

Oct. 6, 1959

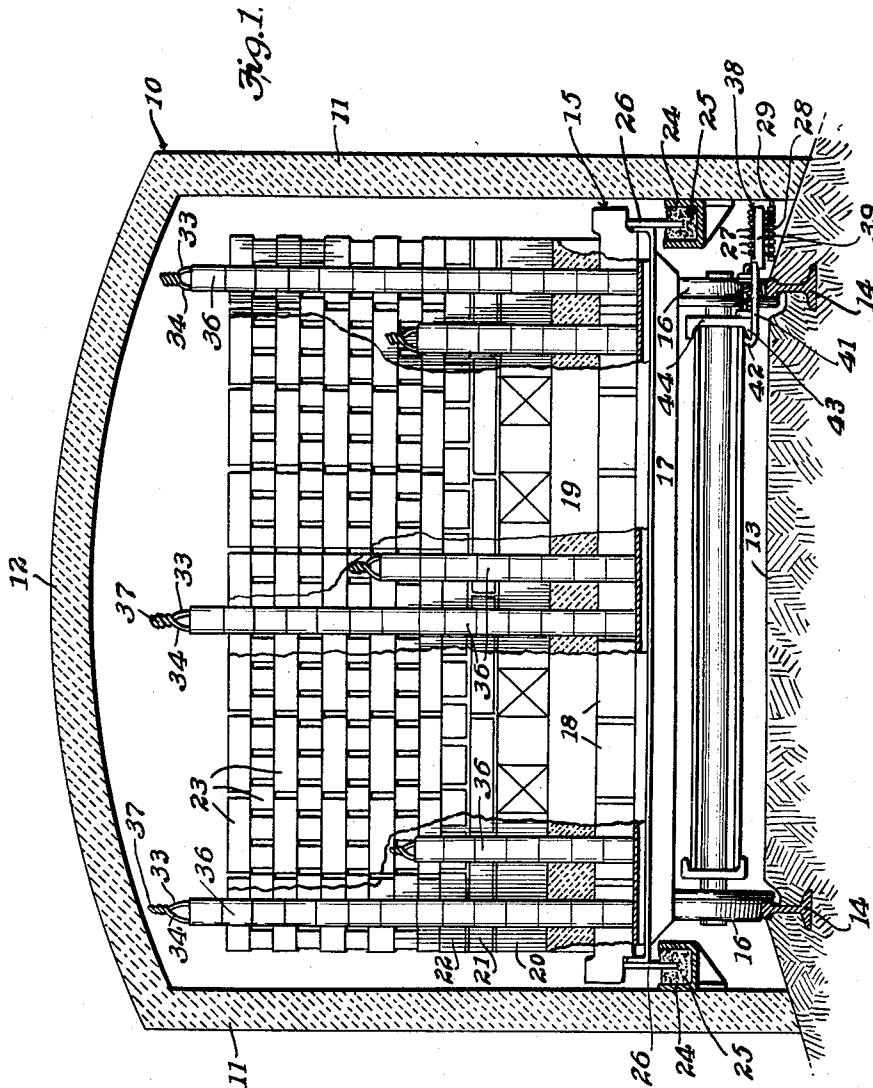
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2,907,209

