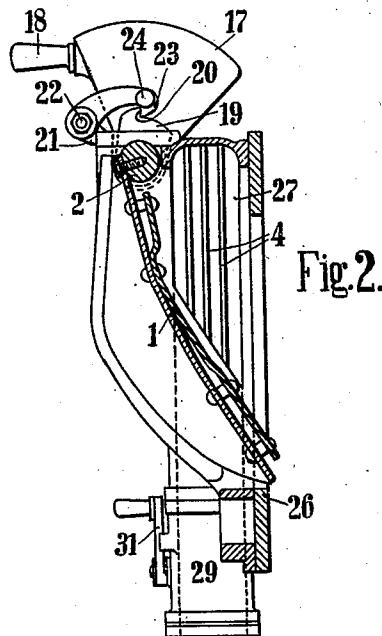
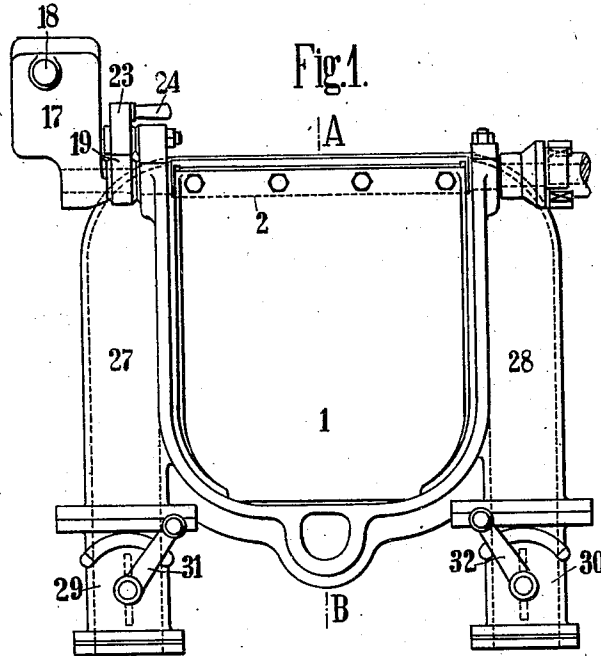


G. DE GRAHL.
BOILER FURNACE.
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980,772.

Patented Jan. 3, 1911.



Witnesses:-

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UNITED STATES PATENT OFFICE.

GUSTAV DE GRAHL, OF WILMERSDORF, NEAR BERLIN, GERMANY.

BOILER-FURNACE.

980,772.

Specification of Letters Patent.

Patented Jan. 3, 1911.

Application filed August 28, 1908. Serial No. 450,659.

To all whom it may concern:

Be it known that I, GUSTAV DE GRAHL, a subject of the German Emperor, and residing at Wilmersdorf, near Berlin, Germany, have invented certain new and useful Improvements in Boiler-Furnaces, of which the following is a specification.

The present invention relates to boiler furnaces and an important object is to provide a method for compulsorily obtaining smokeless combustion in boiler furnaces and a device for carrying out said method.

In the case of boiler furnaces which work with a forced draft, that is, in the case of boiler furnaces in which the combustion gases are drawn off by means of a steam blast in the chimney, a partial vacuum as is well-known is formed in the combustion chamber, namely, the pressure in said chamber becomes less than atmospheric pressure.

Now the new method consists in making the introduction into the combustion chamber of secondary air for combustion obligatory in proportion to the increase of the partial vacuum in the combustion chamber, so that the partial vacuum cannot exceed a certain limit.

One form of the device for carrying out the method, the general characteristic features of which have been just set forth, is represented applied to a locomotive by way of example in the accompanying drawing, in which:

Figure 1 is a front elevation of the device and Fig. 2 a vertical section in the plane A—B in Fig. 1.

