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DEVICE FOR LOCALIZING RAPID VARIATIONS OF TEMPERATURE AT PREDETERMINED POINTS IN TUNNEL TYPE KILNS, PARTICULARLY IN KILNS FOR THE FIRING OF CERAMIC PRODUCTS

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Fig.3

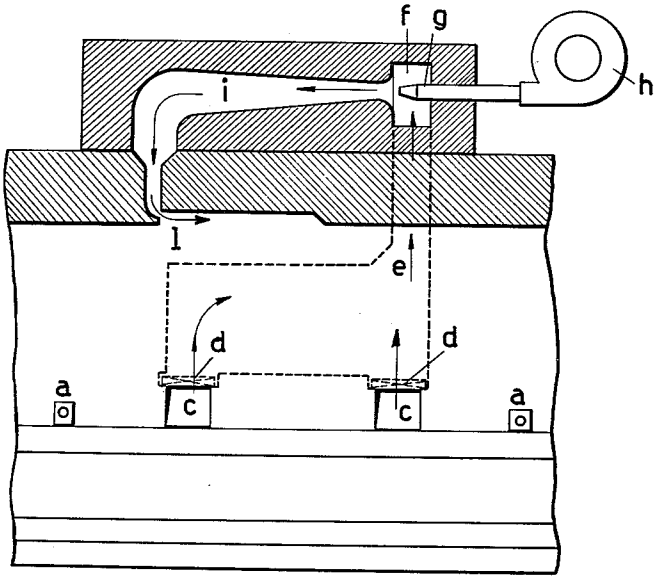


Fig.1

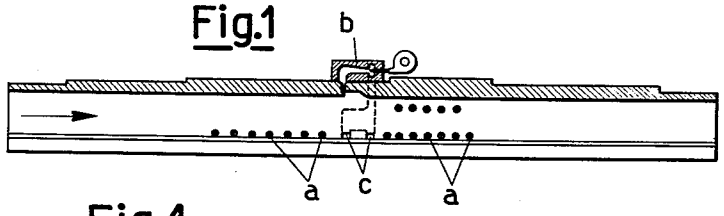


Fig.2

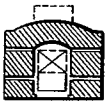


Fig.4

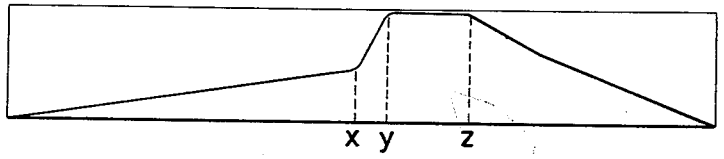


Fig.5

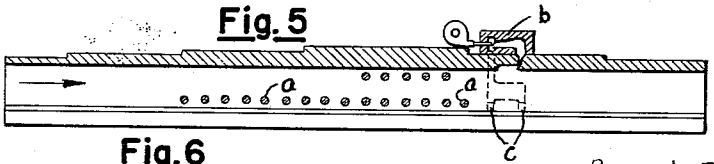
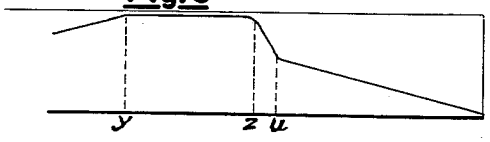


Fig.6



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DEVICE FOR LOCALIZING RAPID VARIATIONS OF TEMPERATURE AT PREDETERMINED POINTS IN TUNNEL TYPE KILNS, PARTICULARLY IN KILNS FOR THE FIRING OF CERAMIC PRODUCTS

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4 Claims. (Cl. 25—142)

For the firing of ceramic and refractory products, the use of continuous kilns is growingly spreading, specially of the tunnel type with trucks, owing to the numerous advantages which they afford.

To obtain the best results from a unnel type kiln, it would be indispensable to be able to adequately in every period of firing the thermal gradient to the requirements of the material, namely heating rapidly the ware where this is possible and useful, and instead reducing said temperature increase where the treatment which the material has to undergo (chemical transformations, hardening, etc.) or the delicacy of it requires so. Only in that way it is possible to obtain more reduced firing cycles and, therefore, higher yield and output.

Certain materials then require being treated according to particular firing diagrams to obtain characteristics which are not obtainable in any other way.

However the difficulty is known which is met in a tunnel type kiln if one wants to obtain a rapid increase of temperature and to localize it at a determined point of the kiln; in fact, by forcing the heating at one zone comes gradually to raise the temperature diagram in the whole preceding zone, thereby cancelling the result obtained at a previous time.

It is an object of the present invention to provide a device which overcomes the difficulties indicated above, creating in a tunnel type kiln rapid variations of temperature, localised at predetermined points.