DEVICE FOR OBSERVING KILN TEMPERATURES

Filed May 15, 1957

4 Sheets-Sheet 1



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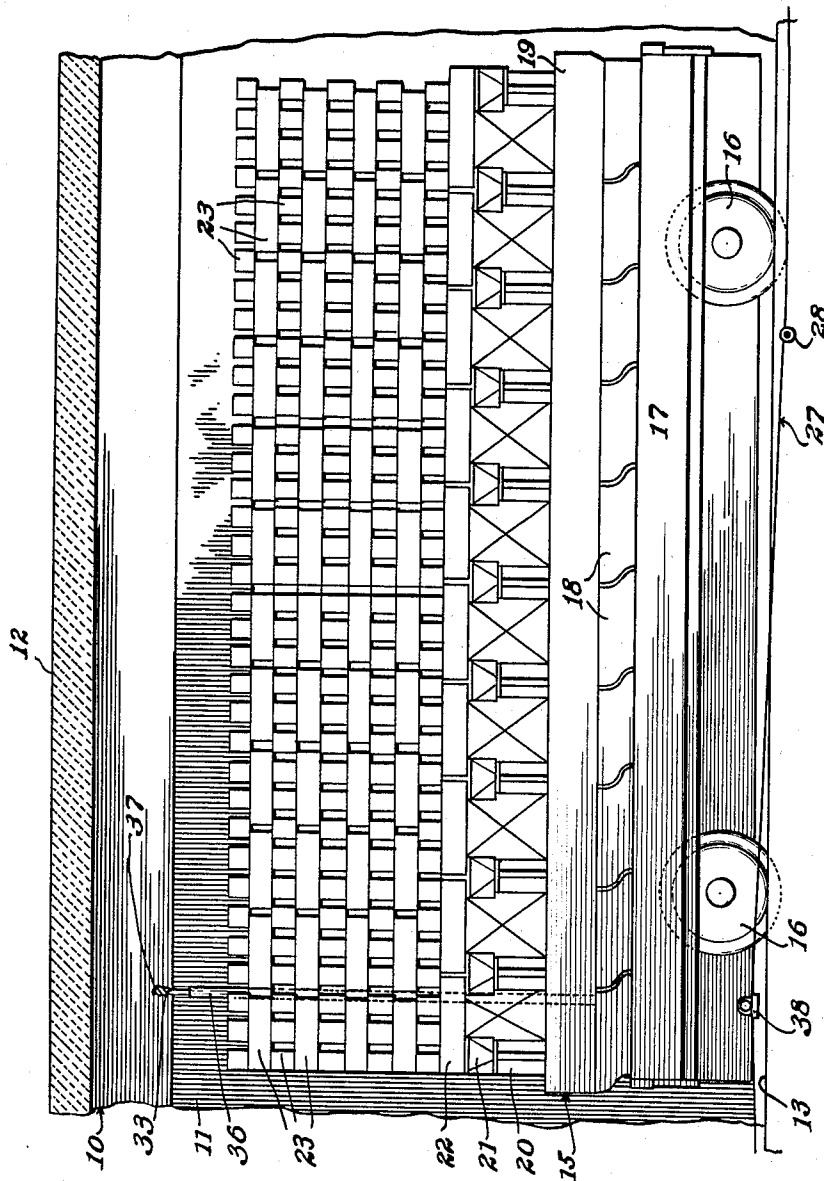
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4 Sheets-Sheet 3

Fig. 4.

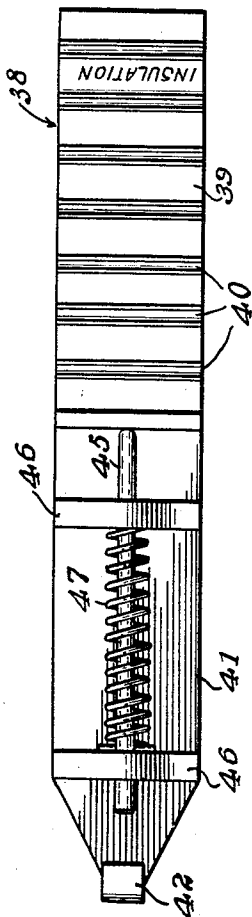
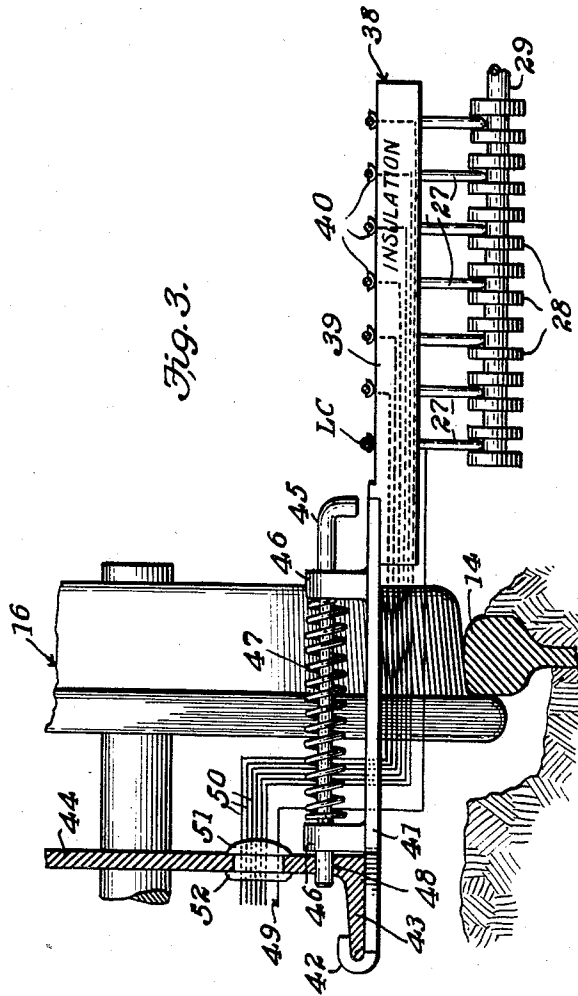


