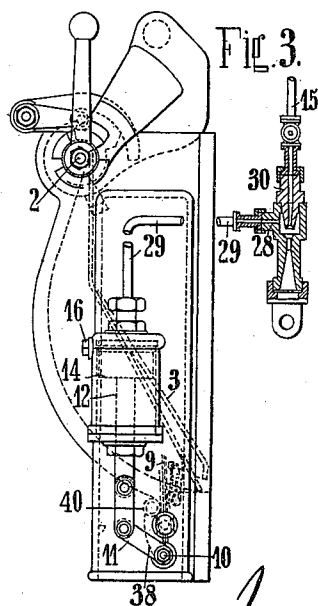
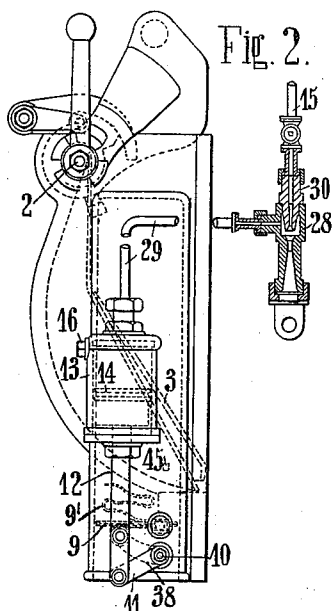
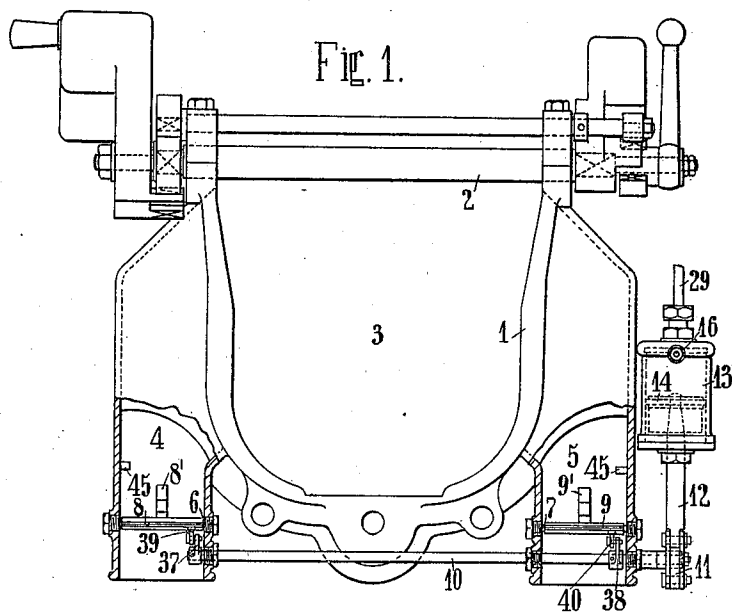


G. DE GRAHL.
BOILER FURNACE.
APPLICATION FILED JUNE 30, 1909.

975,763.

Patented Nov. 15, 1910.

3 SHEETS—SHEET 1.



Witnesses:

A. E. Singer.
H. H. Hunsberger

Inventor:

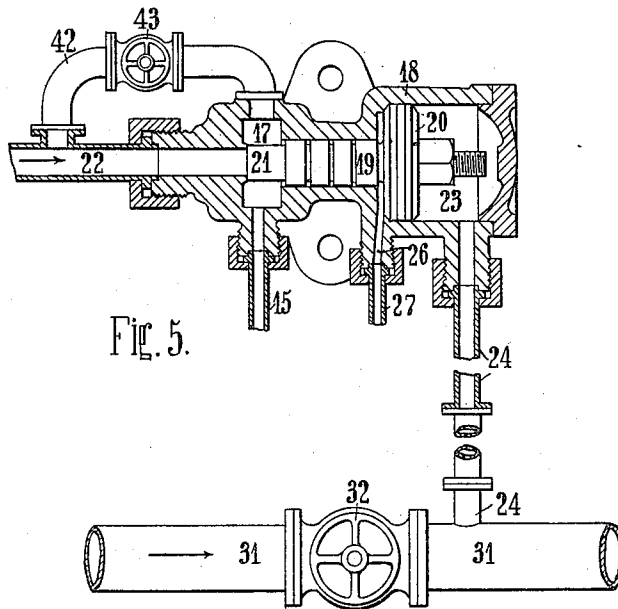
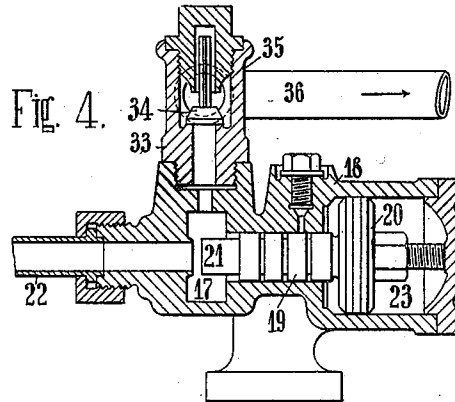
Gustav de Grahl
by P. Singer atty.

