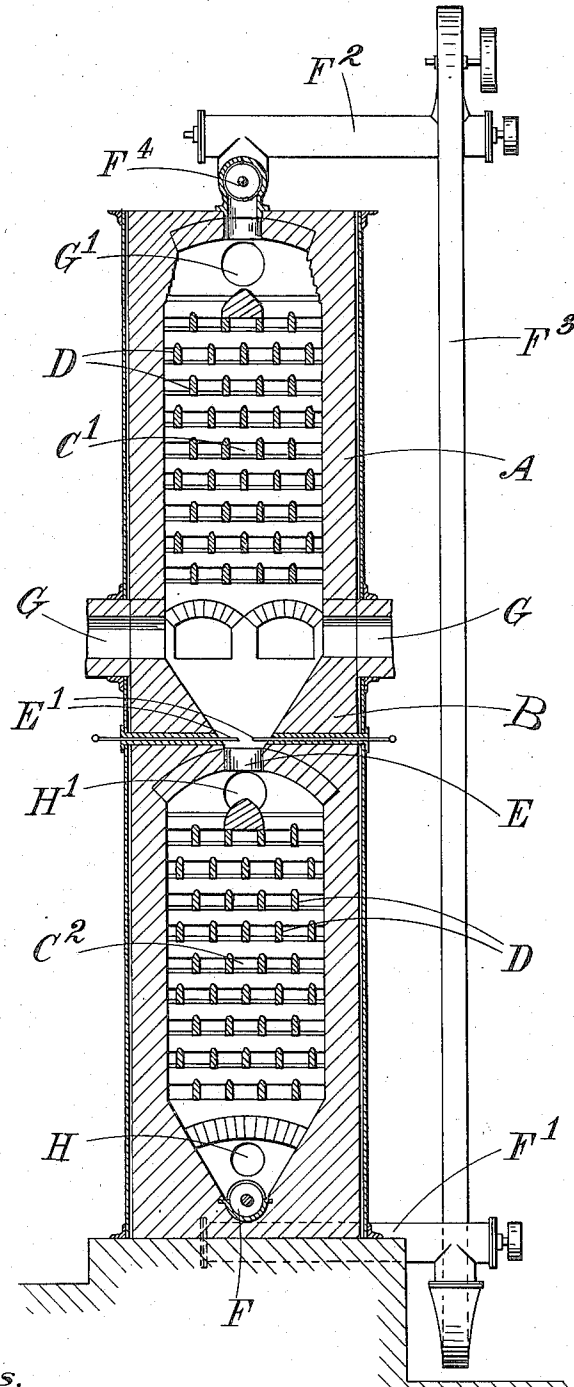


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 FURNACE FOR HEATING GASES OR THE LIKE.
 APPLICATION FILED MAY 18, 1914.

1,148,331.

Patented July 27, 1915.



Witnesses.

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UNITED STATES PATENT OFFICE.

CARL MARTIN TAGE OLSSON, OF SALTSJÖBADEN, SWEDEN.

FURNACE FOR HEATING GASES OR THE LIKE.

1,148,331.

Specification of Letters Patent.

Patented July 27, 1915.

Application filed May 18, 1914. Serial No. 839,254.

To all whom it may concern:

Be it known that I, CARL MARTIN TAGE OLSSON, a subject of the King of Sweden, residing in the municipality of Saltsjöbaden, Sweden, have invented certain new and useful Improvements in Furnaces for Heating Gases or the like, of which the following is a specification.

This invention is for improvements in or relating to furnaces for heating gases and the like of the type in which the gases are passed through a stream of hot solid bodies, for example particles of sand and are heated thereby.

It has previously been proposed to heat air or other gases by passing it through a chamber provided with horizontal partitions and channels in the walls of the chamber providing communication from one side of each partition to the other, the air being passed horizontally between each pair of partitions in turn; the partitions were perforated and hot sand was fed through the various partitions thus passing transversely across the flow of air to be heated. It has also been proposed to recover heat that would otherwise be wasted, in calcining ores or burning cement by imparting it to the air supplied to the combustion chamber.

The apparatus for this purpose comprised a slightly inclined rotating drum communicating with a shaft at the lower end and a furnace at the upper end. Air and gas were fed into the shaft and, burning in the drum, passed out by the furnace. The material being treated was fed into the furnace and through the drum into the shaft; it absorbed heat from the hot products of combustion in the furnace and from the flame in the drum, and gave up some heat to the air or gas in the shaft prior to its being burnt; it will be seen that with this apparatus the air or gas is only heated on its way to the combustion chamber of the same apparatus, whereas the present invention provides for heating gases which may then be drawn off hot and used for any other purpose.

According to the present invention apparatus for heating gases comprises a chamber, means for continuously feeding a stream of solid bodies into the top of it whence they fall to the bottom, means for supplying a continuous flow of hot gases to the bottom of the chamber and drawing them off at the top, a second chamber situated at a lower

level than the first, a conduit conducting the stream of hot solid bodies from the bottom of the first chamber to the top of the second chamber so that it can fall to the bottom, and means for supplying a continuous flow of the gases to be heated to the bottom of the second chamber and means for drawing such gases off at the top.

