4 Sheets—Sheet 1.

G. LIEGEL.

Gas Retort Furnace.

No. 208,106. **Patented Sept. 17, 1878.**

Fig. 1

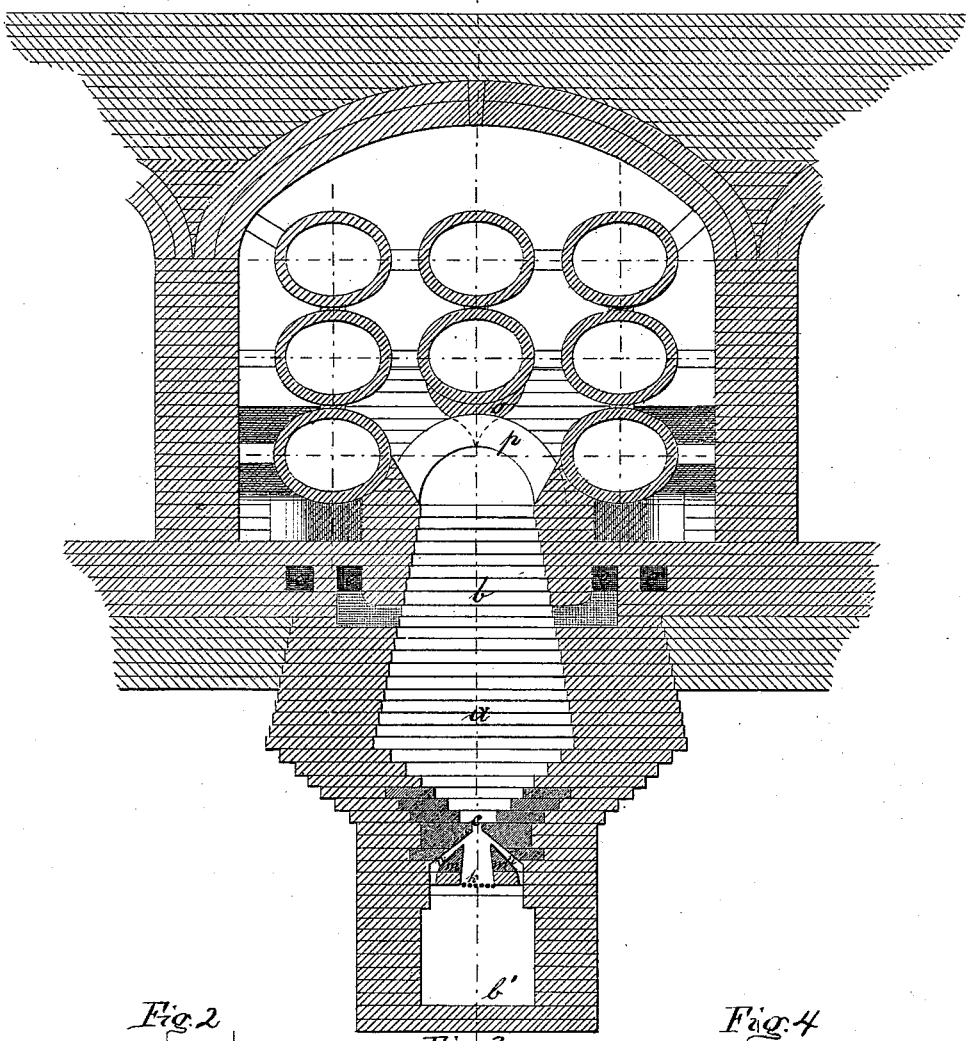


Fig. 2

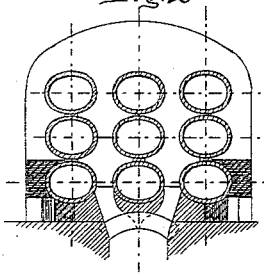


Fig. 3

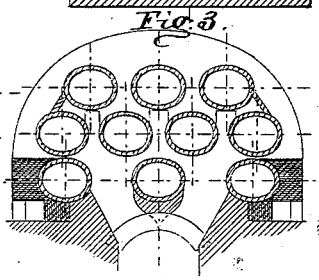
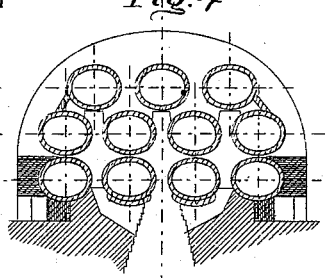
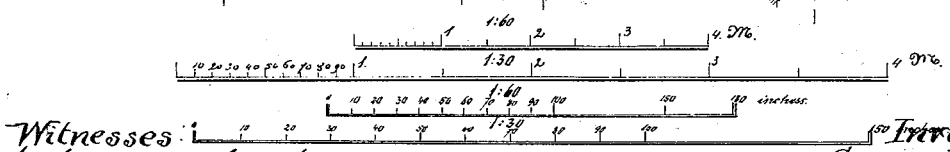


Fig. 4





Witnesses:
J. Hammersbough
Louis Auerbach

Inventor
Georg Liegel
