June 19, 1928.

1,674,167

A. G. EGLER

FURNACE

Filed Oct. 25, 1926

2 Sheets-Sheet 1

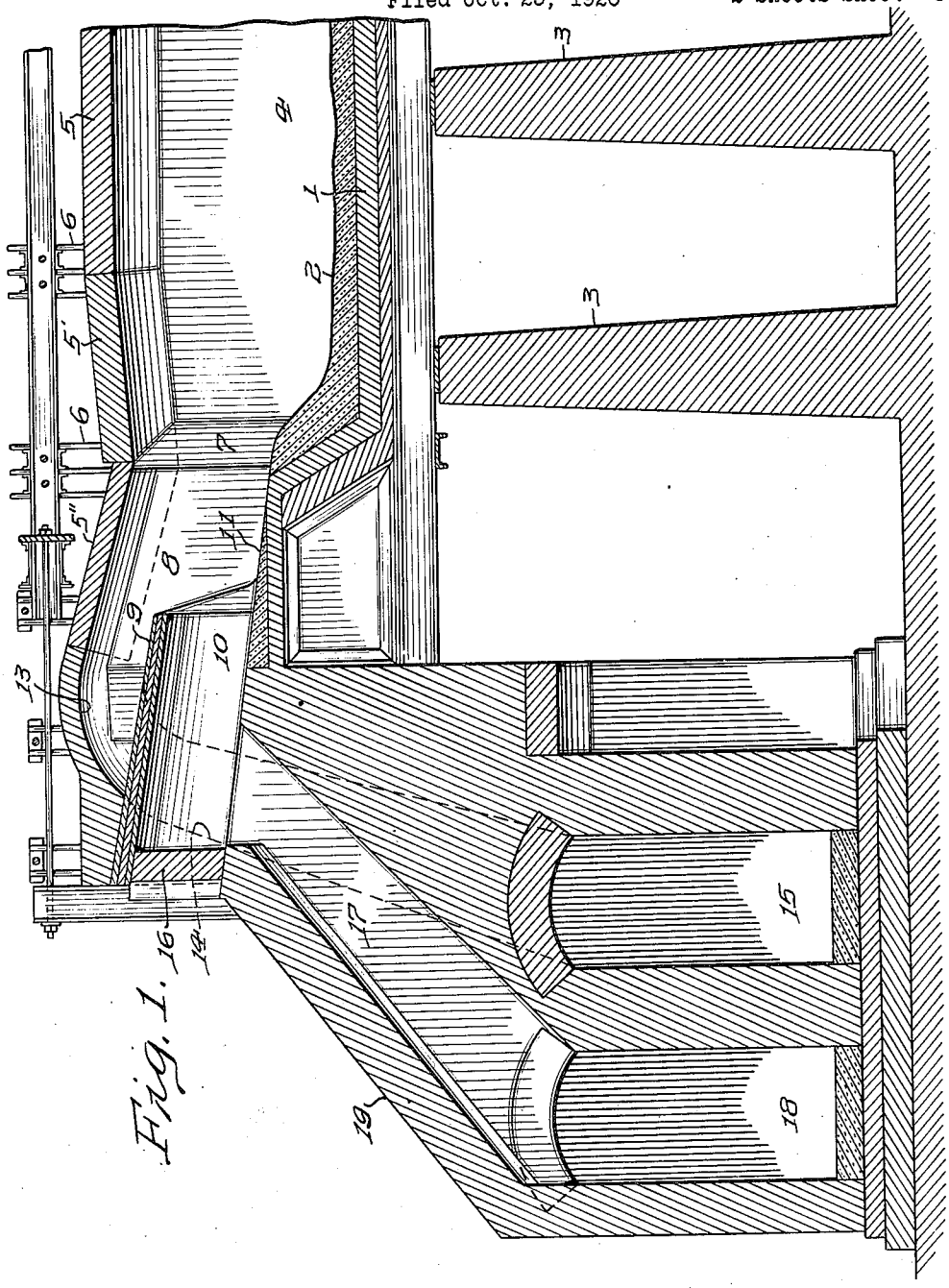


Fig. 1.

