No. 664,526. Patented Dec. 25, 1900.

E. BLASS.

REGENERATIVE HEARTH FURNACE.

(Application filed July 2, 1900.)

(No Model.)

Fig. 1.

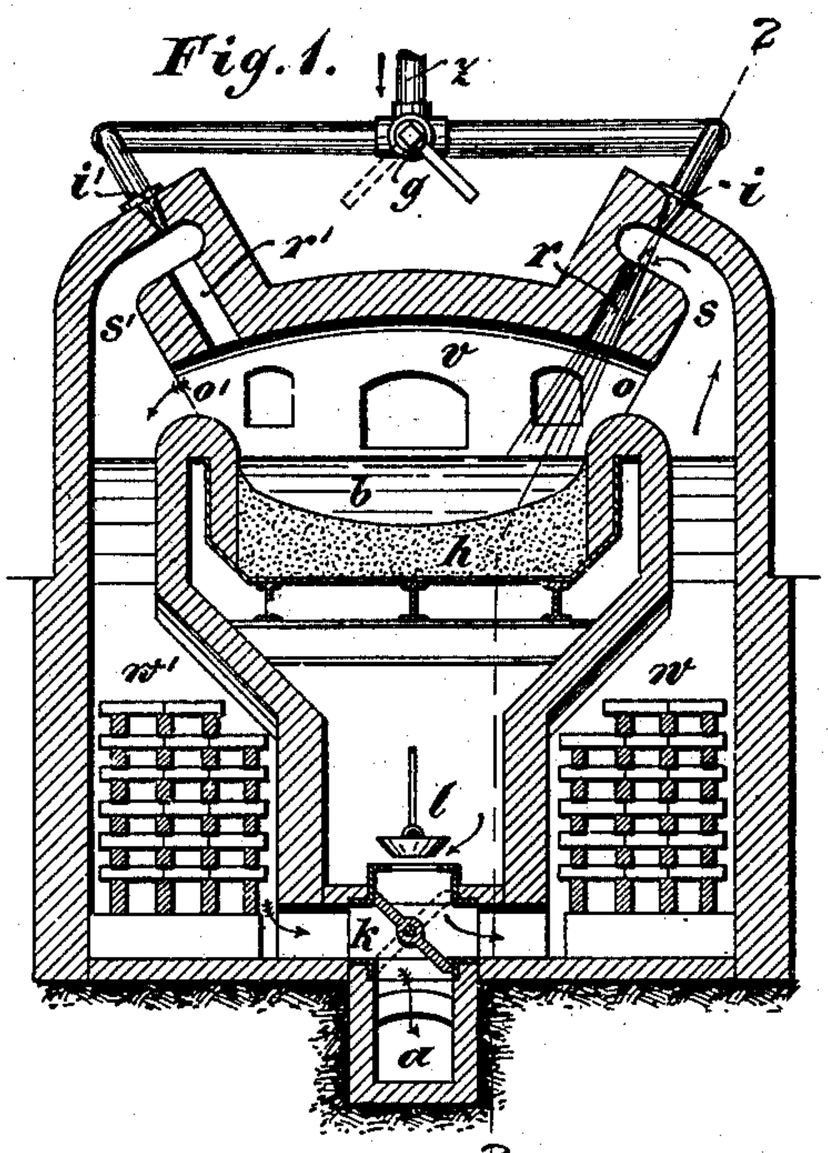


Fig. 2.

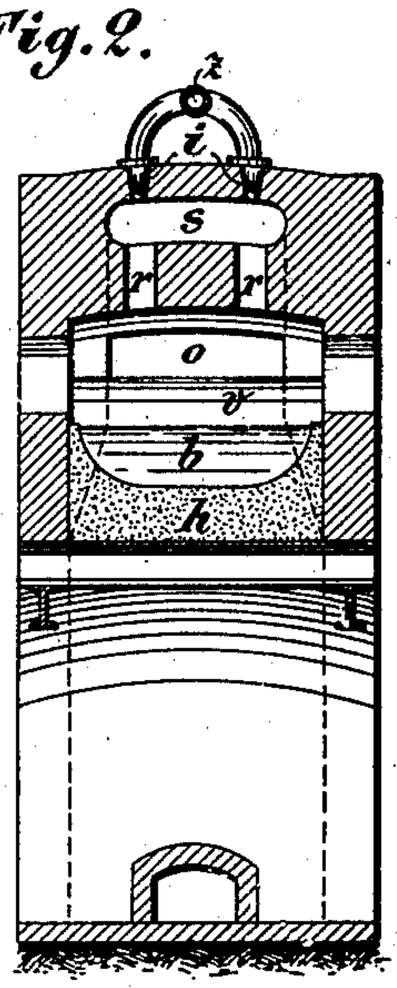


Fig. 3.

