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R. ZIESING.

REGENERATIVE RETORT FURNACE.

APPLICATION FILED APR. 6, 1906.

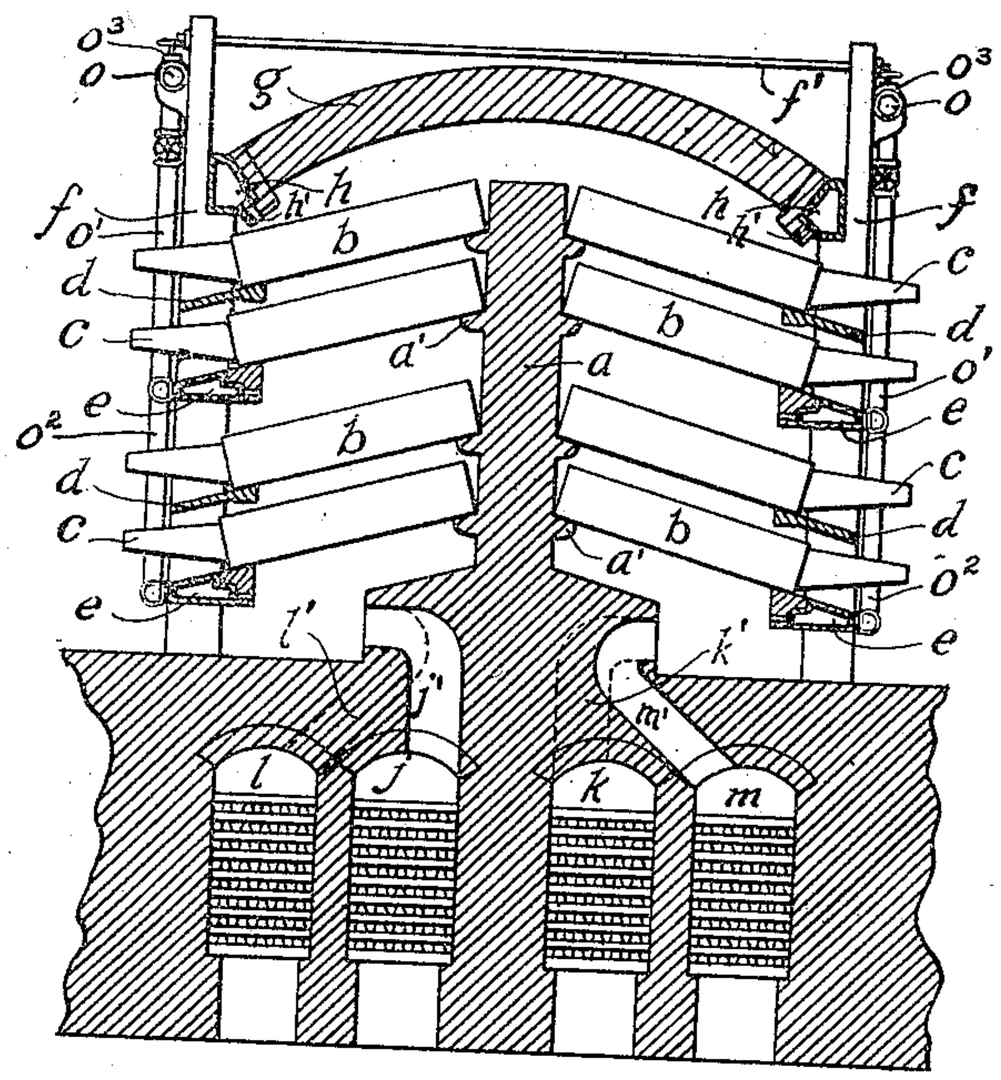

Fig. I.

