E. C. READ.

APPARATUS FOR PROMOTING COMBUSTION IN FURNACES.

APPLICATION FILED FEB. 2, 1911.

1,106,583.

Patented Aug. 11, 1914.

2 SHEETS—SHEET 1.

FIG. 1.

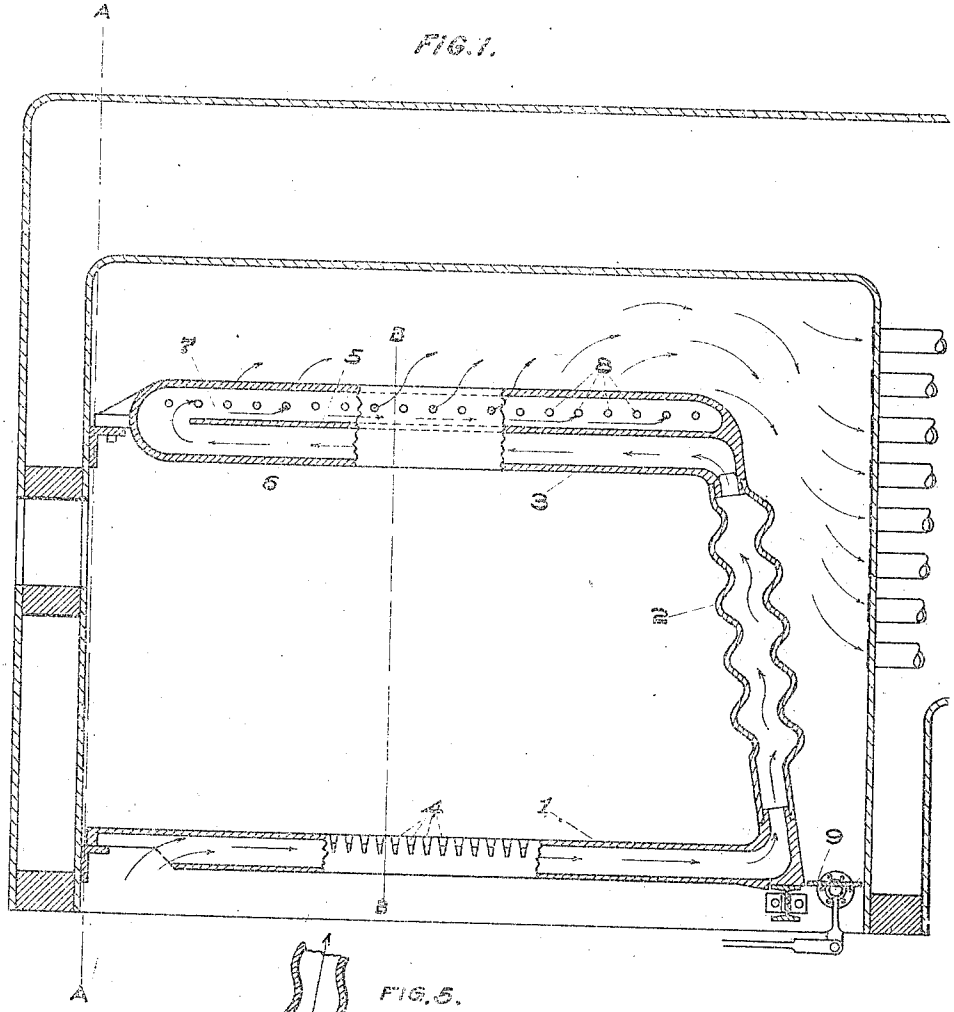
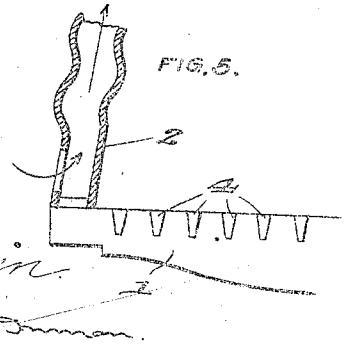


FIG. 5.



