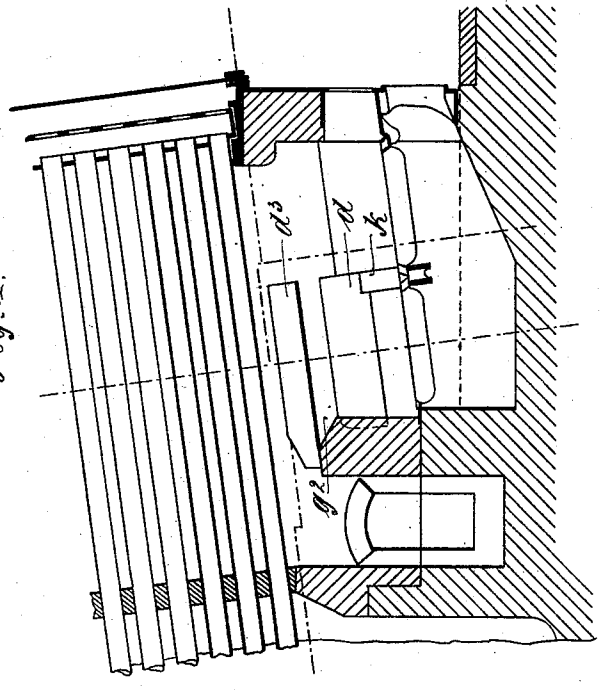
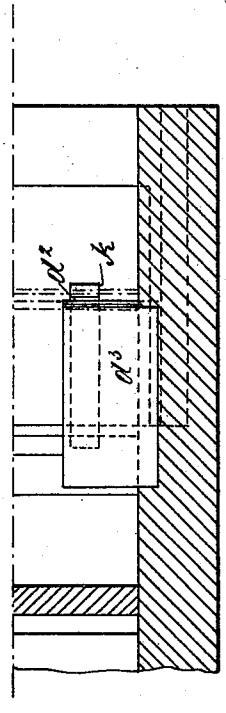


Fig. 6.



Witnesses:
Emil Kayser.
Max Löschelt.

Inventor:
Robt Deissler

UNITED STATES PATENT OFFICE.

ROBERT DEISSLER, OF TREPTOW, GERMANY.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 577,424, dated February 23, 1897.

Application filed April 16, 1896. Serial No. 587,844. (No model.)

To all whom it may concern:

Be it known that I, ROBERT DEISSLER, a subject of the King of Prussia, German Emperor, and a resident of Treptow, near Berlin, in the Kingdom of Prussia, German Empire, have invented an Improved Smoke-Consuming Furnace, of which the following is an exact specification.

This invention refers to furnaces of that kind in which a fire-beam arranged in some distance above the grate divides this latter, or rather the burning fuel lying thereon, into two parts, one of which (the front part) serves for the generation of gas out of the coal, whereas the other serves for the direct combustion of the remaining coke. My improvements in furnaces of said kind relate to means for doing away with a variety of drawbacks that have adhered to said furnaces up to now, and the most essential of which are as follows: Those parts of the grate that are situated in front of the fire-beam and in close proximity to the same are burned in a short time, as in consequence of the projecting of the fire-bridge over the grate and of the thick layer of the coal at the front edge of the fire-beam a sufficient quantity of air cannot find access to the grate from below the same. The rear portion of the grate can but difficultly be charged, and the stoker cannot judge as to whether or not said portion is properly furnished with coal. Moreover, said rear portion of the grate is very easily obstructed by slag, and it is a matter of utmost difficulty to get said portion cleansed.

In order to overcome the aforementioned drawbacks, I provide means for throttling the gases that stream forth from the rear portion of the grate. I prefer to employ as such a means a second fire-beam and may be also a second fire-bridge, and in some cases I prefer to reduce the first or ordinary fire-bridge in height as far as to have the top surface of the latter lie flush with the grate, as is all fully described hereinafter.

The leading principle of my invention is to cause the air to pass through the front or main portion of the grate, or rather through the thick layer of coal lying thereon, in about the same relative quantity or with about the same velocity as is the case with regard to the rear portion of that grate, and I attain that object, as has already been mentioned, by throttling the gases that stream forth from the thoroughly-burning coal lying upon said latter portion.

In order to make my invention more clear, I refer to the accompanying drawings, in which similar letters denote similar parts throughout the different views, and in which—

Figure 1 is a vertical longitudinal section through the front portion of a flame-tube of a Cornwall, Lancashire, or Galloway boiler. Fig. 2 is a horizontal section in line 7 8 of Fig. 1, the grate-bars being left away. Fig. 3 is a view similar to Fig. 1, but showing a slightly-modified form of construction. Fig. 4 is a vertical longitudinal section through the furnace of a tubulous boiler. Fig. 5 is a vertical cross-section in line 9 10 of Fig. 4; and Fig. 6 is an inclined section in line 11 12 of Fig. 5, showing but the left-hand portion of the furnace.