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Fig. 2.

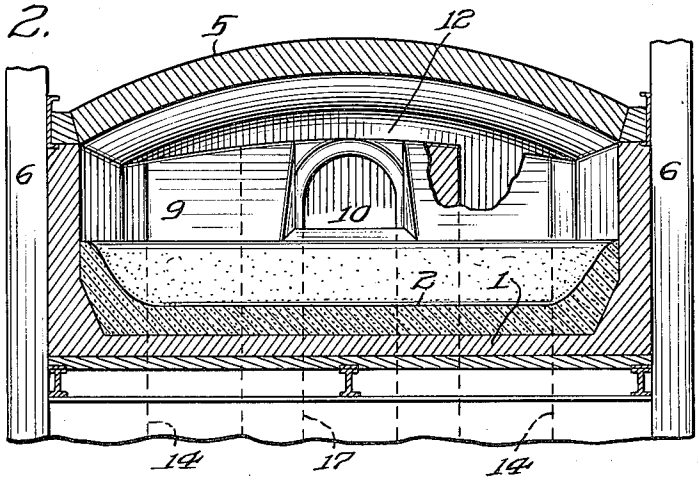
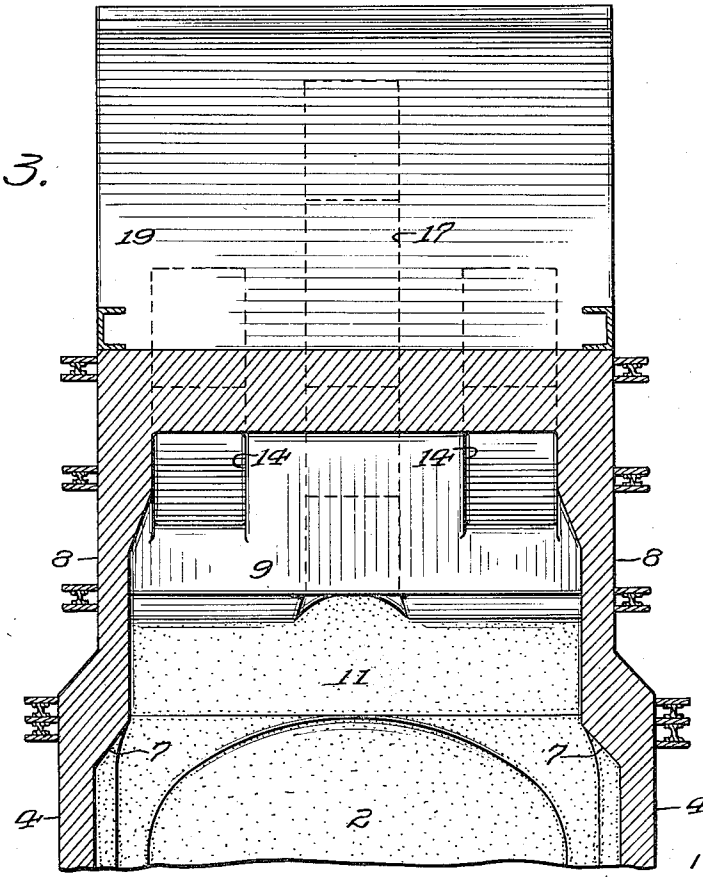


Fig. 3.



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UNITED STATES PATENT OFFICE.

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FURNACE.

Application filed October 25, 1926. Serial No. 143,927.

My invention relates more particularly to regenerative open hearth furnaces, the principal object of the invention being to prolong the life of the furnace by increasing the length of time during which the end walls will remain in serviceable condition. In consequence, by the use of my invention the productive capacity of the furnace over a given period is raised by increasing the length of time between the intervals at which the furnace must be shut down for end wall repair or replacement with consequent lessening of the number of days it must remain idle for that purpose, while the actual cost of operation is materially reduced by reason of the greater length of service obtained from the materials of which the end walls are constructed, and by lessening the labor cost involved in keeping the end walls in serviceable condition.