A hopper or receptacle may be provided between the upper and lower chambers to intercept the flow of the sand or the like in its passage into the lower chamber, and its delivery end is so dimensioned relatively to the flow of the sand that the hopper is maintained partially filled with sand during the operation of the furnace and constitutes a seal against the escape of gas there-through; this hopper may be provided with valves for regulating the flow of the sand through it so that when starting the apparatus the outlet can be closed to allow the hopper to be filled, the rate of the inflow and outflow of sand being maintained equal.

The accompanying drawing is an elevation in section of a furnace in accordance with the present invention.

The furnace comprises a vertical shaft or tower A, divided by a partition B into upper and lower chambers C¹ C². Each of these chambers is provided with a checker work of bricks D by which the fall of sand through the chambers is to a certain extent impeded. These bricks are tapered on their upper side so that no resting place is provided on which sand could lodge or collect.

In the partition B there is provided an opening E in the form of a hopper, the upper end of the opening E extending to the full dimensions of the chamber C¹ and the lower end of it being suitably restricted to allow the correct quantity of flow of sand through the furnace. A valve E¹ may be provided within the hopper E to control the rate of flow of sand through it if it is so desired.

The chamber C² has the bottom tapered and a screw conveyer F is disposed at the bottom. Other conveyers F¹ F² and an elevator F³ convey the sand to the top of the chamber C¹ again into which it is fed and distributed by a screw conveyer F⁴. It will be seen that by this arrangement the sand in the furnace is in constant circulation and a uniform rate of flow is maintained. If it is desired to change this rate of flow, the

speed of the conveyers and elevator is adjusted as required and the opening in the hopper E is simultaneously adjusted.

While the sand is passing through the chamber C¹ it is heated by hot gases entering by passages G at the bottom of this chamber, these gases being any suitable hot products of combustion. These gases pass upward through the chamber C¹, giving up their heat to the sand falling downward and they are discharged, when cooled, by the outlet G¹, at the top of the chamber C¹.

The air or gas which is to be heated is introduced at the bottom of the chamber C², by a passage H and it passes upward absorbing heat from the hot sand which is falling downward. When fully heated it is withdrawn by the passage H¹, at the top of the chamber C².

As mentioned above the hopper E is so designed that a quantity of sand is maintained in it thereby providing a seal between the upper and lower chambers C¹ C² so that there is no fear of the gases becoming intermixed.

The furnace may be lined with suitable heat conserving material and it will be appreciated that the construction hereinbefore described offers particular advantages in that there is little loss of heat in the transference of the sand from the chamber in which it is heated to the chamber in which it is to give up its heat; this saving becomes of more importance as the range of temperature of the sand is increased.

The sand used in this furnace must be able to withstand the temperature of the furnace without caking and also it must not be subject to chemical action by the hot gases. Ordinary or silica sand may be suitable in most cases but if they are unsuitable, products of the electric furnace, such as carborundum, silundum, alundum or the like may be employed, these materials being of course pulverized or ground to provide particles of a suitable size.

Various modifications may be made in the general arrangement of such furnaces according to this invention. Thus for example the sand may be heated by waste gas from another furnace or fuel may be burned with air at the lower part of the chamber C¹ to provide heat for the sand; if gaseous or liquid fuel is used a separate combustion chamber may be employed to insure that the

flame attains its maximum temperature before it comes into contact with the sand.

This apparatus may be used for heating air or gas for any purpose, thus in a process for the direct reduction of iron ore by a reducing gas, this gas may be conveniently raised to any desired temperature by this apparatus. The gases passing off by the outlet G¹ may, if all the heat has not been abstracted, be used for various purposes, such as heating water, or heating air supplied to other furnaces for combustion, but these do not constitute part of the present invention.

It has heretofore been proposed in the manufacture of iron to allow the ore to fall through a tower, in the upper part of which it is heated and in the lower part of which it is subjected to a reducing gas to deoxidize the ore but the present invention has for its object to provide an improved form of furnace for heating air or other gases which may subsequently be applied to any desired purpose being if necessary uncontaminated with any products of combustion.

What I claim as my invention and desire to secure by Letters Patent is:—

In apparatus for heating gases the combination of a chamber, a conduit for supplying a continuous flow of hot gases to the bottom of said chamber and a conduit for drawing off these gases from the top, means for supplying a constant stream of solid bodies such as sand to the top of said chamber, a second chamber situated at a lower level than the first chamber, a conduit for supplying a continuous flow of gases to be heated to the bottom of said second chamber, a conduit for drawing them off at the top thereof, a hopper in the bottom of the first chamber having a discharge opening into the top of the second chamber, a valve in said hopper controlling the flow of the solid bodies from the first chamber to the second chamber and constituting with them a seal against the escape of gas through the hopper, substantially as set forth.

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

CARL MARTIN TAGE OLSSON.

Witnesses:

LESLIE GEORGE EVES,
H. D. JAMESON.