Fig. 3.



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4 Sheets-Sheet 4

Fig. 6.

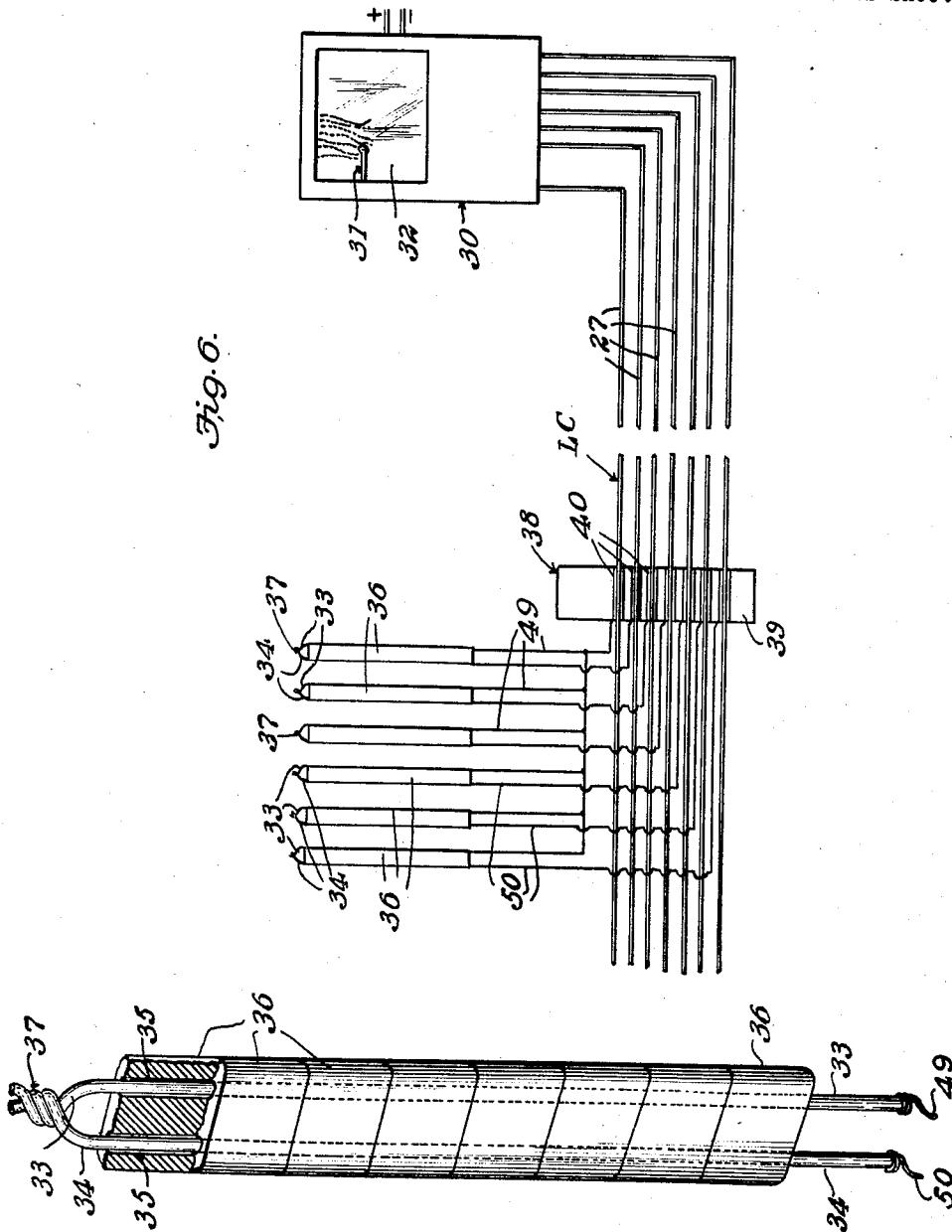


Fig. 5.

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1

2,907,209

DEVICE FOR OBSERVING KILN TEMPERATURES

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6 Claims. (Cl. 73-341)

The invention relates to means for observing kiln temperatures, and more particularly to a device for observing the temperatures in a plurality of zones within a continuous kiln.

In the normal operation of continuous or tunnel kilns for burning bricks, tile, and other clay products, the bricks or other products are stacked upon flat cars which are continuously moved through the kiln.

Upwards of eight or nine tons of bricks are usually stacked upon each car, resulting in a stack of some considerable height and width. As such a loaded car passes through the kiln, it is therefore quite possible that the temperature may vary considerably at points at different heights in the stack of bricks as well as at laterally spaced points therein.

Since it is necessary that all of the bricks in each stack be burned substantially uniformly, it is desirable that the operator of the kiln may be able to ascertain the temperatures at all such points or zones at all times, so as to be able to properly regulate the heating means in the kiln to compensate for variations in temperature at different points or zones.

It is therefore an object of the invention to provide means whereby an operator of a continuous kiln may at all times observe the temperatures at various heights and at transversely spaced points within the kiln.

Another object is to provide such means comprising a temperature recording instrument located exterior of the kiln for recording temperatures at various spaced points or zones within the kiln.

A further object is to provide such a device comprising a temperature recording instrument, such as a multi-point recording potentiometer, located outside of the kiln and operated by heat sensitive device, such as a plurality of thermocouples located at various points within the kiln.

A still further object is to provide a device of the character referred to in which the thermocouples or the like are located at different points in a stack of bricks or the like on a moving car within the kiln.