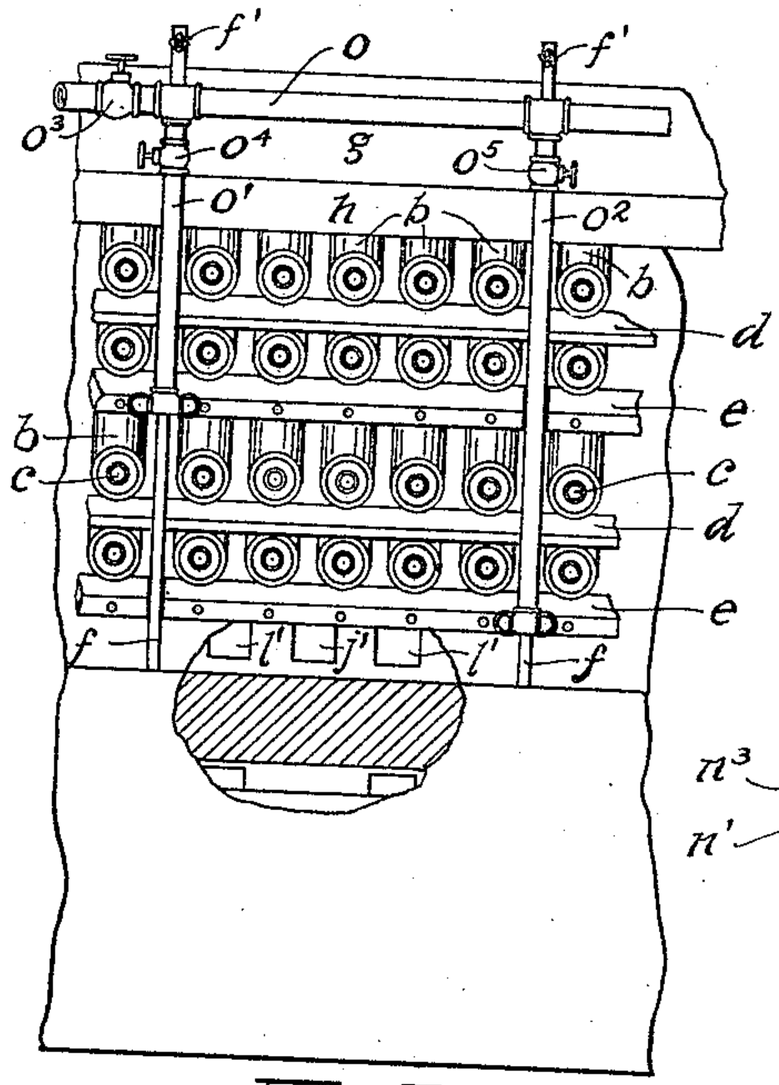

Fig. II.

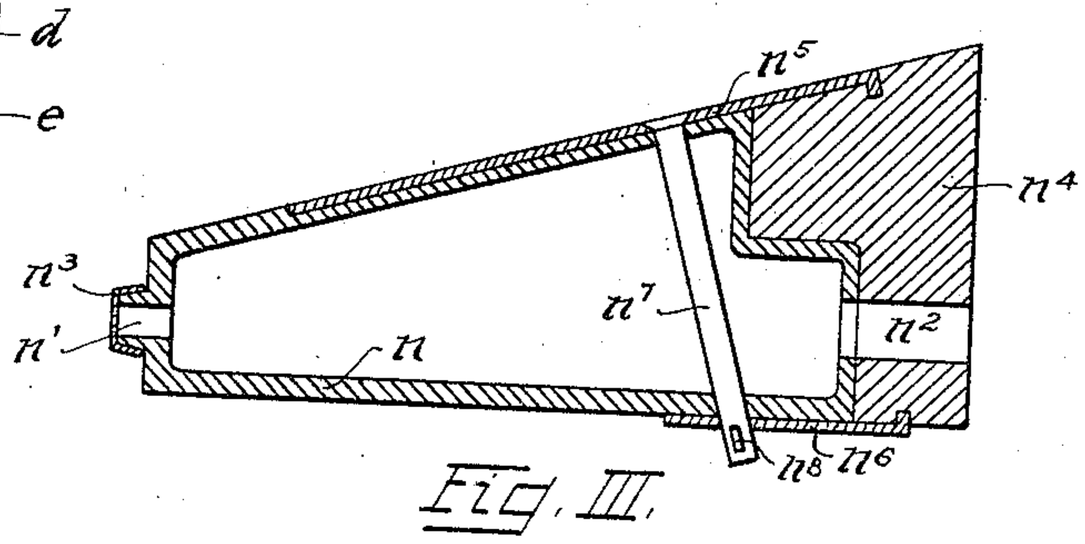

Fig. III.

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UNITED STATES PATENT OFFICE.

RICHARD ZIESING, OF CLEVELAND, OHIO.

REGENERATIVE RETORT-FURNACE.

No. 876,891. Specification of Letters Patent. Patented Jan. 14, 1908.

