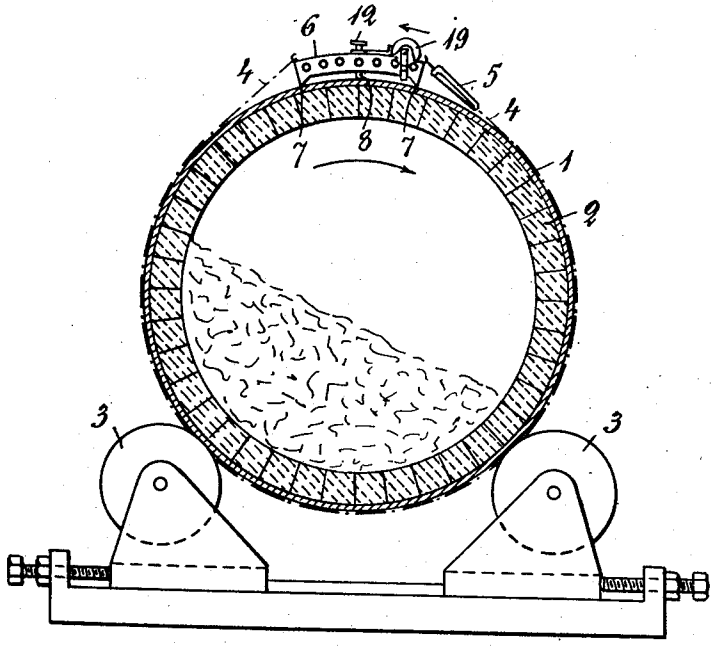
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DEFORMATION RECORDING DEVICE FOR ROTARY FURNACES

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Fig. 1.



E. H. S. Kareby
By Henry C. Parker
Atty

April 27, 1954 E. H. S. KAREBY 2,676,867

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Fig. 2.

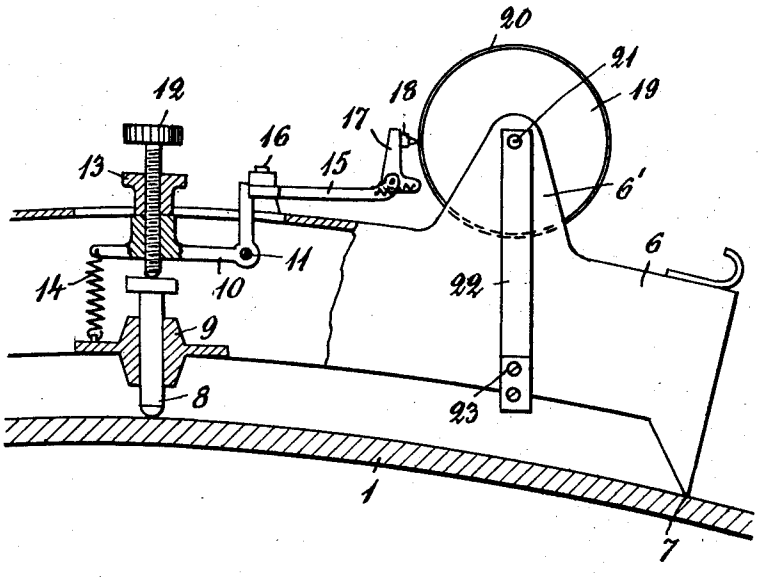
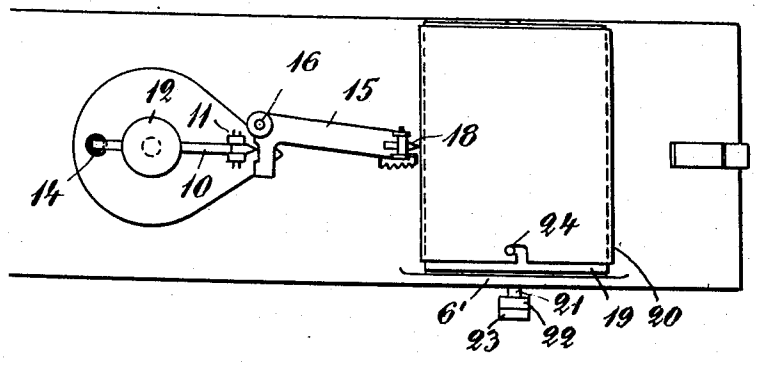


Fig. 3.



