(No Model.) 2 Sheets—Sheet 1.

E. REYNOLDS.

FURNACE.

No. 263,582. Patented Aug. 29, 1882.

Fig. 1

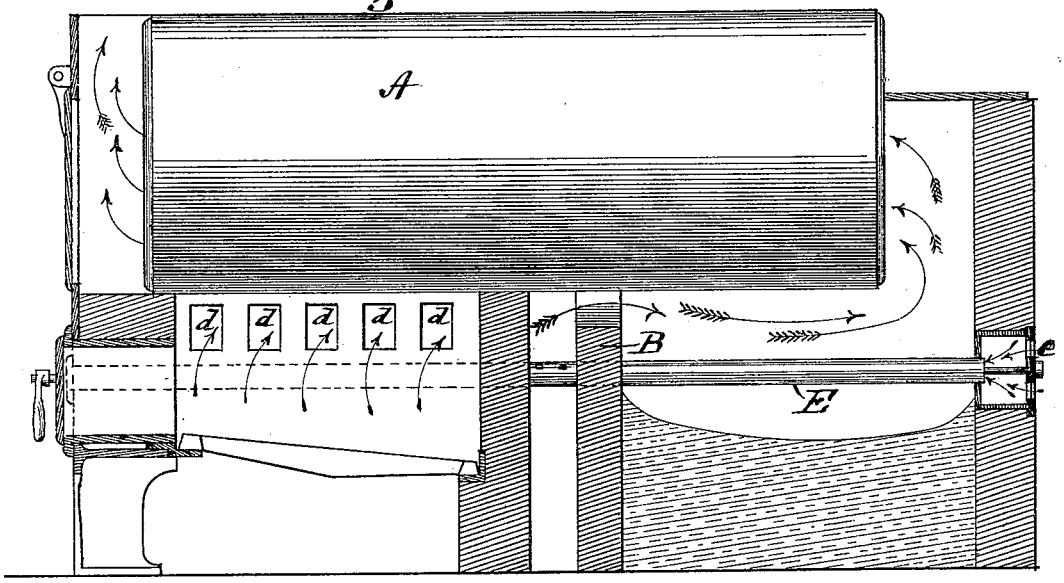
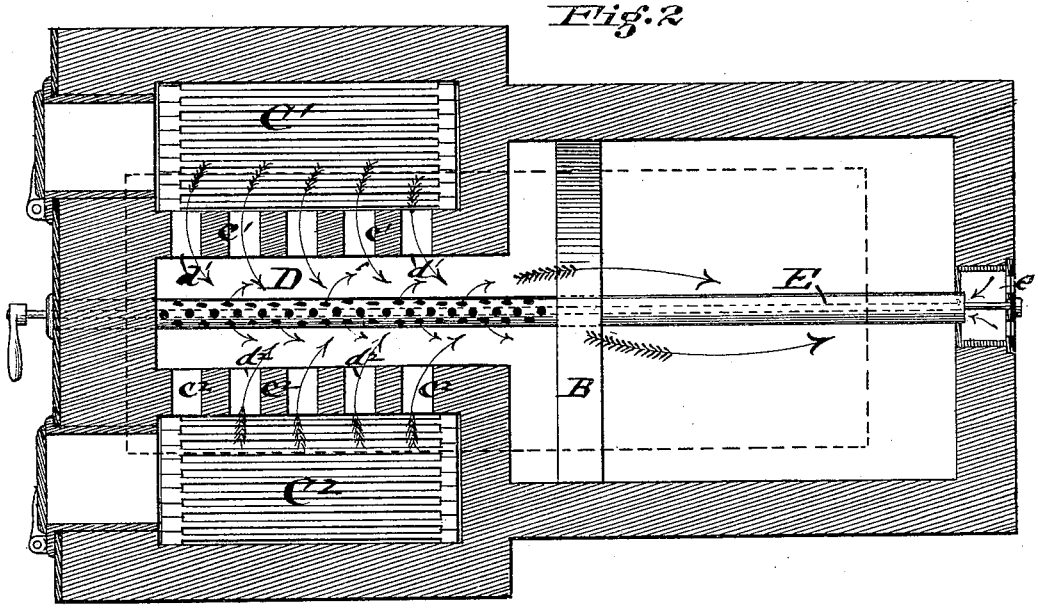