My invention further includes other objects, advantages and novel features of design, construction and arrangement hereinafter more definitely mentioned or which will be apparent from the following description of one form of my invention as embodied in a regenerative open hearth furnace.

As hitherto constructed regenerative open hearth furnaces have been provided with vertical end walls and vertically extending air and gas uptakes, that is, uptakes extending at right angles to the horizontally disposed furnace hearth, these uptakes serving, during the operation of the furnace, to convey the air and gas from one side of the regenerators to a point adjacent one end of the hearth and to convey the hot spent gases from the other end of the hearth to the other side of the regenerators. By reason of the disposition of the uptakes to which I have referred these gases when the furnace is in operation are caused to impinge directly on the inner face of the furnace end wall which forms the rear of the uptakes while substantially at the same point the current of hot gases is abruptly diverted from a substantially horizontal or slightly angularly upward course to a downwardly vertical one with the result that the furnace end wall is burned out and destroyed within a relatively short time. As the hot gases are alternately discharged through the uptakes at the opposite ends of the furnace during the operation of the latter, both of the end walls are substantially equally affected.

Considered in its broader aspects my invention contemplates an angular disposition of the furnace end walls and uptakes with respect to the hearth in such manner that the burning gases instead of striking the end walls at substantially right angles will strike said walls at a more or less acute angle and be deflected angularly downward through the uptakes with the result that the erosion and burning out of the end walls is materially lessened.

To enable those skilled in the art to readily comprehend and practise the invention I have therefore illustrated in the accompanying drawings and will now proceed to describe such portions of a regenerative open hearth furnace constructed in accordance with one embodiment of my invention as are requisite for that purpose, Fig. 1 being a vertical central longitudinal section through one end of the furnace; Fig. 2 a fragmentary transverse vertical section through the hearth, and Fig. 3 a fragmentary horizontal section on a plane just under the furnace roof. Like symbols are used to designate the same parts in the several figures.

As my invention readily lends itself to employment in furnaces of various types and as the particular details of open hearth furnace construction vary widely in accordance with the practice in different plants, I have shown the furnace in the said drawings, in a more or less conventional or typical manner; furthermore, as the principal parts of open hearth furnaces are well known and understood, extended description thereof would be superfluous.

Thus, as illustrated, the furnace comprises a horizontally disposed hearth 1 of refractory material having the usual lining 2 of dolomite or the like and supported on piers 3, the side walls 4 adjacent the hearth and arched roof 5 thereover, the side walls being supported by buckstays 6. The end portion of the roof over the hearth may be inclined slightly downwardly as at 5′ and the side walls narrowed in slightly adjacent the extremity thereof as at 7 and thence prolonged rearwardly in parallel relation as at 8 beyond the end of the hearth and connected by a corresponding prolongation 5″ of the room. In the rear of the earth between the walls 8 a transversely extending bridge wall 9 is arranged in the usual way, this wall being pro-

vided at its center with a gas port 10; the front face of the bridge wall is spaced rearwardly from the end of the hearth proper and connected therewith by an inclined surface 11 and as the bridge wall is terminated below the adjacent portion of the furnace roof a space or port 12 is left between the upper surface of the wall and the under surface of the roof through which the air from the air uptakes can pass into the furnace at one end and through which a part of the spent gases can pass away from the hearth at the opposite end. The arrangement of the several parts to which reference has just been made is substantially in accordance with the usual practice in open hearth furnace construction.

That portion of the furnace roof lying above the surface 11 and the bridge wall I have designated generally as 5″ and I prefer to form the same so that it will incline slightly angularly upward from its forward end near the end of the hearth to a point over the bridge wall and thence, on its under face or surface, curve downwardly and rearwardly as at 13 so that the burning gases in their passage from the hearth, or at least that portion of the gases which escape through the air uptakes will be first directed upwardly over the bridge wall and thence deflected downwardly through contact with the surface 13 into the air uptakes 14 of which I have shown two, one on each side of the furnace, these uptakes being rearwardly and downwardly inclined to their point of connection with the usual passage 15 leading to the regenerator which, in accordance with the usual practice, is disposed below the hearth. While I have shown two air uptakes respectively disposed on opposite sides of the gas uptake, the precise number employed is, of course, a matter of choice.

