2 Sheets—Sheet 1.

C. GRÖBE.

Metallurgic Gas-Furnaces.

No. 207,177. Patented Aug. 20, 1878.

Fig: 1.

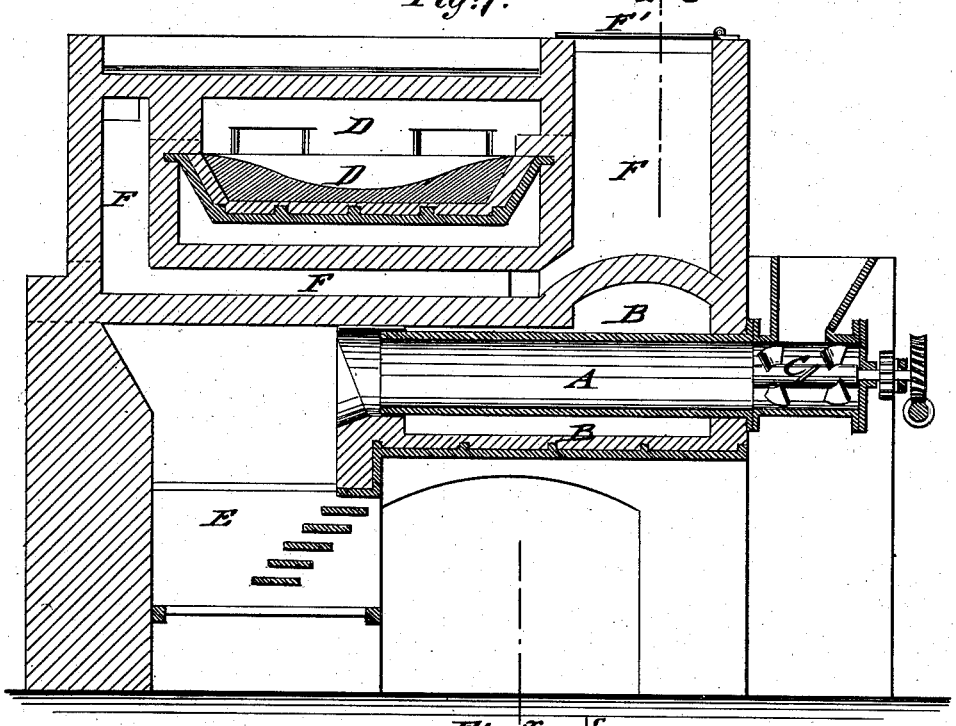
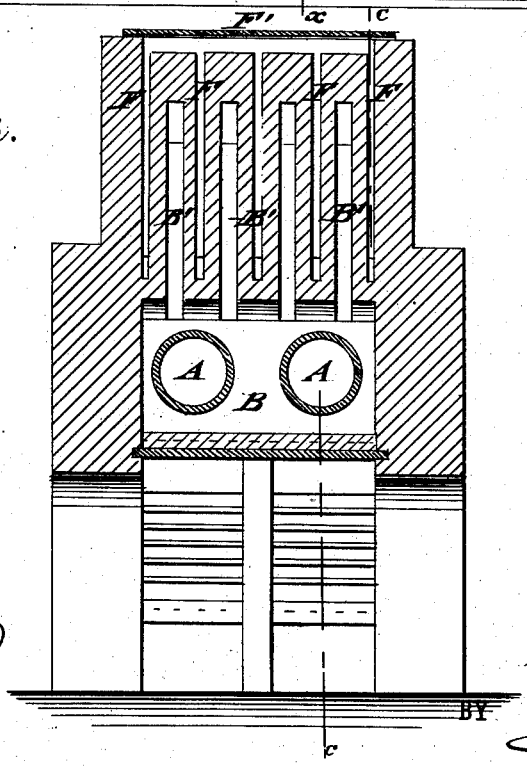


Fig: 2.



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2 Sheets—Sheet 2.

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Fig. 3.