E. H. S. Kareby
By Henry C. Parker
Atty.

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DEFORMATION RECORDING DEVICE FOR ROTARY FURNACES

Erik Harry Sigmund Kareby, Stockholm, Sweden, assignor to Skanska Cementaktiebolaget, Stockholm, Sweden, a corporation of Sweden

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1 Claim. (Cl. 346—33)

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The present invention relates to a device for recording deformation or elliptical form of rotary furnaces, particularly such lined rotary furnaces as are commonly used in the cement and lime industry, and more closely the invention concerns a device which comprises a rigid bridge member adapted to be attached to the casing of the furnace and then to extend in the form of an arch between two peripherally spaced supporting points on the furnace casing, said bridge having a feeling member, which is resiliently held in contact with the furnace casing between the supporting points.

In rotary furnaces, particularly of the kind employed in the production of cement clinker—which are usually of considerable length and diameter—deformation of the furnace casing frequently occurs. Such deformation is due to various causes and may entail considerable damage to the lining material of the furnaces. The most common type of deformation is that an elliptical cross-section with the main axis substantially horizontal is imparted to the furnace, this elliptical form always remaining in approximately the same position notwithstanding the rotation of the furnace. In other words, the furnace casing receives a "permanent" oval cross-section, notwithstanding its angular displacement during rotation. This oval form can often be reduced by adjusting the supporting points for the furnace or by reinforcing the weaker parts of the furnace casing.

However, one condition for enabling the deformation of the furnace and the disadvantages resulting therefrom to be removed in a satisfactory manner is, of course, that it is possible to accurately determine the deformation at different points along the furnace and at various points on its periphery. The present invention has for its object to provide a device by means of which both the changes in diameter at a predetermined cross-section of the furnace casing, and also other movements of the furnace casing at arbitrarily selected peripheral points in the said cross-section can be recorded during the operation of the furnace, whereby both lack of rigidity in the furnace casing and any longitudinal curvature and faults in the supporting of the furnace can be ascertained for correction.

The device according to the invention is broadly characterized by the provision of a recording drum which is rotatably mounted on the bridge with its axis substantially parallel to the furnace, said drum being connected to an eccentric mass to be set in rotation in direct dependence upon

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the rotation of the furnace, and further by the fact that the feeling member is arranged to actuate a recording member contacting the periphery of the recording drum and reciprocatable substantially in the axial direction of the drum in accordance with the movements of the feeling member. With a device of this kind a record of the movement of the furnace casing in that part thereof covered by the bridge is obtained without the help of measuring instruments, and after it has been mounted on the furnace casing the device may be left working while following the furnace casing at least a complete revolution of the furnace without it being necessary for the checker to follow the recorder around the furnace.

In order to render the invention more readily understood a preferred embodiment of the recorder is shown in the accompanying drawings, to which embodiment the invention is not limited, however, since it is obvious that the details may be varied within wide limits. In the drawings Fig. 1 is a schematic cross-section through a rotary cement furnace having a recording device according to the invention attached thereto. Fig. 2 is a partial side view, partly in section, of the recording device on a larger scale than in Fig. 1, and Fig. 3 shows the recorder parts of Fig. 2 as viewed from above.

In Fig. 1, 1 is the casing of the rotary furnace and 2 is the furnace lining. The furnace is mounted on adjustable supporting rollers 3. A rigid bridge member 6 is attached on the outside of the furnace casing 1 with the help of a steel wire or chain 4 and a tensioning device 5, the said bridge extending in the form of an arch between two peripherally spaced supporting points 7 on the furnace casing and carrying a spring actuated feeling pin 8 mounted in said bridge member substantially midway between the supporting points, which pin is held in contact with the furnace casing. The difficulties incurred in placing the chain around the furnace casing are appreciably reduced if one end of the chain is attached to a permanent magnet which is fixed to the furnace casing and allowed to draw the chain with it during the rotation of the furnace. It is obvious that if the cross-sectional shape of the furnace in the cross-section in question changes during the rotation of the furnace, movements will occur in the part of the furnace casing covered by the bridge member, and in such a case the feeling pin 8 will execute a substantially radial reciprocating movement during the rotation of the furnace.