Fig. 2



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3

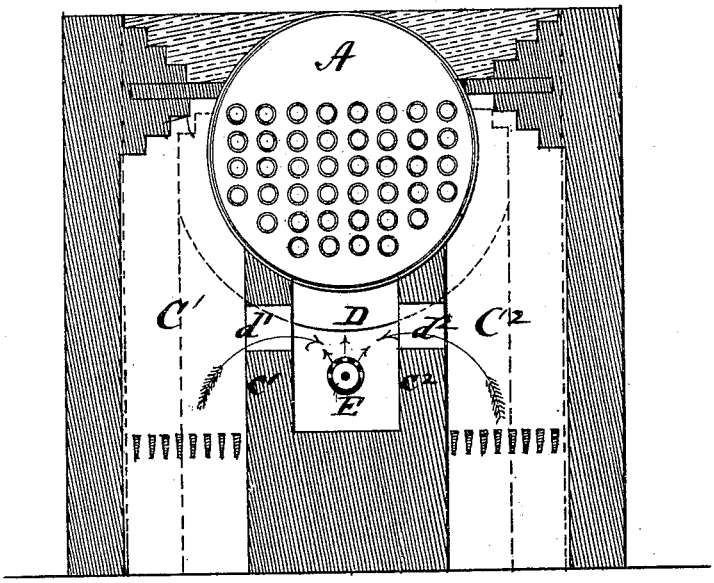
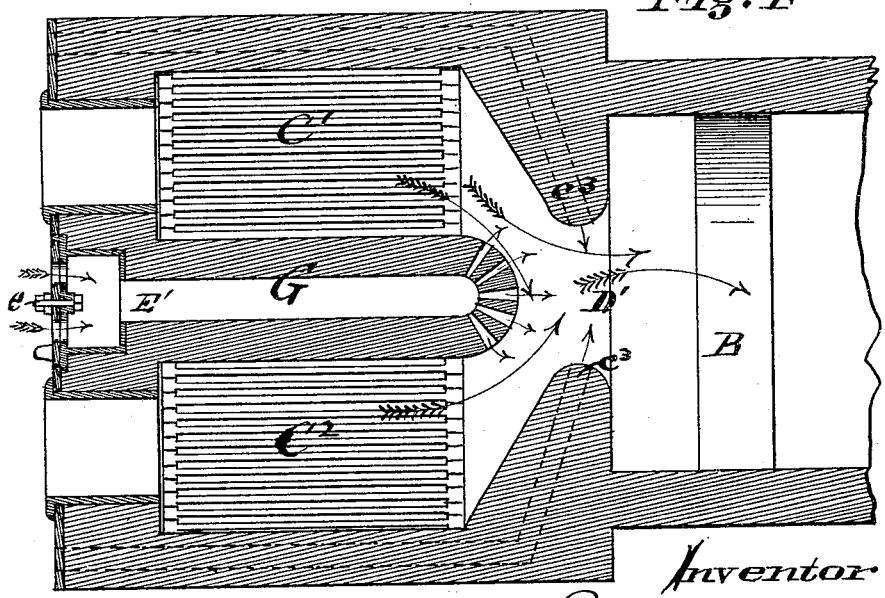


Fig. 4



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UNITED STATES PATENT OFFICE.

EDWIN REYNOLDS, OF MILWAUKEE, WISCONSIN.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 263,582, dated August 29, 1882.

Application filed December 24, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDWIN REYNOLDS, a citizen of the United States, residing at Milwaukee, Wisconsin, have invented new and useful Improvements in Furnaces, of which the following is a specification.

My invention relates to steam-boiler and other furnaces, its object being to improve their construction with a view to the perfect combustion of the fuel and the prevention of smoke.

To this end my invention consists in the construction of a furnace with two fire-chambers arranged to discharge their gaseous products of combustion into a common combustion-chamber, so that by alternate firing the gases and smoke evolved from fresh charges of coal fed to one fire-chamber shall come into contact and mingle with the more highly heated gases issuing from the other fire-chamber, whereby the average temperature of the combined gases in the combustion-chamber may be constantly maintained at or above that required for perfect combustion.

My invention consists, further, in the combination, with the two fire-chambers and their common combustion-chamber, of one or more air-heating flues provided with suitable controlling devices arranged to discharge heated air into the said combustion-chamber, there to mingle with the gases to aid a complete combustion.

It consists, also, in the details of construction, hereinafter more fully described, as a mode of carrying the principles of my invention into effect.

My invention is illustrated in the accompanying drawings, showing preferred forms of construction. In these Figure 1 is a longitudinal sectional elevation of a cylindrical steam-boiler and setting to which my invention is applied; Fig. 2, a plan section taken immediately beneath the boiler through the fire-chambers; Fig. 3, a cross-sectional elevation of same, taken through the grates and fire-chambers; and Fig. 4, a plan section, showing a slightly-modified form of construction embodying the same principles.

The parts referred to in the specification are designated by letters of reference corresponding with those upon the drawings.

A designates a cylindrical boiler, which is set horizontally in brick-work in the ordinary manner, the setting being such as is commonly employed for flue-boilers, excepting as to the construction of that part situated forward of the bridge-wall B, as hereinafter described.

In applying my invention I construct the forward part of the setting somewhat wider than usual, in order to introduce two fire-places, C′ C²—one at each side—provided with grate-bars, with an intervening chamber, D, constituting the combustion or heating chamber and part of the outlet to the stack. The fire-places C′ C² are of rectangular form, whose outside and front inclosing walls are the side and front walls, respectively, of the boiler-setting, and whose inside and end walls are partitions c' c^2, built within the general inclosure of the boiler-setting, flush up against the boiler-shell. The chambers, opening to the front by ordinary fire-doors, communicate with the central chamber, D, preferably by one or more horizontal rows of openings, d' d^2, arranged just below the boiler through the brick partition-walls, separating said fire-places from the intervening chamber D. The fire-places C′ C² are entirely closed above by the boiler, so that the only egress therefrom for the gaseous products of combustion is through the apertures *d* into the chamber D. The bridge is arranged sufficiently in rear of the fire-places C to permit the gases to expand laterally to fill the entire space between the side walls before reaching it, in order that in passing over it the heat may be uniformly distributed to the boiler-shell.