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3 SHEETS—SHEET 2.



Witnesses:

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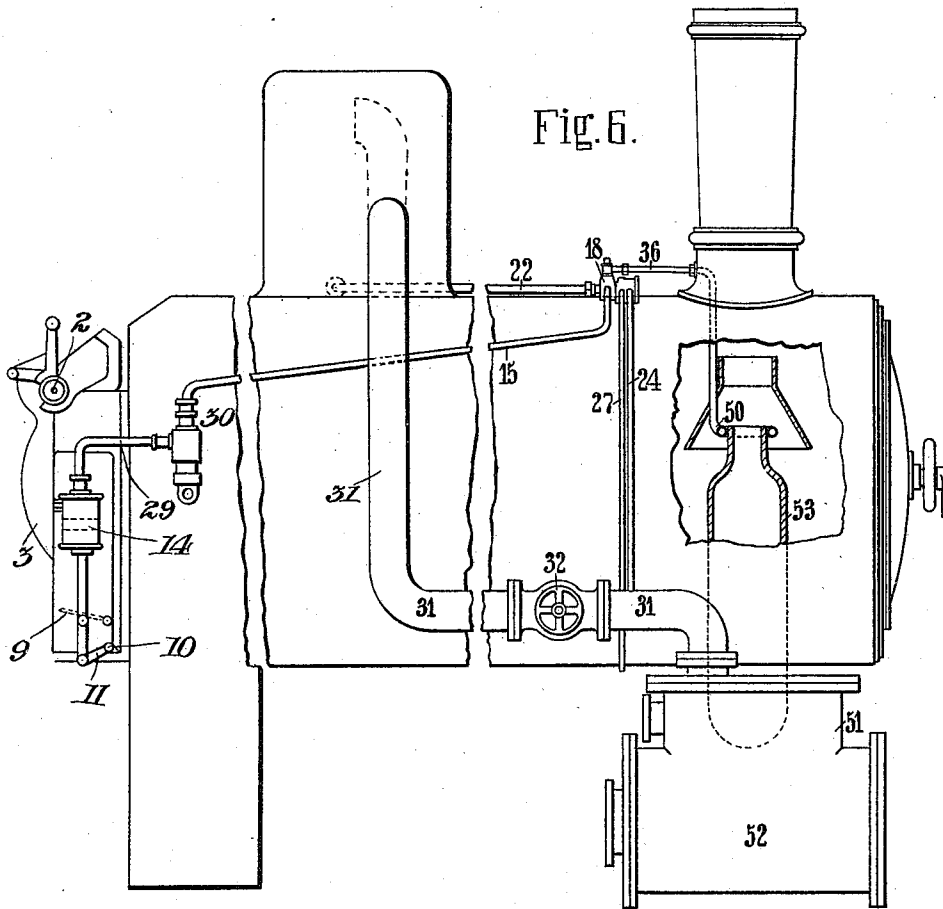
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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

BOILER-FURNACE.

975,763.

Specification of Letters Patent.

Patented Nov. 15, 1910.

Application filed June 30, 1909. Serial No. 505,241.

To all whom it may concern:

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

My invention relates to boiler furnaces, and a primary object is to provide improved apparatus for automatically regulating the draft in the same.

In the case of boiler furnaces with artificial draft, more particularly furnaces into which air is sucked by the action of exhaust steam, it has been observed that with light loads combustion of smoke cannot be insured even by means of overgrate draft. This is due to low vacuum in the fire box causing the air to be sucked in at too low a rate for effectual combustion of smoke. In order to increase the supply of air, the cross-section of the air inlet to the fire box may be increased or the air-supply may be increased by means of an auxiliary blast, that is to say by increasing the vacuum. These methods may also be used simultaneously.

According to my invention the cross-section of the air inlet is regulated by means of a valve or valves, for example two dampers in air ducts at the sides of the fire door, which are held open by vacuum in the fire box when such vacuum is sufficient, and are automatically opened by other means when the vacuum becomes deficient. The air suction may be increased by means of an auxiliary blast and said blast may act in conjunction with the valve-opening mechanism referred to.

In order that my invention may be clearly understood I will now explain the same with reference to the accompanying drawings in which one embodiment is represented by way of example.

In said drawings: Figure 1 is a front view of the door frame and fire door, partly in section, and Figs. 2 and 3 are side views of the same showing the air valves closed and opened respectively; Figs. 4 and 5 are vertical and horizontal sections, respectively, of a valve used for the purposes of my invention, but substantially of a known type, whereas Fig. 6 shows a locomotive-boiler provided with the valve according to Figs. 4 and 5, the wall of the boiler being partly broken away the main-blast shown in sec-

tion, the firedoor being shown diagrammatically.