Referring to Figs. 1 and 2, a' b' designate the front and the rear portion of the grate and d the fire-beam, which is situated in a height of about one hundred and sixty millimeters above said rear portion, as well as about the fire-bridge e. The latter is reduced in height as far as to have its top surface lie flush with the grate.

Another fire-bridge f is arranged behind the first-mentioned fire-bridge e in a distance of about three hundred millimeters from the latter. Said second bridge extends up into the proximity of the fire-beam d and leaves or forms a small channel g between itself and said fire-beam. The latter is supported at its sides or ends by suitable stones h, resting upon the fire-bridge e. This bridge, as well as the second bridge, is provided with bottom channels e' or f', respectively.

The fire-beam d extends horizontally for a somewhat long way over the bridge e, as well as over the rear portion b' of the grate. Owing to this size and arrangement of said beam and to the combination and coöperation of the same with the second bridge f, the gases streaming forth from the coal that is present within the space formed by the parts d, e, and h are throttled, and by suitably proportioning the dimensions of the several coacting parts said gases may be throttled in such a degree that the draft for the large

front portion a' of the grate is practically as strong as that for the small rear portion b' of the same.

It may on first view seem strange that the two fire-bridges e and f are separated one from the other. This is, however, indispensably requisite, because a space for the reception of the slag (from the rear portion of the grate) must be provided. The slag forming upon said portion must be pushed rearward and down (into said space or reservoir) from above the grate, as otherwise the said portion cannot be preserved on proper condition. The channels e' f' of the bridges e f are provided with doors e^2 f^2.

I am well aware that two fire-bridges arranged one behind the other have already been used in a furnace; but then that arrangement was intended to permit of fresh air entering the furnace behind the grate between said two fire-bridges. This is essentially different from what I do in that I first form by the second bridge a reservoir for the reception of the slag, as just described, and, second, employ said second bridge for the formation of a channel that is adapted to throttle the gases streaming forth from the rear portion of the grate. The top surface of the second bridge lies below the plane of the top surface of the fire-beam d. I prefer to let said second bridge have the normal height of ordinary fire-bridges, and by doing so I gain or regain for the whole grate the ordinary or normal conditions of draft.

The great horizontal extent of the fire-beam d to the front as well as the rear (about the rear edge of the fire-bridge e) affords the further advantage that the grate proper is but little exposed to the weight of said beam. The supporting side stones h may partly rest upon the grate, but this will in general be unnecessary, as the projecting front portion of the beam d may well be balanced by the projecting rear portion of the same. Another advantage offered by the great horizontal extent of the beam d resides in the following: The smoke emanating from the front portion a' of the grate (after the latter has been freshly charged) is compelled to wash the large surface of the intensely-heated fire-beam, and is thus itself intensely heated, which greatly facilitates or promotes the subsequent combustion of the same. Further, the beam need take but over a small portion of the grate proper, as the fire-bridge e, by reason of its being reduced in height, as described, forms itself a sort of grate, although without spaces. The rear portion b' of the grate can thus be easily cleansed.

The coal forms a slope from the front edge of the fire-beam d to the rear end of the fire-bridge e. The air passing (in excess) through and over this portion of the fuel is compelled to flow along the lower surface of the beam and is thereby intensely heated. The mixture of hot fire-gases and hot air passes through the channel g into the way of the smoke streaming forth from the space above the beam d and mixes with said smoke. The latter has also been intensely heated by said beam and is now practically completely burned or consumed.

As soon as the fire is burned down or requires fresh charging, respectively, there is first the portion b' of the grate cleansed from slag by pushing the latter over the fire-bridge e down into the reservoir c. The remaining coal, which is thoroughly burning or intensely glowing, is then shoved upon the portion b' of the grate in such a manner that it forms again a slope, commencing at the front edge of the fire-beam d and terminating near to the rear edge of the bridge e. A part of the remaining coal is distributed over the front portion a' of the grate, and said portion is then charged with the fresh coal. The smoke that is instantly or very shortly thereafter evolved by the fresh coal is intensely heated by the beam d and is then burned or consumed, as has already been described. The gases coming from the grate portion b' are able to affect said smokeless combustion, because the air flowing from below into and through said portion is in excess and has been very intensely heated by the thoroughly-burning coal of the said portion b'. The mixture of the fire-gases and of the excess of the air is kept in its heated state by the rearwardly-extending beam d, and the heat as well as the air or oxygen of said mixture are fully sufficient to cause the ignition and the combustion of the smoke.