Application filed April 6, 1906. Serial No. 310,236.

To all whom it may concern:

Be it known that I, RICHARD ZIESING, a citizen of the United States of America, and a resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Regenerative Retort-Furnaces, of which the following is a specification.

My invention relates to improvements in regenerative retort furnaces, and has for its object, the improvement of the well known Siemens regenerative furnace in several particulars, making the same much more economical and efficient in operation.

The furnace herein set forth is particularly adapted for the heating of zinc-distilling retorts, and sufficient details are disclosed to enable one skilled in the art to construct a furnace combining all of my improvements, adapted for this or other uses.

Within recent years, several attempts have been made to improve upon the Siemens furnace, in endeavor to eliminate well recognized undesirable features thereof, and, while this type of furnace has remained largely in use, even as improved, there inhere as well, certain characteristics which I have sought to eliminate in my improved regenerative furnace. Thus, in a furnace of this type, it is highly desirable that an equal heating of the contained retorts shall take place during the operation of the furnace, and preferably such heating should be in a measure controllable. Moreover, the furnace construction should be as simple and strong as possible, to adapt it to the high degree of heat to which it is subjected in use, while conforming generally to the well designed lines of the Siemens furnace.

In providing a distributing air or gas supply throughout the furnace, it should be borne in mind that the portions of the combustion-chamber adjacent to the central wall are subjected to practically no loss of heat by radiation, while the portions adjacent to the outer faces of the furnace, suffer very appreciable loss from this cause. Consequently, in order to obtain a more equal heating of the retorts, it is desirable that the combustion should be augmented near the outer faces of the furnace, rather than near the center wall, as has previously resulted in those types of Siemens furnace seeking to distribute the air or gas supply. My improvements have proceeded upon the lines of supplying air or gas to the furnace, at intervals and adjacent to the outer walls of the furnace, whereby substantial savings are effected in the heating of the retorts, in the time required for completing the treatment of ores, and in damage to the retorts and the furnace from unequal heating. Accordingly, I have retained in my improved furnace, the solid central dividing wall which supports the inner ends of the retort, as opposed to the subdivided or flue-containing central wall, resorted to in other constructions for the purpose of providing a distributive air or gas supply. Again, I have equipped the front of my furnace with an air or gas supply embodied in hollow shelves or transverse passages at the front of the furnace, where they may be readily inspected or given attention, while being entirely out of the way of the workman in charging and discharging the retorts or giving attention to the furnace.

In adopting my improvements, it will be seen that the heat in different sections of the furnace, may be closely and independently regulated, irrespective of the main supply of gas and air reaching the furnace in heated condition from the regenerators.

I shall be able to make the features of my improvements better understood by making reference to the accompanying drawings, wherein are illustrated the several features of one embodiment of my invention; Figure I., thereof, showing in transverse section, a regenerative furnace equipped with my improvements. Fig. II., is a front or face view of one section thereof, and portions of adjacent sections; and, Fig. III., is a cross sectional view on an enlarged scale, of the hollow shelf or duct at the front of the furnace, adapted to supply air or gas at different levels thereof to equalize the combustion and heat in the furnace.

In each of the several figures, I have employed the same character of reference to indicate similar parts, that confusion may be avoided.

In the drawings above described, I have shown the essential or distinguishing features of a small regenerative retort furnace, taking only four rows of retorts, arranged in sections embracing five retorts in each row, or twenty retorts. A central well divides the furnace into longitudinal symmetrical portions, be-

neath each of which are the regenerative passages or chambers for heating and extracting heat from the gas and air, as will be well understood by those acquainted with the Siemens furnace.