WITNESSES

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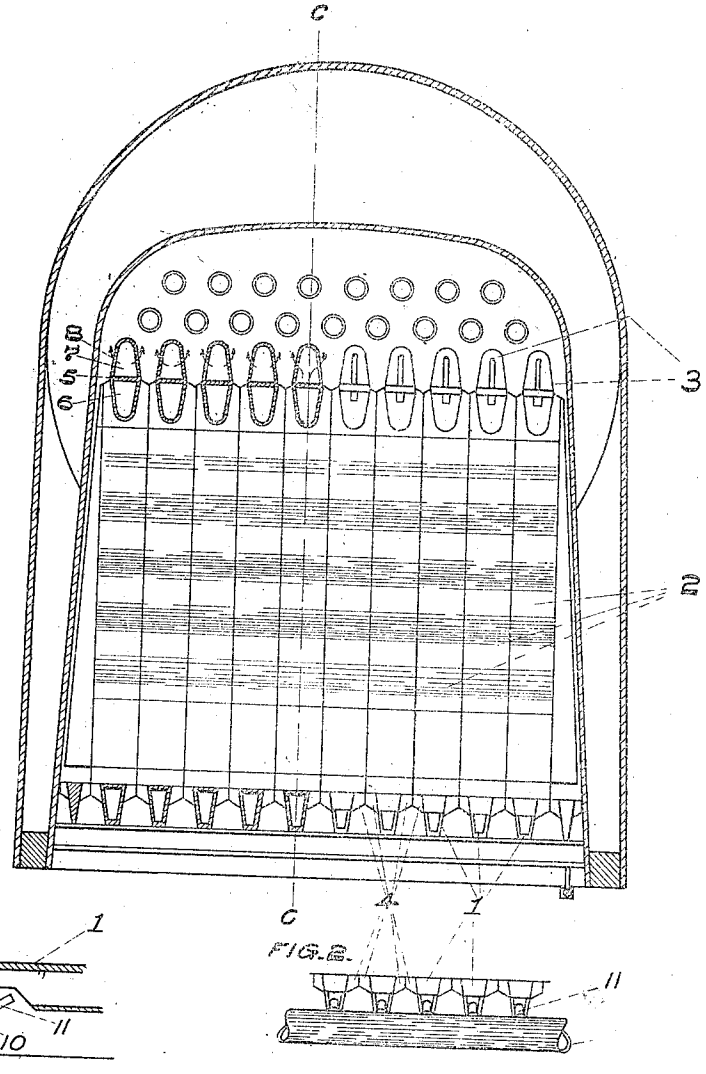


FIG. 2.

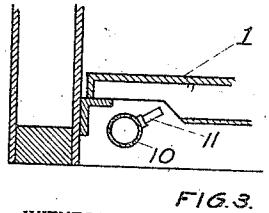


FIG. 3.

FIG. 4.

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APPARATUS FOR PROMOTING COMBUSTION IN FURNACES.

1,106,583. Specification of Letters Patent. Patented Aug. 11, 1914.

Application filed February 2, 1911. Serial No. 606,100.

To all whom it may concern:

Be it known that I, EMERY C. READ, citizen of the United States, residing at Franklin, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Promoting Combustion in Furnaces, of which the following is a specification.

My improved apparatus for promoting combustion in furnaces is herein set forth with sufficient clearness to enable those skilled in the art to which it appertains to employ and construct the same, but I do not wish to be understood as limiting the apparatus to the precise construction here shown, as the drawings are illustrative merely, and many modifications of said apparatus could be employed without departing from the scope of my invention.

In the accompanying drawings, I have shown my improved apparatus as applied to the fire-box of a locomotive, but it will be readily understood that said apparatus may be readily employed in other kinds of furnaces and easily adapted to such employment. While I have here shown a construction which contemplates the use of a hollow-grate bar and the passage of air longitudinally through the same into a vertical flue, said bar could be of the usual construction, and air could be taken directly into the lower end of the vertical flue, and still be within the scope of my invention.

It is a well-known fact that the draft of a locomotive is largely an induced draft caused by the action of the exhaust steam passing from a nozzle into and through the smoke stack, and, especially when the locomotive is laboring under heavy loads, the intensity of the draft is such as to lift the fuel from the grate bars and carry particles of it out through the stack, and in this way a loss of fuel and imperfect combustion are both caused,—imperfect combustion being due to the fact that the air rushes through the fuel and combustion chamber with such rapidity that it does not become sufficiently heated to cause perfect combustion of the fuel. Furthermore, because of this intensity of draft, particles of burning fuel are ejected from the stack and in many instances cause fires which destroy or damage much property.

It will be readily understood that if the intensity of draft could be reduced, it would eliminate the difficulties mentioned, but it will also be readily understood that the rate of combustion or the heat-generating capacity of the furnace must at least be maintained in order to supply the steam demands of the engine. With these conditions in view, I have evolved an apparatus whereby a portion of the air which, by reason of the draft, enters the fire-box, is caused to pass around the bed of fuel, and in such passage, causes said by-passed air to become heated to a high degree of temperature, then causes the same to enter the combustion chamber above said fuel and to there mingle with the burning gases, thereby causing a perfect combustion of said gases and consequently a consumption of all smoke. Referring to the drawings, the by-pass by means of which I direct said portion of air as aforesaid and reduce my invention to practice, may be as follows:—

Figure 1 is a vertical, longitudinal section of the fire-box of a locomotive on line C C of Fig. 2, showing my invention applied thereto and which is also shown in section upon said line. Fig. 2 is a vertical, transverse section of said fire-box on line A A of Fig. 1, the left-hand portion of my apparatus being shown in section on line B B of Fig. 1. Figs. 3 and 4 show a steam injector applied to my apparatus. Fig. 5 is a modified form of my device.