per A. Schroeder King
Attorneys

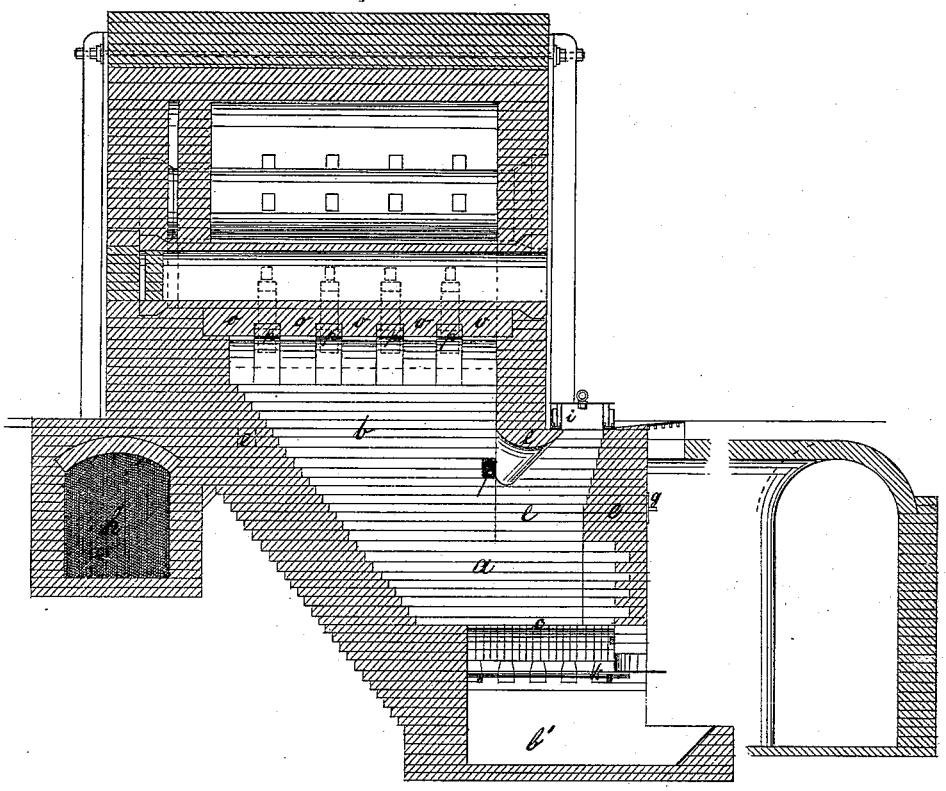
4 Sheets—Sheet 2.

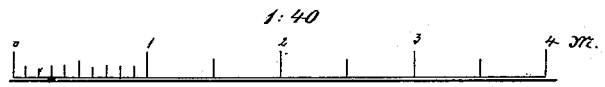
G. LIEGEL.

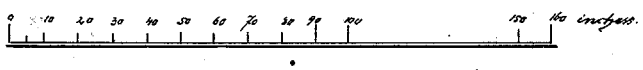
Gas Retort Furnace.

No. 208,106. **Patented Sept. 17, 1878.**

Fig 5







Witnesses
J. Hammerslough
Louis Auerbach

Inventor
Georg Liegel
per A. Schiessling
Attorney

4 Sheets—Sheet 3.

G. LIEGEL.

Gas Retort Furnace.