Referring to the drawing, 1 represents the door frame, in which the spindle 2 is rotatably mounted, the fire door 3 being fixed to said spindle.

4 and 5 are two lateral air conduits or ducts in the door frame for supplying overgrate air to the fire box. In these lateral ducts there are pivots 6, 7 supporting valves or dampers 8 and 9. The movement of these dampers from their normal, closed position is limited by stops 45. Vacuum in the fire box opens the dampers 8 and 9; they are closed again by gravity when the vacuum diminishes, and may have attached to them springs 8' and 9', respectively, which abut against the walls of the air ducts when the dampers are opened.

Below the fire door there is a shaft 10, to which is fixed a lever 11 pivoted to the rod 12 of a piston 14 movable in a cataract cylinder 13. The cylinder has an air-hole at the top regulatable by means of a screw 16. The space above the piston 14 is connected by pipes 29 and 15 to the chamber 17 of a valve (Figs. 4 and 5). The valve comprises a box or casing 18 and a differential piston 19, 20 rigidly connected to the valve body 21. The chamber 17 is in open relation through a pipe 22 with the steam space of the boiler.

The chamber 23 is connected by a pipe 24 to a pipe 31 leading to the valve chest 51 of the engine-cylinder 52. The valve chest 51 is connected with the main-blast 53. The pipe 31 is provided with a valve or faucet 32. The space at the rear of the piston 20 communicates with the atmosphere by means of a duct 26 and pipe 27.

Between the steam pipes 15 and 29 is interpolated an ejector consisting of a nozzle 30 extending into a case 28 which communicates with the pipe 29.

The valve chamber 17 is connected by means of a socket 33, valve 34 and chamber 35 with the pipe 36 leading to the auxiliary blast 50.

To the shaft 10, which extends through the air duct 5 and into the air duct 4, are fixed levers 37, 38. The latter carry rollers 39 and 40, respectively, which abut against the dampers 8 and 9 respectively.

The apparatus works as follows: So long as there is a sufficient vacuum in the fire

box the dampers 8, 9 are open to a degree depending on the degree of vacuum, so that air can enter above the grate through the ducts 4 and 5. If the valve 32 which controls the main-blast 53 is closed the pressure acting on the piston 20 from the main steam duct 31 is cut off, and the pressure acting on the piston from the second steam duct 22 thrusts the piston to the right, as shown in Fig. 4. With the piston in this position steam can flow from the second steam duct 22 to the auxiliary blast pipe 36 and also to the pipe 15 leading to the ejector 28. But when the main-blast is stopped and the auxiliary blast put into action the vacuum in the furnace is reduced, the dampers tend to close and there is a deficiency of air in the fire box. The steam issuing from the ejector nozzle, however, creates a vacuum in the pipe 29 and above the piston 14, and by this means the piston 14 is lifted. This movement of the piston 14 is communicated by means of the piston rod 12 and lever 11 to the shaft 10, which rotates. The levers 37, 38 participate in this rotation, and the valves or dampers 8 and 9 are opened.

To allow of operating the auxiliary blast and ejector when the steam supply to the engine is not interrupted the pipe 22 is connected to the chamber 17 by means of a pipe 42 provided with a valve 43. By opening this valve steam can be admitted from pipe 22 to chamber 17 while the valve 21 is closed.

I claim:

1. In an apparatus for automatically regulating the draft in boiler furnaces the combination of an air duct leading into the fire box of the furnace, a valve in said air duct, adapted to be automatically opened by and in proportion to the vacuum in the fire

box, a steam duct, a main blast in said steam duct, a valve for controlling the main blast, an auxiliary steam blast, a second steam duct, means for automatically connecting said auxiliary blast with said second steam duct, when the valve controlling the main blast is being closed, said means serving for disconnecting said auxiliary blast from said second steam duct when said valve controlling the main blast is being opened and means for automatically opening the valve in the air duct when the valve controlling the main blast is closed.

2. In an apparatus for automatically regulating the draft in boiler furnaces the combination of a pair of air ducts leading into the fire box of the furnace, a valve in said air ducts, adapted to be automatically opened by and in proportion to the vacuum in the fire box, a steam duct, a main blast in said steam duct, a valve for controlling the main blast, an auxiliary steam blast, a second steam duct, means for automatically connecting said auxiliary blast with said second steam duct when the valve controlling the main blast is being closed, said means serving for disconnecting said auxiliary blast from said second steam duct when said last named valve is being opened, means for automatically opening the valve in the air duct when the valve controlling the main blast is closed and means for connecting said auxiliary blast and said second steam duct when the valve controlling the main blast is open.

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

GUSTAV DE GRAHL.

Witnesses:

FRIEDRICH ROKAHR,
HENRY HASPER.