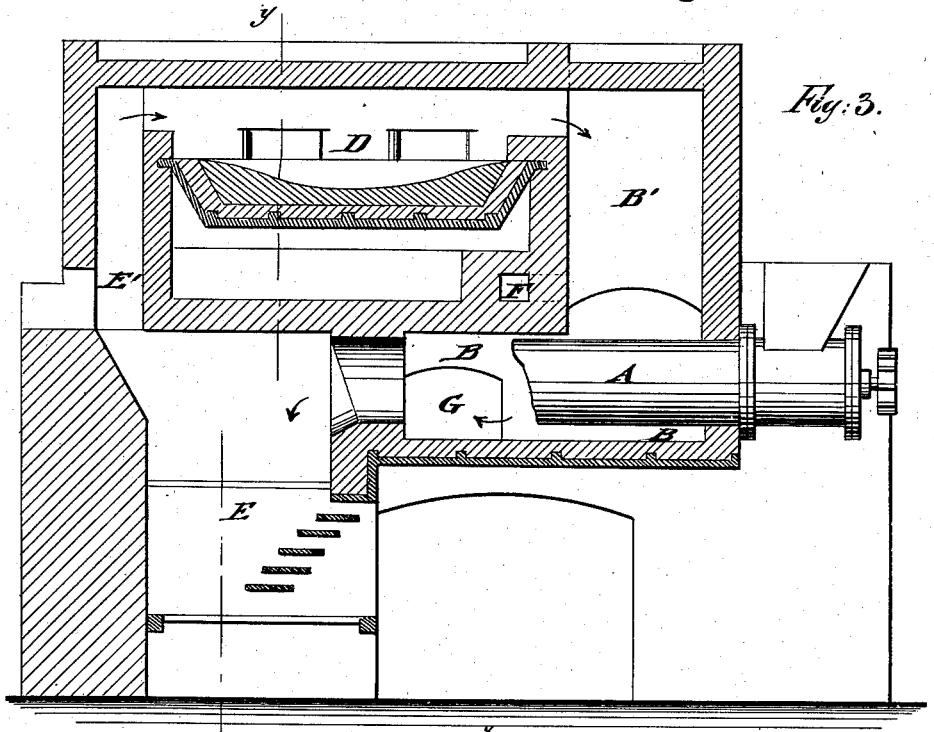
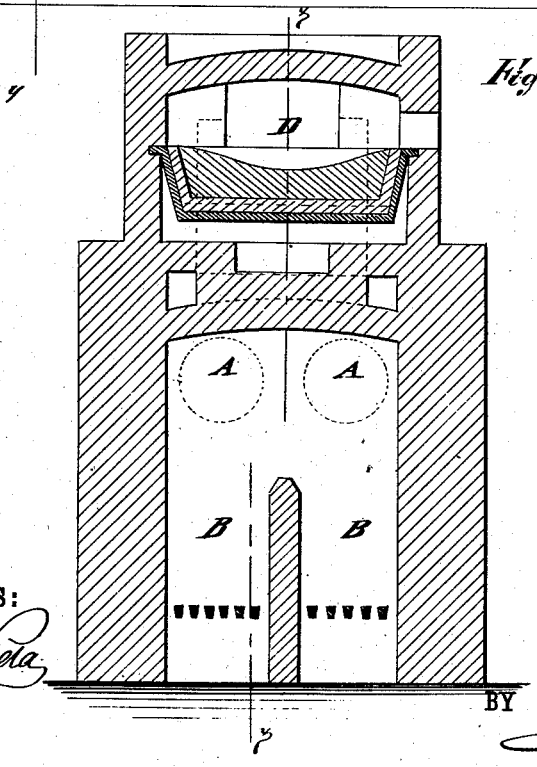


Fig. 4.



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CARL GRÖBE, OF BERLIN, PRUSSIA, ASSIGNOR TO FRIEDRICH LÜRMANN, OF OSNABRUCK, GERMANY.

IMPROVEMENT IN METALLURGIC GAS-FURNACES.

Specification forming part of Letters Patent No. **207,177**, dated August 20, 1878; application filed May 22, 1878.

To all whom it may concern:

Be it known that I, CARL GRÖBE, of Berlin, Prussia, Germany, have invented a new and Improved Metallurgic Gas-Furnace, of which the following is a specification:

In the accompanying drawings, Figure 1 represents a vertical longitudinal section on line *c c*, Fig. 2, showing a furnace with my improved gas-generating attachment. Fig. 2 is a vertical section of the same on the line *x x*, Fig. 1. Fig. 3 is a vertical longitudinal section on line *t t*, Fig. 4, showing the retort or gas-generator partly in side view; and Fig. 4 is a vertical transverse section through the furnace and fire-place on the line *y y*, Fig. 3.

Similar letters of reference indicate corresponding parts.

My invention is an improvement in that class of gas-generators for furnaces, or in iron smelting or puddling gas-furnaces, in which the gases evolved from coking coal are caused to mingle with the gases of combustion in the fire-place, and they are together forced into and through the iron smelting or puddling chamber.

The improvement relates to the construction and combination of parts, as hereinafter described and claimed.