Another object of the invention is to provide a device of this type in which a plurality of lead wires are located longitudinally through the kiln and connected at one end to the temperature recording instrument outside of the kiln, the thermocouples located upon a car within the kiln being operatively connected to said lead wires by a trolley device carried by the car.

The above and other objects, apparent from the drawings and following description, may be attained, the above described difficulties overcome and the advantages and results obtained, by the apparatus, construction, arrangement and combinations, subcombinations and parts which comprise the present invention, a preferred embodiment of which, illustrative of the best mode in which applicant has contemplated applying the principle, is set forth in detail in the following description and illustrated in the accompanying drawings.

In general terms the invention may be described as applied to a continuous kiln of considerable length,

2

through which cars loaded with bricks or the like are continuously moved. A plurality of lead wires are located longitudinally through at least the greater portion of the kiln, preferably near the bottom of the kiln and at one side thereof.

These lead wires extend out of one end of the kiln, preferably the exit end thereof, and are connected to a temperature recording device, such as a multi-point recording potentiometer, located at a convenient point outside of the kiln where it may be readily observed by the operator of the kiln.

A plurality of thermocouples are located at different heights and at variously spaced points from one side to the other of the stack of bricks or the like on one of the moving cars within the kiln. These thermocouples are connected by conductors to a plurality of brushes or sliding contacts upon a trolley device carried by the car.

Said brushes slidably contact the lead wires located longitudinally within the kiln so as to electrically connect the thermocouples to the temperature recording instrument, so that the temperatures at the various points where the thermocouples are located will be recorded upon said instrument.