As may be seen from Figs. 2 and 3, the feeling

pin 8 is longitudinally displaceable in a bearing sleeve 9 in the bridge 6 and the radial movements of the pin 8 in relation to the furnace will be transmitted to a bell crank 10 pivoted on a shaft 11 which is substantially parallel to the shaft of the furnace. More particularly, the said transmission of movement between the feeling pin 8 and the bell crank 10 is effected by means of an adjusting screw 12 which is screw-threaded through one arm of the bell crank 10 and provided with a lock nut 13. The bell crank 10 is influenced by a spring 14 which tends to press the point of the adjusting screw 12 against the feeling pin 8 and at the same time press the latter resiliently against the furnace casing 1. The bell crank 10 acts on another bell crank 15 which is pivoted at the bridge around a shaft 16 which is substantially radial in relation to the furnace. This second bell crank 15 supports at its one end a spring actuated, swingable arm 17 which in turn carries a recording member or pen 18.

In front of the recording pen 18 a recording drum 19 is mounted on the bridge 6, onto which a suitable paper sleeve 20 is pushed when the device is set to work. The recording drum 19 is supported on one side only by a lug 6' which projects from the bridge 6 and the shaft 21 of the recording drum 19 runs through the lug 6' and carries, outside the latter, an arm 22 rigidly connected to the recording drum 19, the end of this arm being provided with a suitable weight 23. The arm 22 and its weight 23 constitute an eccentric mass connected to the recording drum for imparting a rotational movement thereto as the bridge member follows the rotation of the furnace. It is obvious that the arm 22 will always tend to hang vertically from the shaft 21 of the recording drum 19, and when the device is working and the bridge 6 consequently follows the rotation of the furnace, the recording drum 19 will turn on its own axis entirely automatically so that a given axial line on the periphery of the recording drum will always correspond to a certain definite angular position of the bridge in relation to the horizontal plane.

The shaft 21 of the recording drum 19 is substantially parallel to the shaft of the furnace, and the recording drum 19 and paper sleeve 20 on which the recording is done by means of the recording pen 18 which is pressed against the sleeve 20, are connected to one another by a bayonet joint, for example, in such a way that when checking the recording on the paper sleeve it is always possible to determine the angular position of the bridge 6 at a given recording moment. To the recording pen 18 which is pressed resiliently against the paper sleeve 20 on the recording drum 19 is imparted a substantially axial movement along the recording drum by means of the feeling pin 8 through the

medium of the two bell cranks 10 and 15, which constitute movement transmission means connecting the feeling member and the recording member. To enable the movement of the recording pen 18 to be held within the limits prescribed by the length of the paper sleeve 20, the position of the recording pen can be adjusted in relation to that of the feeling pin 8 by means of the adjusting screw 12 which is locked by the lock nut 13.

It is obvious that with the help of the device described above a recording of the casing movements in that part of the furnace casing covered by the bridge 6 is obtained on the paper sleeve 20. In the first place, such recording gives an indication of the relative magnitudes of the casing movements, and this is of primary importance for enabling the existing deformation of the furnace casing to be removed as far as possible.

If desired, the arrangement may, of course, be supplemented by an indicating instrument in a known manner, which will permit changes to be read off in mm. for example. Instead of using an indicating device it is also possible to use a graduated paper sleeve 20 so that the magnitude of the changes expressed in mm. for example, can be read off directly from the sleeve.

I claim:

A device for recording deformation of rotary furnaces during their work comprising in combination an arch-like rigid bridge member, means for attaching said bridge member to the casing of the furnace in such a manner that said bridge member extends between two peripherally spaced supporting points on said casing, a spring actuated feeling member movably mounted in said bridge member and contacting said casing substantially midway between said supporting points, a recording drum rotatably mounted on said bridge member so as to have its axis substantially parallel to the axis of the furnace, an eccentric mass connected to said recording drum for imparting a rotational movement thereto as said bridge member follows the rotation of the furnace, a recording member contacting the periphery of said recording drum, said recording member being reciprocable substantially in the axial direction of said drum, and movement transmission means connecting said feeling member and said recording member to cause said recording member to record the movements of said feeling member.

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