Referring to the drawing, A represents one or more retorts, that pass longitudinally through a chamber, B, the retorts being open at the inner ends, and provided at the outer ends with a hopper for conducting the fuel to the retorts, and with a continuously or intermittently revolving spiral feed-screw, C. The retort-inclosing chamber B is connected by means of suitable flues B′ with the exit end of the furnace D, so that the spent gases of combustion may be drawn off through the channels B′ into the chamber B, for the purpose of heating the retorts A, and thereby gradually the fuel during its passage to the fire-place E of the furnace. The fuel, being heated up in its passage through the retorts, liberates the gases that are contained therein, and conducts them through the open end into the space above the fire-place E. The fuel, being thus liberated from its gas, is dropped at the end of the retorts at red heat onto a step-shaped grate of the fire-place, and there burned up in connection with a suitable supply of atmospheric air.

The carbon of the fuel is, by the influence of air, first changed into carbonic acid, which is again reduced to carbonic oxide on its passage through the upper layer of fuel, that is at a red heat.

The discharge end of the retort may be made tapering, and larger than the retorts, so as to facilitate the passage of the heated fuel into the fire-place. When fuel is used that is liable to cake under the influence of heat, the feed-screw may be extended to suitable length, and also the conical exit portion of the retort. The spiral screw, that causes the fuel to advance in the retorts, closes tightly the passage of the same, so as to compel the gases to issue into the space above the fire-place, and come there in contact with the products of combustion of the burning fuel on the fire-grate, so that all those gases which are capable of a combination with carbon, such as steam, carbonic acid, &c., are changed into hydrogen gas and carbonic oxide. No product of tar can pass through the retorts, as they are converted by the red-hot carbon into carbureted-hydrogen gas, carbonic oxide, and hydrogen.

By the gradual screwing of the fuel through the retorts the moist fuel that is fed by the hopper does not come in contact with the fuel already heated up, and from which the gases are liberated, so as to interrupt and retard the generation of the gas; but, on the contrary, a uniform generation of gas from the fuel is kept up during its passage through the retorts. The gases which are discharged at the inner ends of the retorts have about the same temperature as the spent gases of combustion that pass from the furnace into the heating-chamber of the retorts, the former having taken up a considerable degree of heat from the spent products of combustion.

By the continuous or intermittent motion of the fuel, the formation of coke, that has been so detrimental to the production of gas in former processes, is prevented. The fire-place is provided with mica windows, for the purpose of observing the regular progress of the heating operation in the fire-place, where the fuel is finally burned, and where its gases

of combustion are mingled with the gases generated in the retorts, to be then jointly conducted with the same through suitable channels E′ and over the fire-bridge into the furnace D. The generation of gas in the fire-place is not hindered by any change in or by irregular forms of the fuel, and any carbonic acid formed by the atmospheric air is changed into carbonic oxide by the upper layer of red-hot carbon.

In order that the ashes may form a good fusible slag, a proper amount of flux may be introduced to the fuel. If the ashes of the fuel should require the addition of carbonate of lime, this is converted while in the retorts into caustic lime and carbonic acid, of which the latter is reduced by the red-hot carbon into carbonic-oxide gas. The caustic lime passes with the other products into the fire-place, and remains there with the ashes of the fuel, so as to form with the same a lightly-fusible slag. The heating-gases of the fire-place, mingled with those generated in the retorts, are supplied during their passage through the flues E′ with heated atmospheric air, that is drawn in at the top part of the furnace by a number of air-flues, F, which are arranged intermediately between the vertical conducting-flues B′, leading from the furnace to the heating-chamber of the retorts, as shown clearly in section in Fig. 2.

In place of the flues F that heat up the atmospheric air, any other system or arrangement of air-flues may be provided, so as to heat up the air to a high degree of temperature. The quantity of atmospheric air to be supplied with the heating-gases for final combustion to the furnace is regulated by a sliding or turning valve, F′, situated on the top part of the furnace, above the air-supply flues. From the heating-chamber of the retorts the spent products of combustion pass finally through a flue, G, into the chimney, or in works are employed in heating the boilers, or for other purposes.

I do not claim, broadly, a retort arranged above or in connection with a fire-place, so that fuel (coal) may be fed through it into the fire-place; nor do I claim a screw or spiral-flanged shaft for feeding fuel through a tube or cylinder; but,

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

The combination of the retorts A and the feed-screw C, tightly fitted therein, the retort-inclosing chamber B and flues B′, the fire-place E, the passage or channel E′, and the smelting or puddling chamber D, located above the fire-place and communicating with the flues B′, all as shown and described, for the purpose specified.

CARL GRÖBE.

Witnesses:
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HERMANN LEICHSENRING.