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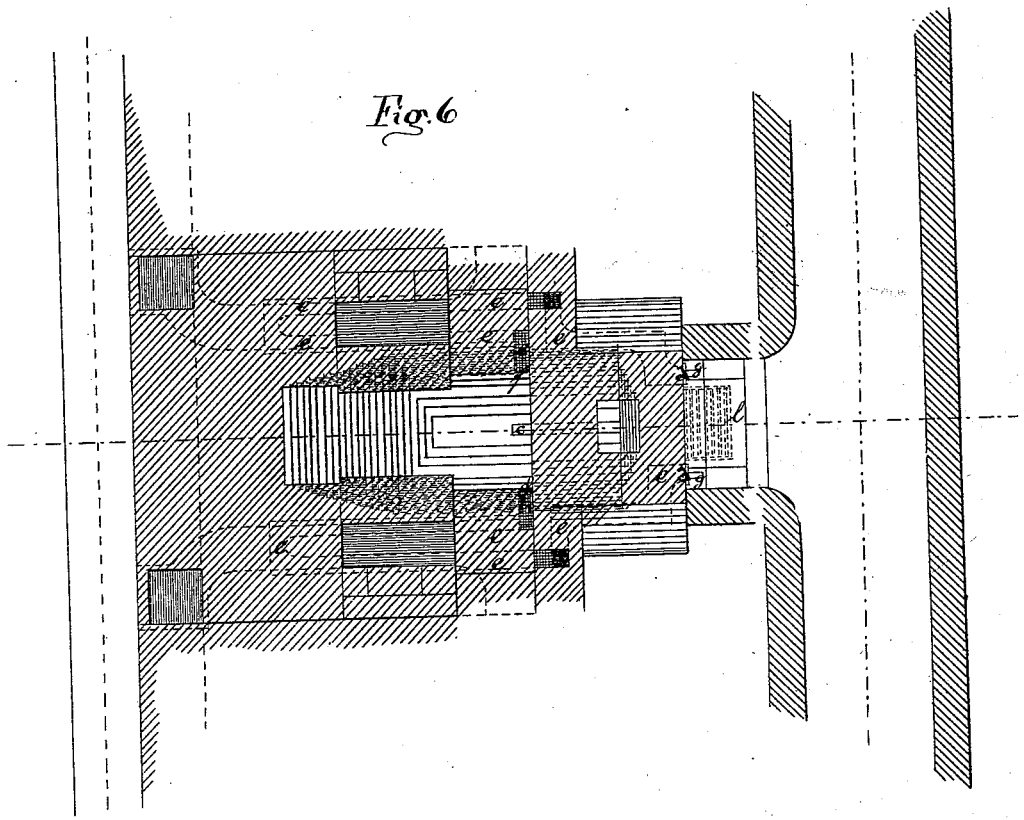
Fig. 6



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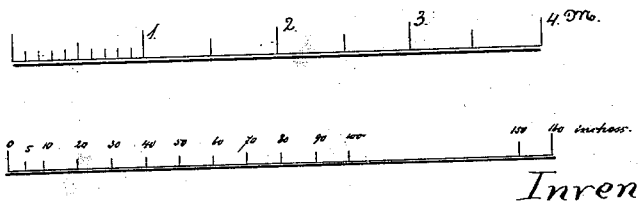

Witnesses:
J. Hammersbough
Louis Auerbach

Inventor
Georg Liegel
per Ad. Schieckhing
Attorney

4 Sheets—Sheet 4.

G. LIEGEL.

Gas Retort Furnace.

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Fig. 7.