In like manner the gas port 10 in the bridge wall may be inclined slightly upwardly from its forward end and closed at its rearmost extremity with brick work 16, and from a point adjacent the rear end of this port the gas uptake 17 is extended downwardly and rearwardly to connect with the usual passage 18 leading to the gas regenerator, the end wall 19 of the furnace which forms the back of the uptakes being correspondingly downwardly and rearwardly inclined.

In the particular embodiment of the invention shown in the drawings, the air uptakes 14 are somewhat less inclined to the vertical than the gas uptake 17 and this is a convenient construction in that it permits the passages 14 and 18 leading to the regenerators to be arranged one in advance of the other as shown in Fig. 1. However, the precise relative angular inclination of the air and gas uptakes is a matter of choice as well as the angular inclination of each uptake so long as the uptakes are arranged at a sufficient angle to lead the burning gases away from the furnace in a fairly easy sweep and prevent the gases from impinging on the inner faces of the end walls substantially at right angles thereto with consequent abrupt alteration in the course of the gases.

It will of course be apparent that ordinarily the inclination of the end walls and uptakes in a furnace constructed in accordance with my invention will somewhat increase the overall length of the furnace beyond that of a furnace having an equal length of hearth but constructed with vertical end walls so that a little more room is usually required for the installation of the former than the latter and perhaps a slightly greater amount of brick work, but these disadvantages, if such they may be so termed, are substantially negligible when contrasted with the reduction in operating costs over a given period of furnace operation arising from the use of the invention both in the actual cost in material and labor required for repair or replacement of the end walls and, what is usually more important, in the reduction in the number of days which the furnace must be kept idle in order to effect them.

It will of course be understood that while in the drawings forming a part of this application I have shown but one end of the furnace, the opposite end thereof is preferably similarly constructed, and furthermore that while the invention particularly lends itself to employment in regenerative open hearth furnaces, it may be utilized with equal facility in furnaces of other types. Moreover, it is to be understood that I do not in any manner limit or confine myself to the precise embodiment of the invention I have herein illustrated and described to enable those skilled in the art to comprehend and practise the invention, as numerous changes and modifications may be made in the design, construction and arrangement of structural details and the like and the disposition and angular inclination of the end walls and uptakes varied if desired without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States:

1. An open hearth furnace having a hearth, a bridge wall adjacent each end of the hearth, a gas port in each bridge wall, an end wall sloping outwardly and downwardly from a point in the rear of each bridge wall, and an air and a gas uptake respectively housed in each end wall and outwardly and downwardly inclined in substantial correspondence therewith, the upper end of each gas uptake communicating with

the adjacent gas port and the upper end of each air uptake communicating with the interior of the furnace at the top of the adjacent bridge wall.

2. An open hearth furnace having the inner surface of each of its end walls sloped downwardly and outward to form the rear surface of outwardly and downwardly inclined uptakes adjacent each of said walls whereby the burning gases in their passage from the furnace hearth will be caused to impinge against said walls at an acute angle and be diverted into said uptakes without an abrupt change of direction.

3. An open hearth furnace having a bridge wall adjacent each end of its hearth, a roof over the hearth prolonged in each direction so as to overlie said bridge walls, the under face of said roof in the vicinity of each bridge wall being downwardly and outwardly sloped away from the hearth, outwardly and downwardly sloping end walls, and uptakes housed in said walls and terminating adjacent the sloped portion of the roof whereby the burning gases in their passage from the hearth will be deflected by said sloped under surface into said inclined uptakes.

In witness whereof, I have hereunto set my hand this 4th day of October, 1926.

ANDREW G. EGLER.