The device is characterized by means adapted to ensure a special recycling provided in the zone immediately preceding the zone where a rapid increase of temperature is effected.

That recycling is obtained in such a way as to subtract the exhaust gases at too elevated temperature coming from the hottest zone of the kiln while reintroducing them into the kiln after having conveniently cooled them by means of dilution with air or exhaust gases at lower temperature.

The means that serves as a diluent serves also as a driving fluid to enact the recycling. In fact the exhaust gases coming from the kiln may find themselves at very elevated temperature and, therefore, the recycling may not be possible to be effected by mechanical means such as fans or the like.

The recycling device has also the purpose of attaining the maximum uniformity of temperature in the section of the kiln, preventing too hot gases coming from the hottest zone, from passing forward and causing thereby the inconvenience mentioned above of amplifying the overheated zone.

To make the invention more fully clear, reference is made hereinafter to an embodiment illustrated merely by way of example in the accompanying drawing wherein:

FIG. 1 represents diagrammatically a tunnel type kiln with the device according to the invention. The arrow indicates the direction of forwarding of the carriages; FIG. 2 represents a cross-section of the same tunnel type

kiln; FIG. 3 represents the particulars of the device; FIG. 4 represents a firing diagram; FIG. 5 is a longitudinal section, similar to FIG. 1, showing the means effecting the recycling of the exhaust gases in the zone immediately after that where the rapid cooling is effected, by diluting it with a fluid of lower temperature; and FIG. 6 represents a diagram according to FIG. 5.

In FIG. 1 the burners are indicated with *a*; the recycling device according to the present invention, is indicated with *b*. Said device is detailed in larger scale in FIGURE 3.

In FIG. 4 there is reported the firing diagram which it is desired to be obtained from the kiln. From it there appears that after a slow increase of temperature until position *x*, there is requested a rapid increase of temperature from *x* to *y* and then a stay at the same temperature from *y* to *z*.

The recycling device according to the invention is arranged in corespondence with the point *x*, that is to say, immediately before the zone of rapid temperature increase.

In FIG. 3, the too hot exhaust gases coming from the high temperature zone are taken from the interior of the kiln through the intakes *c* provided in the walls of the kiln. Said intakes are adjusted by means of registers *d*.

Through the conduits *e*, the exhaust gases pass into the injector chamber *f*.

In the chamber *f* there are provided one or more nozzles *g* for air or exhaust gases at lower temperature than that at the interior of the kiln in the zone in question and blown by a fan, compressor or other suitable means *h*.

The fluid conveyed to the nozzles *g* serves as a driving fluid for actuating the injector in such a way as to create the necessary suction for taking the gases from the interior of the kiln through the intakes *c* and for re-introducing them into the kiln through the slit *l* provided in the crown of the kiln.

There may be provided one single injector *i* or a series of injectors operating in parallel (as the need may be).

The gas intakes *c* from the interior of the kiln are represented in the drawing at the lower portion of the charge in correspondence with the sole of the trucks and the reintroduction *e* in the top portion of the kiln in correspondence with the crown. That arrangement is the one that has afforded the best results in practice to attain the maximum uniformity of temperature in the whole section of the kiln, however, for particular requirements one may change the points of intake and blowing.

The device may also be applied in the cooling zone, of course, while making the necessary adaptations. In that case the recycling is provided immediately after the zone of rapid cooling (that is to say, at the cooler side) and the air for direct cooling is recycled and cooled, which comes from the outlet of the kiln.

I claim:

1. In a kiln of the tunnel type, means to produce an abrupt change in temperature at a localized cross-section of the kiln comprising intake means arranged in a wall of the kiln at said cross-section, a mixing chamber arranged exteriorly of the kiln, conduit means communicatively connecting said intake means with the chamber, means defining a flaring injector passage communicating at its smaller end with said chamber, nozzle means in said chamber directed into said smaller end of the injector passage, means for injecting fluid through said nozzle means into said injector passage, whereby to develop suction in said chamber to withdraw gases from the kiln via said intake means into said chamber, and return conduit means communicatively connecting the larger end of said injector passage with the kiln at said cross-section, whereby the

gases, diluted with said fluid, re-enter the kiln at said cross-section, thereby producing a distinct temperature change at the cross-section between the intake means and the return conduit means.

2. The structure of claim 1, and means to adjust the cross-sectional area of said intake means.

3. The structure of claim 1, and wherein said kiln has a floor and a ceiling, and said intake means is arranged adjacent said floor and said return conduit means connects with said ceiling.

4. The structure of claim 1, and wherein said fluid injecting means comprises a fan assembly mounted externally of said chamber.

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