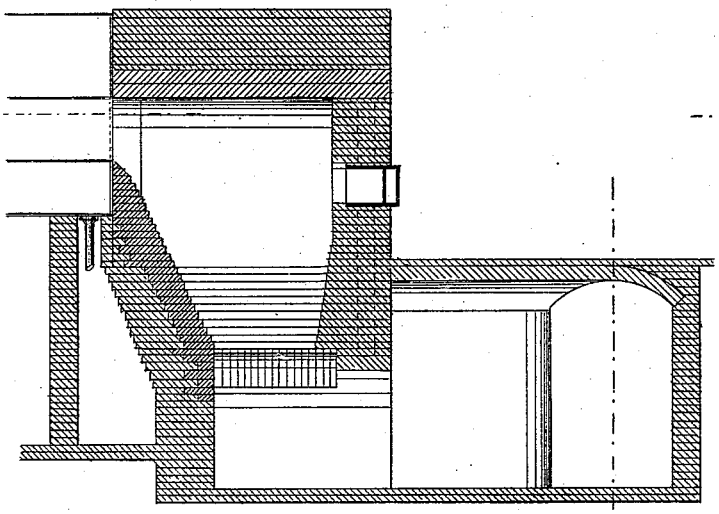


Fig. 8.

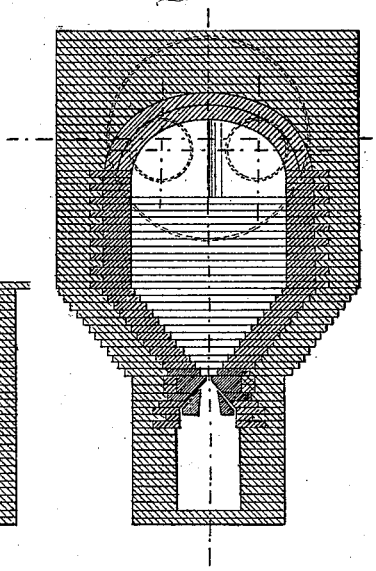
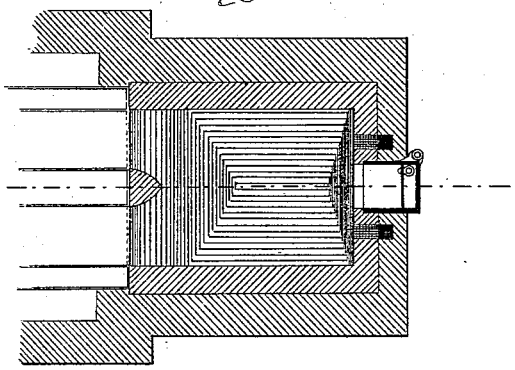


Fig. 9.



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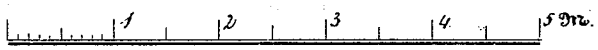

Witnesses
J. Hammersbough
Louis Auchbach

Inventor
Georg Liegel
per Schmeckenbecher
Attorney

UNITED STATES PATENT OFFICE.

GEORG LIEGEL, OF STRALSUND, PRUSSIA.

IMPROVEMENT IN GAS-RETORT FURNACES.

Specification forming part of Letters Patent No. **208,106**, dated September 17, 1878; application filed October 29, 1877; patented in Germany, June 6, 1877, and in England, June 16, 1877.

To all whom it may concern:

Be it known that I, GEORG LIEGEL, of the city of Stralsund, Kingdom of Prussia, and German Empire, have invented Improvements in Gas-Retort Furnaces, of which the following is a specification:

The present invention relates to a novel furnace system, adapted particularly for gas-furnaces, smelting and ore-roasting furnaces, steam-boilers, evaporating-pans, &c.

The invention consists in the construction and arrangement of the furnace proper, as will be hereinafter more fully explained, and then set forth in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a transverse vertical section of a furnace having a series of gas-retorts combined therewith. Figs. 2, 3, and 4 illustrate gas-retorts grouped in various ways. Fig. 5 is a vertical longitudinal section of the furnace and gas-retorts represented in Fig. 1. Fig. 6 is a horizontal section of the same. Figs. 7, 8, and 9 are sectional views of a steam-boiler furnace.

As represented in Figs. 1 and 5, the fire-chamber of the furnace may be divided into two parts, *a b*, the lower part, *a*, being designated the fuel-chamber or generator, and the upper part, *b*, the combustion-chamber or regenerator.