Where bituminous coals are used which produce a large amount of smoke I add to the construction thus described a means of introducing heated air to the gases in the combustion-chamber D. This consists of a pipe, E, arranged centrally in the furnace from front to rear, preferably on a line just below the openings *d*. That portion of the pipe forward of the bridge B in the combustion-chamber D is provided with numerous perforations, as shown, and at its rear end the pipe opens through the furnace-wall to the outer air, and is provided with a register or damper, *e*, controlled from the front by a rod passing entirely through the pipe and operated by a handle, F.

It is intended by means of the register to regulate the quantity of air admitted to the combustion-chamber D, as occasion may require, and the air drawn through the pipe by the natural draft of the furnace is heated in its passage by the pipe itself, which thus lies in the path of the products of combustion to the stack.

The operation of the furnace is as follows: The fuel is distributed in the fire-places C' C^2, the fires being fed alternately, so that when one fire is receiving fuel the other is incandescent and giving off its gases at a high temperature. The products of combustion meet in the central chamber, D, in a divided state from passing through the apertures d' d^2 in the partition-walls e' e^2, and as they become mingled the surplus heat of the gases from the incandescent fire elevates the temperature of the gases from the green fire, so that both are maintained at the temperature required for thorough combustion. The introduction of heated air to these gases at the moment of their meeting and mingling in the combustion-chamber is under such conditions as facilitate their thorough mingling, so that the gases, being elevated to a proper temperature and thoroughly mingled with the required amount of oxygen, pass thence from the combustion-chamber in a state of perfect combustion. The addition of heated air by the air-pipe E or otherwise may, however, in some cases be dispensed with, as with some fuels a sufficient excess of air will pass through the grates and body of fuel to answer all purposes; but with bituminous coals the air-pipe is to be preferred.

I have shown in Fig. 4 a slightly modified arrangement, in which the intervening chamber D is dispensed with, or, rather, placed at the rear, and the fire-places separated by a partition-wall, G, in common. The rear walls, c^2, of the fire-places are in effect wing-walls extending inwardly from the side walls of the setting, leaving a common central throat between them, through which the products of combustion from both fire-places pass.

I have shown the air-tube E′ extending from the front directly through the common partition-wall G, having a controlling-register, *e*, in front, and arranged to discharge air centrally in the line of draft between the wing-walls c^3 into the throat D′, which corresponds in effect with the combustion-chamber D, first described.

Instead of the air-passage E′, arranged in the central partition, G, as described, suitable air-flues may be arranged in the side walls of the furnace, extending through the wing-walls, so as to discharge directly into the throat D, as indicated by dotted lines in the drawings.

There are other modifications which might be made in the construction without departing from the spirit of my invention.

While for the purpose of convenient illustration I have shown my invention as applied to the ordinary boiler with brick setting, it may be applied with equal facility to fire-box boilers. Thus, referring to Fig. 4 for illustration, and considering B to indicate the position of the tube-sheet, the partition G and wing-walls c^3 may be constructed as "water-legs," giving the same general conformation to the parts as shown. In this case the air-tube E′ would of course be otherwise arranged than as shown in the figure, or omitted, and other provision made for admitting heated air to the gases at the point designated; or the wing-walls c^3 might be so constructed, and the central partition, G, built of brick-work or tiling with air-passage E′, as shown, which arrangement would perhaps be preferable, as I have reference here to the application of my invention to existing boilers in which radical changes of construction might be impracticable. In constructing a boiler, however, originally for this purpose, either form of my invention could be embodied with facility.

I am aware that the smoke and gases from a green fire have been carried to a clear-fire chamber, mingled with heated air, and consumed; but I am not aware that the products of combustion from a green fire have ever before been mingled with the flames and gases from a high fire in a mixing-chamber containing no grate or fuel, and burned without the aid of a special fire in said chamber. I do not therefore claim the intermediate fire-grate and clear fire; but an intermediate mixing-chamber in which the gases, smoke, and heated air are mingled and consumed without a special fire I believe to be new.

I am also aware that a hot-air pipe has been arranged to deliver heated air to the smoke and gases from the fire chamber or chambers to cause the mingled elements to be completely consumed.

Having described my invention, I claim and desire to secure by Letters Patent of the United States—

The combination, in a boiler-furnace, of two independent fire-places, an intermediate chamber in which the gases and products of combustion are mingled and consumed without the aid of a special fire in said chamber, an independent bridge-wall, and a perforated pipe extending from the outside of the furnace through the smoke-arch and bridge-wall and into the mixing-chamber, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

EDWIN REYNOLDS.

Witnesses:
GEO. H. TUCKER, Jr.,
WM. K. DOWNEY.