Said apparatus consists of a plurality of units, each of which is composed of three sections, viz: a hollow grate bar 1, a vertical flue section 2, and a hollow, horizontal crown-bar 3. Each of said units may be of any suitable width, which will be determined more or less by the size of the furnace and convenience of installation. Said grate-bars, in form, resemble that of a rectangular tube having adjacent to the top thereof the lateral lugs 4, between which air enters into the fuel bed. The rear end of said bar is open for the entrance of air as shown by the arrows in Fig. 1. The flue section 2 is of tubular construction, the front and rear walls of which are preferably corrugated as shown, for the purpose of presenting more surface to the action of the heat. The lateral faces of said sections are plain and are designed to form a close joint with each other so that said sections form a wall or baffle-plate which deflects the gases of combustion to the upper part of the combustion chamber and causes them to pass between the crown-bars 3. Said crown-bars are of tubular formation, preferably of oval cross-section and have a horizontal, longitudinal partition 5

which extends nearly the entire length of the bar. The lower chamber 6 of said crown-bar is in communication with the chamber of the flue section 2. The upper chamber 7 of said crown bar is provided with a number of lateral orifices 8 through which the heated air passes into the combustion chamber where it mingles with the gases of combustion and, being in a highly heated state, it causes nearly or quite perfect combustion of said gases and a consequent complete consumption of the smoke. The unoccupied portion of the fire-box in front of the grates may be closed by a tilting damper 9, whereby draft may be prevented from entering at this point, and cinders and ashes may be easily emptied therefrom by tilting said damper.

At times it may be desirable to accelerate or force the passage of air through my apparatus, which I term the draft by-pass, and in order to accomplish this result, I provide for directing jets of live steam into said by-pass. In Figs. 3 and 4, I have shown a steam supply pipe 10, which leads from the steam dome and is provided with a throttle—not shown—which may be actuated from the fireman's station in the cab. Said pipe 10 is equipped with a plurality of small nozzles 11, one for each unit of by-pass, and by opening said throttle, live steam may be injected into the by-pass and this will greatly accelerate the passage of air through the same.

I claim the following:—

1. An apparatus for promoting combustion in furnaces, consisting of a plurality of sectional by-pass units, each of said units being composed of the following sections,—a hollow grate section arranged for the intake of air at one end into its chamber, a vertically-disposed baffle flue section having its chamber arranged in communication with said grate chamber, and a hollow crown-bar arranged horizontally across the upper portion of the combustion chamber of a furnace with its chamber in communication with the chamber of said flue, said crown bars being arranged with intermediate spaces, there being apertures in said crown bar leading from its chamber into said spaces for the purpose of causing air passing through said several sections to mingle with the gases of combustion, and said flue sections being arranged to direct the gases of combustion upward through said spaces, for the purpose set forth.

2. An apparatus for promoting combustion in furnaces consisting of the combination of a plurality of sectional units, each of said units comprising a hollow grate bar, a vertically-disposed flue section positioned at the rear of the fire-box of such furnace and a horizontally-disposed hollow crown-bar extending across the upper portion of said fire-box and having lateral orifices therein for the egress of air, said grate-bar, flue section and crown-bar being constructed and arranged for the passage of air through the same and to have its ingress in said grate-bar and its egress from said lateral orifices in said crown bar; said crown-bar section being arranged with spaces between the same through which the gases of combustion are caused to pass and to mingle with the air as it issues from said orifices, for the purpose set forth.

3. An apparatus for promoting combustion in furnaces, consisting of the combination of a plurality of sectional units, each of said units comprising a hollow grate-bar, a vertically-disposed flue-section positioned in proximity to the rear of the fire-box of the furnace, and a horizontally-disposed crown-bar extending across the upper portion of said fire-box and having orifices therein for the egress of air, said units being constructed and arranged for the passage of air through the same, which has its ingress in said grate-bar, and its egress from said orifice in said crown-bar, the units of which crown-bar are arranged with spaces between the same, through which the gases of combustion are caused to pass and there mingle with the air as it issues from said orifice, and means injecting fluid under pressure, at the point of ingress of said air, for the purpose specified.

4. An apparatus for promoting combustion in furnaces consisting of a plurality of horizontally-disposed hollow crown bars extending longitudinally across the furnace, and positioned in the upper part thereof, there being an intervening space upon either side of each of said bars, between the same and the bar in juxtaposition thereto, for the passage of the gases of combustion, also lateral orifices in each of said bars opening into the spaces adjacent thereto, and vertically-disposed flue-sections having interior passages communicating with the interior of said crown-bars at one end thereof and adapted to conduct air to the interior of said bars from beneath the furnace, said flue sections being positioned in proximity to the rear end of the combustion chamber of said furnace, for the purpose of forming a baffle plate to deflect the gases of combustion into the upper portion of said chamber.

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

EMERY C. READ.

Witnesses:
CLYDE M. READ,
WM. A. MALLORY.