The fire-chamber of the furnace is formed of stone or masonry, and increases gradually in width from the top toward the bottom. The lower portion of the fire-chamber, however, has its side walls made to slope in an opposite direction from the upper portion, so as to form a long narrow slit, *c*, between said walls. The air or oxygen necessary to support the combustion of the coke or fuel enters through said slit *c*. The gases rising from the fuel-bed encounter a second current of atmospheric air, which enters the openings *d*, passes through the flues *e*, and enters the regenerator or gas-space of the furnace through the openings *f*.

The admission of the air is regulated by the slides *g*, which slide over the openings *d*. The products of combustion leave the furnace through front and rear flues, which are in communication with a smoke-flue, *h*.

As shown in the present instance, the fuel is fed into the furnace from the floor of the retort-house.

The charging-hole is closed by means of a cover, *i*, which is packed by a hydraulic seal. The coke, slag, and ashes, falling through the slit *c* in the bottom of the fuel-chamber, pass onto the auxiliary grate *k*, where the coke is burned. The slag is drawn into the ash-box *b'* by means of a hook, and the ashes also pass into said box through the spaces between the grate-bars.

At the side of the grate *k* are formed two channels or ducts, *n*, which serve for the passage of air to a point above the grate, so that it can enter the fuel-chamber through the slit in the bottom thereof.

The air-channels are formed by building two narrow walls, *m*, on the side supports of the grate, as is shown in Fig. 1.

The furnace heretofore described is specially adapted for heating a series of gas-retorts. Said retorts may number from one to eleven, and are in all instances arranged beneath an arched roof and above a fire.

As shown in the main Fig. 1, the retorts are generally arranged in three vertical rows, and they extend entirely through the retort or receiving chamber, and are embedded in the walls thereof.

When more than eight retorts are used they are grouped together as is shown in Figs. 2, 3, and 4. The middle retort, located nearest to the fire, rests on a longitudinal bearer-bar, *o*, formed of plates and supported on transverse arches *p*.

The operation and advantages of the furnace above described may be briefly stated as follows, viz: The presence of a dense fuel-bed in connection with the air passing through the same will tend to intensify the fire. By dispensing with a grate for the main fire, and using instead the peculiarly-constructed fire-chamber with a slit in the bottom thereof, it is not necessary to use water linings for cooling the grate and ash-box. By making the side and rear walls of the fire-chamber sloping or inclined and stair-shaped, the air will more effectually pass through the fuel-bed than is the case when the walls of the fire-chamber are perpendicular and smooth.

By contracting the lower portion of the fire-chamber the heat is intensified at that point, thus effecting the perfect smelting of the slag to cause the same to run out by itself. The bottom fire on the secondary grate is fed by the small coke falling through the slit in the main fire-chamber. This fire has for its object to utilize the waste coke by burning the same, also to heat the air passing through the slit in the fire-chamber. Another object is to prevent the cooling of the slag passing out through the slit, thus obviating the clogging of the latter. The lateral air-currents, passing up at the sides of the secondary grate, will tend to cool the angles of the stones forming the bottom of the fire-chamber, or the slit therein, thus preventing the melting of the same. The curved shape of the bearer-bar for the central retort will act to deflect the flame of the fire, so that said central retort is not heated to a greater degree than the others. The retorts extend nearly through the rear wall of the retort-chamber, thus increasing the length or capacity of the same.

As represented in Figs. 7 to 9, inclusive, the furnace is of the same construction as that used for heating the gas-retorts. It is used for heating a steam-boiler having two flues, the door for charging the furnace being located higher than usual, so as to have it above the fuel-bed.

I may use my furnace system in connection with evaporating-vessels and ovens of various kinds, the necessary changes in the arrangement of the parts readily suggesting themselves.

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

1. A furnace having a combustion-chamber with inner sloping walls, and a bottom fuel-chamber with oppositely-sloping walls, and provided with a longitudinal bottom slit, as and for the purpose set forth.

2. The grate *k* and lateral converging air-channels *n*, in combination with a furnace-chamber having a bottom slit, as and for the purpose set forth.

3. The bearer-bar *o*, having curved sides, and the arches *p*, in combination with a furnace and a central retort, as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORG LIEGEL.

Witnesses:
GERARD V. NAWROCKI,
HERMANN KREISMANN.