Each of the thermocouples is formed of two wires or similar elements, formed of two different metals, separated by insulation, the upper ends of said wires being joined. The longitudinal lead wires comprise a common wire to which one side of each thermocouple is connected, through said trolley device, and a wire for each thermocouple, the other side of each thermocouple being connected, through the trolley device, to one of said lead wires.

When such a construction, as the loaded car carrying the thermocouples, moves through the kiln, the thermocouples will be at all times connected, through the trolley device and lead wires, to the multi-point recording potentiometer. Thus, the temperatures at the various points within the kiln will be constantly recorded on said recording potentiometer and may be readily observed by the operator, who may properly regulate the heating means to compensate for temperature variations at different points within the kiln.

Having thus briefly described the invention, reference is now made to the accompanying drawings illustrating a preferred embodiment thereof, in which;

Fig. 1 is a transverse sectional view through a continuous kiln, showing an end view of a loaded car therein, with parts broken away to show a plurality of thermocouples located at different heights and at transversely spaced points throughout the stack of bricks, and a trolley device carried by the car;

Fig. 2 is a fragmentary longitudinal section through the kiln, showing a side elevation of the car shown in Fig. 1;

Fig. 3 is an enlarged side elevation of the trolley device, showing the manner of connection thereof to the car, and the manner in which the brushes or sliding contacts thereof engage the lead wires;

Fig. 4 is a top plan view of the trolley device;

Fig. 5 is an enlarged, detached perspective view of one of the thermocouples, with parts broken away; and,

Fig. 6 is a wiring diagram of the multi-point recording potentiometer, the lead wires connected thereto, the thermocouples and the trolley device for electrically connecting the thermocouples to the recording potentiometer through the lead wires.

Referring now more particularly to the embodiment of the invention illustrated, in which similar reference characters refer to like parts throughout, a portion of a continuous or tunnel kiln is indicated generally at 10. Such kilns are of considerable length and may be upwards of three hundred feet long.

The kiln comprises side walls 11, a roof or crown 12, and the bottom or floor 13 upon which are mounted the longitudinally disposed track rails 14 extending throughout the length of the kiln so that cars loaded with bricks or the like may be moved through the kiln upon said tracks.

One such car is indicated generally at 15 in Figs. 1 and 2, and is shown provided with conventional flanged railway car wheels 16 rolling upon the rails 14. The car is shown as having a metal bed 17 upon which is built up a refractory platform comprising the lower course of fire clay blocks 18, a refractory cement slab 19, and courses 20, 21, and 22 of fire clay blocks, all of which are cemented together to form a solid, rigid platform upon which bricks or the like may be stacked, as indicated at 23, in any usual checkerwork arrangement.

Conventional sand seals are provided for protecting the running gear of the cars from the extreme heat of the kiln. These sand seals are shown as comprising the usual troughs 24 supported upon the side walls 11 of the kiln and filled with sand as indicated at 25, and plates 26 depending from the sides of the car and extending into the sand.

Any usual and well known heating means may be located at desired points within the kiln, above the sand seals. As the heating means forms no part of the present invention, the same is not shown in the drawings.

Located longitudinally within the kiln, and extending at least throughout the greater portion of the length thereof, is a plurality of lead wires indicated generally at 27. These lead wires are shown located in the lower portion of the kiln, near one side thereof, and are supported upon insulation spools or the like 28, mounted upon the adjacent side wall of the kiln as indicated at 29.

The lead wires 27 extend through one end of the kiln, preferably the exit end thereof, and are connected to a temperature recording instrument, such as the multi-point recording potentiometer indicated generally at 30 in Fig. 6. This instrument is of conventional construction, being provided with a usual pen or stylus 31 for multiple recording upon a moving roll or chart as indicated at 32, all in usual and well known manner.

For the purpose of obtaining the temperatures at various points within the kiln, a plurality of thermocouples are provided. Each of these thermocouples may be of the construction shown in detail in Fig. 5, and comprises a pair of elements in the form of wires or the like formed of two different metals, as indicated at 33 and 34.