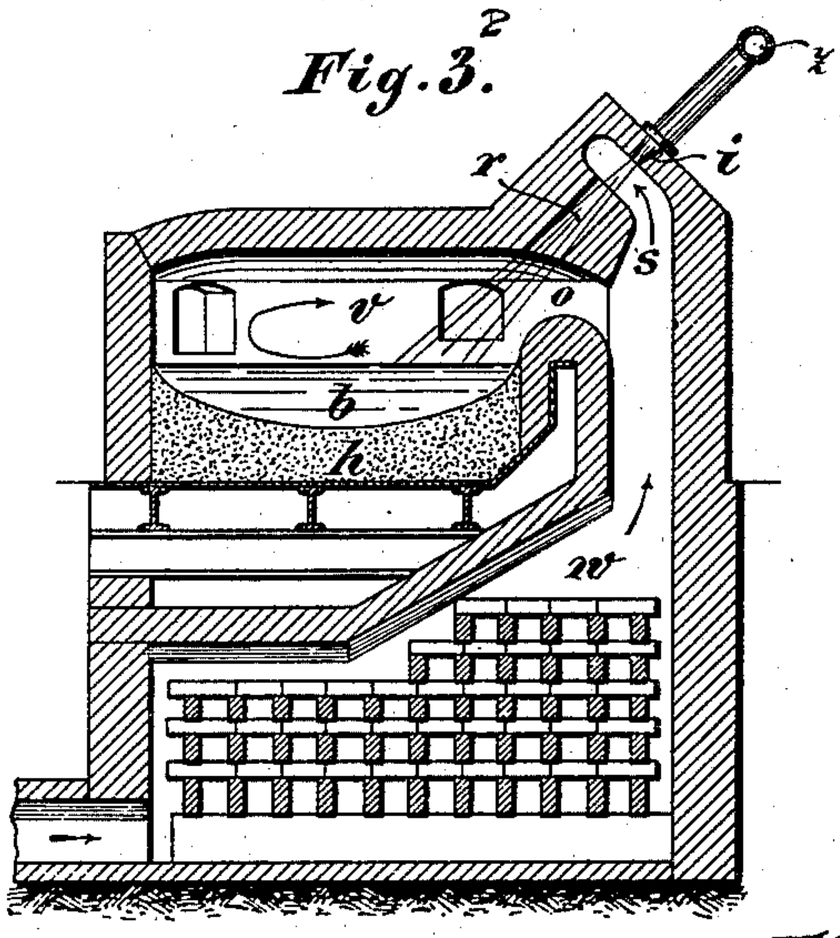


Fig. 4.