Refering to Fig. I., the central wall *a*, of fire brick, is provided with supports or ledges *a'*, for carrying the inner ends of the retorts *b*, equipped outwardly with the usual condensers *c*, and carried at their outer ends by the usual supports or shelves *d*, or by the hollow shelves *e*, provided in accordance with my improvement. Buckstaves *f*, united by tie-rods *f'*, sustain the outer portion of the structure and carry the arch or roof *g* upon hollow cast iron skewbacks *h*. Beneath the floor of the furnace are provided the gas regenerative chambers *j*. *k*. and the air regenerative chambers *l*. *m*. Ducts *j'*. *k'*. *l'*. *m'*., as indicated, respectively leading into the combustion-chambers of the furnace, through the bottom ports, as shown in the central broken away portion of Fig. II, serve to convey the initial supply of gas and air to and from the regenerative chambers. Along the upper portions of the buckstaves, are carried supply pipes *o*, which form part of the distributing system from a fan-blower adapted to furnish air under moderate pressure to the pipes, the transverse ducts, and ultimately to the combustion-chambers of the furnace. These supply pipes in the type shown, are provided with shorter branches *o'*, connecting with the upper hollow shelves for the retorts in two adjacent sections, and with longer branches o^2, connecting with the lowermost hollow shelf of two adjacent sections, all as best shown in Fig. II. Suitable valves o^3, o^4, and o^5, are provided for controlling the flow of air to such hollow distributing shelves. By this arrangement, it is seen that the air supply beneath each two adjacent sections of the two upper or lower tiers of retorts may be regulated as required, in order to secure the best operation of the furnace. In addition to the above, the hollow skewbacks *h* are provided with vents *h'*, and are connected with the source of supply, whereby air may alternatively be injected into the furnace at these points. Thus, during the operation of the furnace, assuming that the reversing valve, (not shown) is turned to supply air and gas from the regenerative chambers *j l*, the air supply beneath the retorts upon the left hand side of the center wall would be maintained from its two hollow shelves; and from the skewback *h*, and the uppermost of the two hollow shelves upon the right hand side of the furnace, thus facilitating combustion of the gas adjacent to each two of the tiers of retorts. The exhausted products of combustion, it will be understood, are withdrawn through the checkerwork of the regenerative chambers *k*. *m*., beneath the right hand side of the furnace, which chambers are thus heated previous to reversing the direction of flow of the air and gas, precisely as in the ordinary type of Siemens furnace.

In the operation, as described, the full supply of gas is admitted from the gas regenerator *j* upon the left, while a restricting supply of air is furnished direct from the corresponding regenerator *l*. The additional air supply furnished from the several shelves and the skewback, obviously serves to augment the combustion at the several intervals of air supply throughout the furnace; the intention being to completely consume all gases within the combustion-chamber upon the right. As a precautionary measure, however, the lowermost shelf upon the right hand side may be used to furnish a very limited supply of air, sufficient to finally consume any unburned gases.

In Fig. III., I have exhibited an enlarged detail of one type of hollow shelf which is made up of a hollow iron casting *n*, having a series of oppositely positioned nipples *n'* and vents or openings n^2, the latter of which in practice are positioned beneath the respective retorts. The nipple is closed by a conical sheet iron cup n^3, while the vent is extended by means of an angular and specially molded fire-brick facing n^4, held in place by means of upper and lower clamping plates n^5, n^6, which in turn are secured to the casting by means of the cross bolt and wedge n^7, n^8.

By reason of the feàtures of construction above set forth, I am enabled to build my improved furnace of any desired workable height, since with the means provided, I am enabled to secure an even heating of the contained retorts, although six or more tiers be employed upon either side of the furnace. The gas supply is such that although the entire amount is introduced beneath the lowermost tier of retorts, only enough air is admitted to bring such retorts to the required temperature, and in consequence little or no difference in heat occurs throughout the furnace, and the bottom rows of retorts are not subject to rapid deterioration, as in the original Siemens furnace. The initial combustion beneath the lowermost row of retorts is regulated so that the volumes of gases supplied from the regenerators, are sufficiently heated to distil the zinc, and the augmented air supply furnished at proper intervals by the several ducts, serves to maintain the initial temperature throughout the combustion-chambers.

The air supply preferably is forced by the fan-blower through a chamber suitably heated by the products of combustion and which may well be positioned adjacent to the chimney stack; and, although in describing my improvements, I have spoken of the distributive supply of air to my furnace, I wish it to be understood that gas may be furnished instead, if desired, through the

system of piping and the hollow shelves or transverse ducts. In such case, the initial supply of gas would be restricted, while the full supply of air would be furnished through the ports leading from the regenerative chamber.

It will be appreciated that this distributive air or gas supply throughout the front or outer portions of the combustion-chambers, may be accomplished by other means than those specifically set forth above in the preferred and most convenient form. Distinctive and important advantages attained by thus disposing the apparatus for furnishing the supplementary air or gas supply at the outer portions of the furnace, are the reduction in radiation, and the notable ease with which this apparatus may be inspected, repaired and regulated. While I have, moreover, explained in some detail, certain features of my furnace adapted for the distillation of zinc, which contains the several features of my invention, I may say that these details are not necessarily linked with the real improvements, which I have made in this type of furnace, and, accordingly, I wish to claim the same, with such modifications as may be made by those ordinarily skilled in the art.