The elements 33 and 34 are located through openings 35 in the insulation members 36, and the upper ends of the two elements are joined together as by twisting or the like, as indicated at 37.

As best shown in Fig. 1, a plurality of these thermocouples are located upon the car, preferably near one end thereof, and are built up to various heights within the refractory platform of the car and the stack of bricks loaded thereon, and are located at transversely spaced points from one side of the car to the other side thereof.

Although any desired number and spacing of the thermocouples may be used, for the purpose of illustration six thermocouples are shown, two near each side of the stack of bricks and two at the longitudinal central portion thereof, and at different heights, as best shown in Fig. 1.

For the purpose of electrically connecting the thermocouples to the lead wires 27, so as to operate the multi-point recording potentiometer 30, a trolley device is carried by the car, and indicated generally at 38.

This trolley device is illustrated in detail in Figs. 3 and 4, and comprises generally an insulation block 39 having thereon a plurality of brushes or sliding contacts 40, corresponding in number and spacing to the lead wires 27 in the kiln.

These brushes or sliding contacts are preferably of channel or U-shape, and are formed of suitable conductor

material. In practice they may be formed by splitting copper tubing longitudinally in half.

For the purpose of detachably mounting the trolley device upon the car, a bracket plate 41 is fixed to one end of the insulation block 39 and provided at its free end with a hook 42 adapted to engage over the lower flange 43 of the channel frame member 44 of the car.

A latch bolt 45 is slidably mounted through suitable apertures in the cars 46, upon the bracket plate 41. The bolt 45 is loaded by coil spring 47, so as to be urged into the opening 48 in the channel frame 44 of the car to detachably connect the trolley device thereto.

One wire element 33 of each thermocouple may be formed of a nickel-aluminum alloy commonly known as Alumel, and the other element 34 may be formed of a chrome alloy commonly known as Chromel.

With the arrangement illustrated, using six thermocouples, seven lead wires 27 are required, one of said lead wires indicated at LC being a common wire to which the Alumel elements 33 of all of the thermocouples are adapted to be connected. Instead of having a common wire, an individual lead wire may be provided for the Alumel element of each thermocouple.

The Chromel element 34 of each of the thermocouples is adapted to be connected to one of the other six lead wires. This connection is made through the trolley device 38. For this purpose, a wire 49 connects the Alumel elements 33 of each of the thermocouples to one brush or sliding contact 40 which engages the common lead wire LC. In like manner, wires 50 connect the Chromel elements 34 of the several thermocouples each to one of the other brushes or sliding contacts 40 of the trolley device.

For the purpose of disconnecting the wires 49 and 50 on the trolley device from the corresponding wires on the car, so that the trolley device may be removed from the car when desired, a connector plug 51 is provided upon the trolley device for detachable connection to a plug-in receptacle 52 upon the car, as shown in Fig. 3.

With the construction illustrated and above described, the thermocouples may be located at the desired points throughout the load of bricks or the like upon the car, and the trolley device 38 may be attached to the car in the manner above described.

As the car, equipped with the thermocouples and trolley device, moves through the kiln, the brushes or sliding contacts 40 on the trolley device will each pick up the corresponding lead wire 27 from the insulation spools 28 and will remain in sliding contact therewith throughout the movement of the car through the kiln.

The multi-point recording potentiometer 30 will thus be continuously connected to the thermocouples on the moving car and will be constantly operated thereby, so as to record the temperatures at the various points of location of the thermocouples in the kiln, throughout the entire passage of the car through the kiln.

Thus, the operator may at all times observe, upon the recording potentiometer, the temperatures at the various points in the kiln so that he may regulate the heating means to compensate for variations in temperatures as may be required.

Although the invention is disclosed as applied to a continuous kiln for the burning of clay products, it should be understood that it may be used upon continuous furnaces through which any materials may be carried upon movable cars or the like.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom beyond the requirements of the prior art, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of ex-

5

ample, and the scope of the present invention is not limited to the exact details of construction.

Having now described the invention or discovery, the construction, the operation, and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby; the new and useful construction, and reasonable mechanical equivalents thereof obvious to those skilled in the art, are set forth in the appended claims.