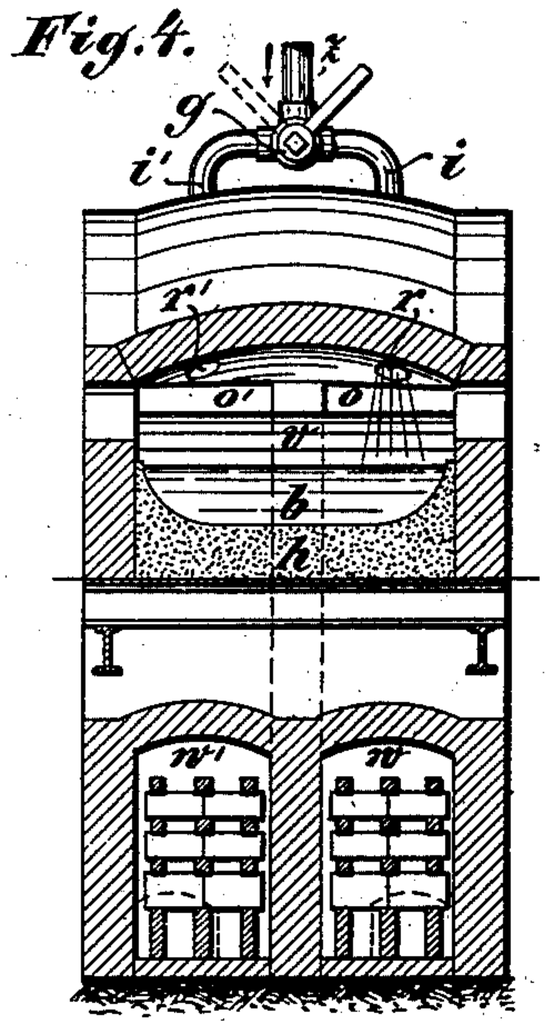
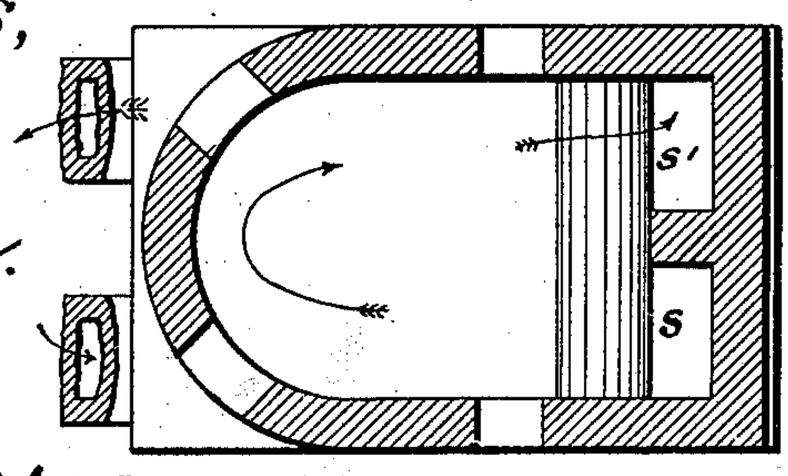


Fig. 5.



Witnesses,

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UNITED STATES PATENT OFFICE.

EDUARD BLASS, OF ESSEN, GERMANY.

REGENERATIVE HEARTH-FURNACE.

SPECIFICATION forming part of Letters Patent No. 664,526, dated December 25, 1900.

Application filed July 2, 1900. Serial No. 22,415. (No model.)

To all whom it may concern:

Be it known that I, EDUARD BLASS, a subject of the King of Prussia, Emperor of Germany, residing at No. 80 Bahnhofstrasse, Essen-on-the-Ruhr, Prussia, German Empire, have invented certain new and useful Improvements in Regenerative Hearth-Furnaces, of which the following is a specification.

My invention relates to improvements in regenerative hearth-furnaces of the Siemens-Martin type, and has for its object certain new arrangements whereby blowpipe-flames of high temperature can be applied in the furnace without damaging the material constituting the walls of the combustion-chamber.

The application of a blowpipe-flame in hearth-furnaces presents many advantages over the combustion with ordinary or free flame. When a blowpipe-flame is used, it is possible to direct the hottest part of the flame on the material to be treated, (steel, glass, &c.,) so that the heat is utilized to the greatest extent possible and the walls of the furnace are preserved from rapid destruction. This permits of high temperatures being used which ordinary regenerative and other furnaces could not resist.

It has not hitherto been possible to apply blowpipe-flames to the regenerative furnaces in which the direction of the flame is alternately reversed. The flame could only be made to pass through the furnace in one direction, and this is the reason why a recuperator has to be used in lieu of the well-known Siemens regenerators when it is desired to heat the air necessary for the combustion by means of the combustion gases that leave the combustion-chamber; but every practical metallurgist avoids as much as possible the application of recuperators, for the reason that they are a frequent cause of interruptions in the working, which arise even at a low temperature and pressure from leakages, while at a higher temperature and pressure they invariably fail to act.

The production of a blowpipe-flame requires that the gas and air that are to be burned in the flame should be both under pressure or that at least one of them be supplied to the blowpipe under pressure. Moreover, it is necessary that the outlet-opening of the blowpipe be of contracted area or else no blowpipe-flame would be produced.

If it were desired to use a blowpipe-flame in connection with the regenerative furnace of the usual type fitted with a reversing-valve for altering the direction of the flame, the gas and air forced by the blowpipe into the furnace through one of its sides would when burned occupy a considerably large volume, and, being compelled to leave the combustion-chamber through the narrow outlet of the blowpipe on the other side of the furnace in order to get into the regenerator, the gaseous products of combustion would not only fill the combustion-chamber at a higher pressure, and thus escape through the joints, but they would also soon burn out the narrow outlet of the blowpipe, and consequently prevent the formation of a blowpipe-flame.