In the modification shown in Fig. 3 the second fire-bridge f is also low or reduced in height, and carries also a fire-beam d'. The latter extends horizontally for rather a long way, very nearly so as has been described with regard to the first or front fire-beam d, and there is also left a channel g between the beams d and d'. The beam d', however, is supported by the fire-bridge f, not throughout the whole breadth of the same, but there is or are left a channel or channels g', that also forms or form a way or ways for the fire-gases streaming forth from the rear portion of the grate. Said gases are, it is true, throttled in this case, not in the same degree, as occurs in the construction shown in Fig. 1, but the degree of their throttling is a sufficient one for the purpose intended. The throttling action to which the lower stream or streams of the fire-gases are exposed is due not only to the narrowness of the channel or channels b', but also to the friction arising at the lower surface of the beam d'.

The arrangements described up to now are especially adapted for use with Cornwall, Lancashire, Galloway, and similar boilers, but if suitably modified they may also with other types of boilers be advantageously employed. I have shown such a modification in Figs. 4, 5, and 6 of the drawings. The main difference resides in the particular position of the fire-beam proper, d^2, in that this

latter extends not across the rear portion of the grate, but parallelly to the bars of the same. In this case I prefer to make use of two of such lateral fire-beams, as shown in Fig. 5. That portion of the fresh coal which is to cover the rear half of the grate is filled up between the two fire-beams d^2 d^2 after the burning coal that was present upon said half of the grate has been shoved to the left and to the right, so as to form two slopes. (Compare Fig. 5.)

I prefer to combine the fire-beam proper, d^2, with another fire-beam d^3, that is arranged above said beam d^2 and forms between itself and said beam a small channel g^2, by means of which the gases coming from the lateral chambers of the grate or furnace are throttled. The air entering the grate from below passes through the two lateral chambers as well as through the central main chamber, (containing the fresh coal.) Owing to the throttling action of the channel g^2 the air is hindered from flowing in too great a quantity through the lateral chamber or chambers, (formed by the fire-beams d^2 d^3 and the adjacent portion of the wall of the furnace,) and the grate portion lying below the central chamber receives thus sufficient air to be prevented against being burned. There may be one or two of said fire-beams d^2 and one or two of said fire-beams d^3 in a furnace, and in either case said fire-beams or pairs of fire-beams need not extend over the whole length or depth of the grate, but need extend only over the rear half or rear portion of the same. (Compare Figs. 4 and 6.) The front ends of the fire-beams d^3 may be supported by stones k of any suitable configuration.

I prefer to provide within the furnace-wells two inclined channels c', situated in close proximity to the side portions of the grate or to the chambers containing the slopes of thoroughly-burning coal, respectively. Said channels c' are intended to receive the slag removed from said side portions of the grate.

Having thus fully described the nature of my said invention, what I desire to secure by Letters Patent of the United States is—

1. In a furnace having a reduced fire-bridge, and a fire-beam extending in some distance over said bridge and over the rear portion of the grate, the combination with the said bridge, of another fire-bridge arranged in some distance behind the former, and extending up to about the height of said fire-beam, and forming between itself and said beam a channel the free section of which is smaller than the free section of the space existing between the fire-beam, the first-mentioned fire-bridge, and the adjacent portions of the walls of the furnace, for the purpose as described.

2. In a furnace having a reduced fire-bridge and a fire-beam extending in some distance over said bridge and over the rear portion of the grate, the combination with the said bridge, of another bridge arranged in some distance behind the former, and of another fire-beam supported by said other bridge, and forming between itself and the first-mentioned beam a channel the free section of which is smaller than the section of the space existing between said first-mentioned beam, the first-mentioned fire-bridge, and the adjacent portions of the walls of the furnace, for the purpose as described.

3. In a furnace having a reduced fire-bridge, and a fire-beam extending in some distance over said bridge and over the rear portion of the grate, the combination with said bridge, of another fire-bridge arranged in some distance behind the former, and of another fire-beam arranged in some distance over said other bridge, and forming between itself and the latter as well as between itself and the first-mentioned fire-beam channels the combined free sections of which are smaller than the free section of the space existing between said first-mentioned beam, the first-mentioned fire-bridge and the adjacent portions of the walls of the furnace, for the purpose as described.

4. In a furnace having a fire-beam arranged in front of the fire-bridge, and extending in some distance over the grate, the combination with said beam and said bridge, of another fire-beam supported by the said bridge and arranged in some distance over the first-mentioned fire-beam, and forming between itself and the latter a channel the free section of which is smaller than the space of the free section existing between said first-mentioned beam, the said bridge, and the adjacent and opposite portions of the wall of the furnace, for the purpose as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

ROBERT DEISSLER.

Witnesses:
W. HAUPT,
HENRY HASPER.