I claim:

1. A device for observing temperatures at spaced points upon a car movable longitudinally through a continuous kiln, the car having a frame member with a flange thereon, said device comprising a plurality of lead wires located longitudinally through the kiln, a multi-point recording potentiometer connected to said lead wires at a point exterior of the kiln, a plurality of spaced thermocouples upon the car, a trolley device comprising an insulation block, a plurality of brushes on the block, each brush slidably engaging one of said lead wires, a bracket plate on said trolley device having a hooked end engaging the flange on said frame member, a spring loaded latch bolt on said bracket plate operatively engaging said frame member for detachably mounting the trolley device on the car, and conductor means connecting said thermocouples to said brushes.

2. A device for observing temperatures at spaced points upon a car movable longitudinally through a continuous kiln, the car having a frame member with a flange thereon, said device comprising a plurality of lead wires located longitudinally through the kiln, a multi-point recording potentiometer connected to said lead wires at a point exterior of the kiln, a plurality of spaced thermocouples upon the car, a trolley device comprising an insulation block, a plurality of brushes on the block, each brush slidably engaging one of said lead wires, a bracket plate on said trolley device having a hooked end engaging the flange on said frame member, a spring loaded latch bolt on said bracket plate operatively engaging said frame member for detachably mounting the trolley device on the car, conductor means connecting said thermocouples to said brushes, and receptacle and plug means detachably connecting said conductor means.

3. A device for observing temperatures at spaced points upon a car movable longitudinally through a continuous kiln, the car having a frame member with a flange thereon, said device comprising a plurality of lead wires located longitudinally through the kiln, a multi-point recording potentiometer connected to said lead wires at a point exterior of the kiln, a plurality of spaced thermocouples upon the car, a trolley device comprising an insulation block, a plurality of brushes on the block, each brush slidably engaging one of said lead wires, a bracket plate on said trolley device having a hooked end engaging the flange on said frame member, a spring loaded latch bolt on said bracket plate operatively engag-

6

ing said frame member for detachably mounting the trolley device on the car, a receptacle on the car, conductor means connecting the thermocouples to said receptacle, a plug detachably mounted in said receptacle, and conductor means connecting said plug to said brushes.

4. A device for observing temperatures at spaced points upon a car movable longitudinally through a continuous kiln, the car having a frame member, said device comprising a plurality of lead wires located longitudinally through the kiln, a multi-point recording potentiometer connected to said lead wires at a point exterior of the kiln, a plurality of spaced thermocouples upon the car, a trolley device comprising an insulation block, a plurality of brushes on the block, each brush slidably engaging one of said lead wires, a bracket plate connected to the insulation block, means for detachably connecting said bracket plate to the frame of the car, and conductor means connecting said thermocouples to said brushes.

5. A device for observing temperatures at spaced points upon a car movable longitudinally through a continuous kiln, the car having a frame member, said device comprising a plurality of lead wires located longitudinally through the kiln, a multi-point recording potentiometer connected to said lead wires at a point exterior of the kiln, a plurality of spaced thermocouples upon the car, a trolley device comprising an insulation block, a plurality of brushes on the block, each brush slidably engaging one of said lead wires, a bracket plate connected to the insulation block, means for detachably connecting said bracket plate to the frame of the car, conductor means connecting said thermocouples to said brushes, and receptacle and plug means detachably connecting said conductor means.

6. A device for observing temperatures at spaced points upon a car movable longitudinally through a continuous kiln, the car having a frame member, said device comprising a plurality of lead wires located longitudinally through the kiln, a multi-point recording potentiometer connected to said lead wires at a point exterior of the kiln, a plurality of spaced thermocouples upon the car, a trolley device comprising an insulation block, a plurality of brushes on the block, each brush slidably engaging one of said lead wires, a bracket plate connected to the insulation block, means for detachably connecting said bracket plate to the frame of the car, a receptacle on the car, conductor means connecting the thermocouples to said receptacle, a plug detachably mounted in said receptacle, and conductor means connecting said plug to said brushes.

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