As is clearly shown in the drawing, the furnace door 1 which is formed as a swing-door is rigidly connected with the shaft 2. On the shaft 2 there is fixed a lever 17 forming a counterweight and provided with the handle 18. By the side of the lever 17 there is fixed on the shaft 2 a sector 19 possessing a nose 20. The dog 23 is pivoted at 22 on the lug 21 on the upper part of the bearing, said dog being provided with the handle 24 and engaging by means of its tooth with the nose 20. In this position the furnace door does not rest close against the frame 26, but at a distance of a few millimeters from said frame 26, in order to prevent the door from rattling which might occur for example when the locomotive is running. When the fire in the furnace is being started the dog 23 is lifted off from the sector, the result of which is that the furnace door rests

directly against the frame 26 and completely closes the door-opening, so that the smoke cannot escape through the door-opening when the furnace is being started. When the furnace door is being opened the dog 23 slides on the sector 19.

The lever 17 which is formed as a counterweight is so arranged on the shaft 2 that the statical moment with regard to the shaft 2 together with the statical moment of the furnace door 1 guarantees that the furnace door will remain in the position shown in Fig. 2 as long as the partial vacuum obtaining in the combustion chamber does not exceed a certain limit.

The two air pipes or flues 27, 28 provided with heating ribs 4 open laterally into the door-frame and allow heated air to pass into the combustion chamber. The ribs 4 which extend from the top of each flue to the bottom, as clearly shown in the drawing, prevent coal from falling into the flues 27, 28 and heat the air preliminarily. The air pipes are connected below with the closure devices 29, 30 which can be opened or closed by actuating the levers 31, 32 in the one or other direction.

The device forming part of the subject-matter of this invention operates as follows:—Heated air passes through the pipes 27, 28 into the combustion chamber and thereby prevents combustion resulting in the production of carbon monoxid when the grate is being run near the higher limits of its capacity. If the closure devices 29, 30 are not sufficiently open, the partial vacuum in the combustion chamber will then exceed the vacuum at which the statical moments of the lever 17 and the furnace door 1 with regard to the shaft 2 are smaller than the statical moment of the atmospheric excess pressure acting against the furnace door from outside, and the furnace door will be drawn inward by the partial vacuum in the combustion chamber and will consequently allow the external air to enter into the combustion chamber. As stokers do not like to see that air is being admitted through the door, they have their attention drawn to the need of opening to a greater extent the closure devices 29, 30. After said devices have accordingly been further opened the furnace door closes again. When the partial vacuum in the combustion chamber diminishes, the closure devices 29, 30, which may be in the form of throttle valves, may be closed again but

not to such an extent that the furnace door opens again. The decreasing rate at which steam is generated also serves, among other things, as an inducement to the stoker to take this step.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a device for obtaining smokeless combustion in a furnace in which a partial vacuum is formed in the combustion chamber, the combination of an oscillatable shaft, a furnace door and a counterweight mounted on said shaft, the statical momentum of said counterweight with respect to said shaft being so as to place said furnace door automatically in approximately closing position when the partial vacuum in the furnace does not exceed a certain limit, and manually releasable means permitting said door to open in response to the partial vacuum in the furnace chamber and to close when the partial vacuum falls, but to automatically lock said door against movement when in the nearly closed position.

2. In a device for obtaining smokeless

combustion in a furnace in which a partial vacuum is formed in the combustion chamber, the combination of an oscillatable shaft, a furnace door and a counterweight both rigidly mounted on said shaft, the statical momentum of said counterweight with respect to said shaft being so as to place said furnace door automatically in approximately closing position when the partial vacuum in the furnace does not exceed a certain limit, a single toothed sector rigidly mounted on said shaft and manually releasable means engaging the tooth of said sector for locking the door against movement when in the nearly closed position, said means permitting said door to open in response to the partial vacuum in the furnace chamber and to close when the partial vacuum falls.

In testimony whereof, I affix my signature in the presence of two witnesses.

GUSTAV DE GRAHL.

Witnesses:

FRIEDRICH ROKAHR,
WOLDEMAR HAUPT.