1. In a furnace of the class described, the combination with regenerative chambers positioned upon either side of a center-wall, of combustion-chambers positioned above the latter and communicating with each other, and a distributing system for a gaseous medium positioned at the front or outer faces of the furnace, whereby combustion is augmented at intervals adjacent to the contents of the combustion-chambers, substantially as set forth.

2. In a regenerative retort furnace, the combination with combustion-chambers, of regenerators disposed beneath said chambers, a center-wall dividing the said regenerators and combustion-chambers but affording communication therebetween, and a distributing system associated with the front or outer faces of the combustion-chambers and adapted to supply a gaseous medium at intervals to the contents thereof, whereby gradual combustion is secured and the heating is equalized, substantially as set forth.

3. In a regenerative retort furnace, the combination with a system of regenerative chambers, of combustion-chambers connected therewith and with each other, adapted to receive the retorts under treatment, transverse ducts positioned at the front of the furnace at intervals between such retorts, and a distributing system connected therewith adapted to supply a gaseous medium for furthering combustion adjacent to the outer faces of the furnace, substantially as set forth.

4. In an improved Siemens furnace, the combination with a system of regenerative chambers, of combustion-chambers connected therewith and with each other, adapted to receive the retorts under treatment, a center-wall dividing said chambers except at the upper portion of the furnace, hollow shelves extending transversely along the outer faces of the combustion-chambers, and a distributing system of piping connected therewith and adapted to supply a gaseous medium for furthering combustion at intervals throughout the contents of the furnace, substantially as set forth.

5. In a regenerative retort furnace, the combination with combustion chambers, of a center-wall separating them except at the upper portion of the furnace, regenerators positioned beneath each of said combustion chambers and respectively communicating therewith, transverse ducts positioned along the outer or front faces of said combustion-chambers, and means for supplying therethrough to the outer portions of said combustion-chambers, a suitable gaseous medium for furthering combustion, substantially as set forth.

6. In a regenerative retort furnace, the combination with combustion-chambers, of a center-wall separating them except at the upper portion of the furnace, regenerators positioned beneath each of said combustion-chambers and respectively communicating therewith, hollow shelves disposed at intervals along the front or outer faces of the combustion-chambers for partially supporting the contents thereof, and a system of piping connected therewith and adapted to supply through said shelves, a gaseous medium for furthering and equalizing the combustion in said chambers, substantially as set forth.

7. In a regenerative retort furnace, the combination with combustion-chambers, of a center-wall separating them except at the upper portion of the furnace, regenerators positioned beneath each of said combustion-chambers and respectively communicating therewith, hollow shelves disposed at intervals along the front or outer faces of the combustion-chambers for partially supporting the contents thereof, hollow skewbacks adjacent to the arch of the furnace, and means for supplying through said shelves and skewbacks, a suitable gaseous medium for furthering and equalizing combustion within the retort chambers of the furnace, substantially as set forth.

8. In a furnace for the treatment of zinc and other ores, the combination with two adjacent and communicating combustion-chambers, of a center-wall partially dividing them, means for supplying gaseous fuel and air to the lower portion of one of said combustion-chambers, and means for withdrawing the products of combustion from the lower portion of the other combustion-cham-

ber, air passages or ducts positioned at intervals in the front or outer faces of said combustion-chambers, and means for supplying therethrough a suitable gaseous medium for furthering combustion and equalizing the heat throughout the contents of the combustion-chambers, substantially as set forth.

9. In a furnace of the class described, the combination with two adjacent combustion-chambers, of a center-wall separating the same except at their upper portions, means for supplying gaseous fuel and air and for withdrawing the products of combustion, respectively associated with the lower portions of said combustion-chambers, hollow shelves or ducts disposed at intervals along the front or outer faces of the combustion-chambers, and suitable means for directing a gaseous medium through the latter to augment combustion and equalize the heat throughout the interiors of said combustion-chambers, substantially as set forth.

Signed at Cleveland, this 3rd day of April, 1906, in the presence of two subscribing witnesses.

RICHARD ZIESING.

Witnesses:
JOHN F. MCDONNELL,
ALBERT LYNN LAWRENCE.