The object of my invention is to remedy these disadvantages and render possible the application of blowpipe-flames to regenerative hearth-furnaces of the Siemens type, in which the direction of the flame is alternately reversed.

For the purpose of rendering my invention more clearly understood I have attached to my present specification two sheets of drawings, in which—

Figure 1 is a longitudinal section of a regenerative furnace constructed according to my invention; Fig. 2, a transverse section of same, while Figs. 3, 4, and 5 are respectively a longitudinal section, a transverse section, and a sectional plan of another form of my invention.

Like letters of reference indicate like parts throughout the drawings.

By means of the construction shown in the drawings it is possible to use blowpipe-flames without foregoing the advantage of the use of Siemens regenerators and alternately-reversed flame. I effect this by providing on each side of the combustion-chamber a special wide opening, through which the products of combustion escape from the said combustion-chamber into the corresponding regenerator.

In Figs. 1 and 2, z is the gas-main, and g a valve.

i i' are gas-injecting nozzles.

h is the hearth which receives the charge b to be smelted or fused, and l the air-valve.

w and *w'* are regenerators, and *s s'* passages, through which the heated air required for the combustion is supplied to the nozzles.

r and *r'* are narrow blowpipe-flame outlets, through which the mixture of air and gas issues into the combustion-chamber.

k is a reversing-valve for altering the direction of the air and combustion gases.

a is a flue for the escape of the combustion gases.

The gas under pressure supplied by main *z* is led, according to the position of valve *g*, to one or the other of the nozzles *i i'* and passes through this into the combustion-chamber *v*. This gas draws in the air required for the combustion, which air enters through the open valve *l* and in the position of the reversing-valve *k* (shown in the drawing Fig. 1) flows through the hot regenerator *w*, whence it reaches the nozzles *i* through passage *s*. The gaseous mixture issuing through the narrow outlet *r* produces on being burned a blowpipe-flame, the hottest zone of which impinges against the material under treatment and imparts to it an intense heat. By the direction given to the blowpipe-flame the gaseous products of combustion are driven toward the opposite wide opening *o'*, through which they leave the combustion chamber or hearth to enter the regenerator *w'*, to which they give off their heat. From there they escape into flue *a*. When the regenerator has taken sufficient heat from the escaping gases, the direction of the flame is reversed in the usual manner.

The openings *o* and *o'* are considerably larger than the blowpipe-flame outlets *r* and *r'*, located above them, this for the purpose to present to the products of combustion an easier way from the combustion-chamber to the regenerator than through the openings *r r'*, which are also open toward the regenerator *w'*. On the valve being reversed to alter the direction of the flame the air heated in regenerator *w'* and flowing toward *s'* can only reach the combustion-chamber through the blowpipe-flame outlet *r'*, although both passages *r'* and *o'* are in communication with said regenerator *w'*. The hot products of combustion leave, therefore, the combustion-chamber rapidly without coming in contact with or damaging the blowpipe.

Another constructional form of my invention (shown in Figs. 3, 4, and 5) differs from that shown in Figs. 1 and 2 in this that the injectors which work alternately are arranged side by side, so that the regenerators can for the purpose of reducing losses of heat be also arranged side by side. This arrangement renders the attendance at the same time more convenient.

The regenerative hearth-furnaces hitherto constructed are heated by producer-gas, the use of which renders it necessary to subject both gas and air to a preliminary heating if the temperature inside the furnace is to be carried as high as 1,600° to 1,800° centigrade. I, however, purpose to employ in my new furnace water-gas, which, even when used in cold state and burned with cold air, gives a temperature of 1,870° centigrade. For this reason I have in the regenerative furnaces shown in the drawings provided regenerators only for the air required for the combustion while the gas is supplied cold to the furnace. The mode of working of the furnace and the construction of the same and its attendance are thereby considerably simplified. I may, however, subject also the gas to a preliminary heating.

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

In a regenerative hearth-furnace the combination, with the hearth, the arch, two regenerators and reversing-valve, of two sets of gas-injecting nozzles arranged in diverging planes above the arch, a narrow blowing-in port for each nozzle located in the arch in axial line with its respective nozzle, hot-air passages leading from the regenerators to the upper orifices of said ports, and separate large exit-openings for the combustion-gases arranged in the side walls below the lower orifices of said ports and communicating with the regenerators, substantially as and for the purpose specified.

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

EDUARD BLASS.

Witnesses:

CARL MARTIN,

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