Dec. 6, 1960 J. SCHMIDT 2,963,529

ELECTRIC KILN

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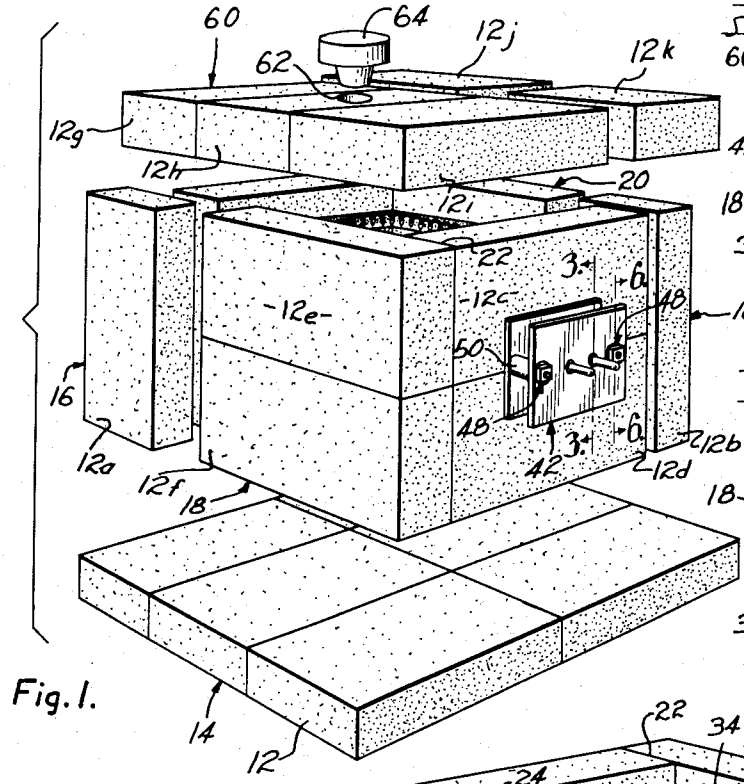

Fig. 1.

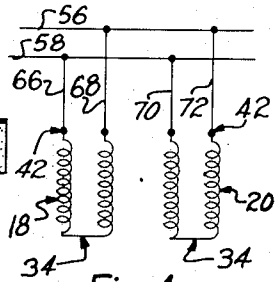

Fig. 4.

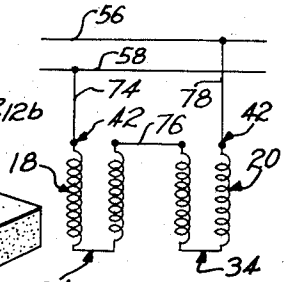

Fig. 5.

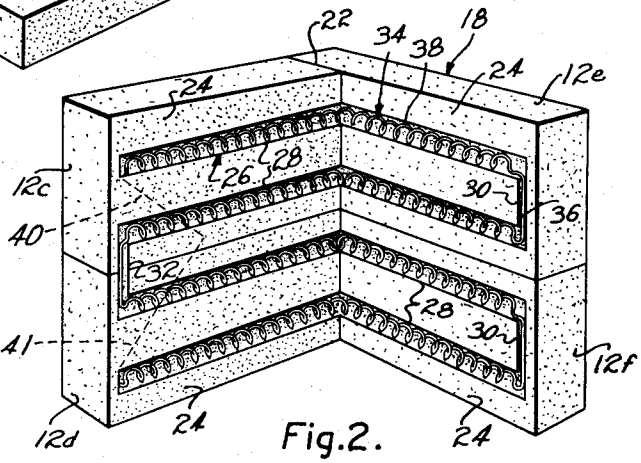

Fig. 2.

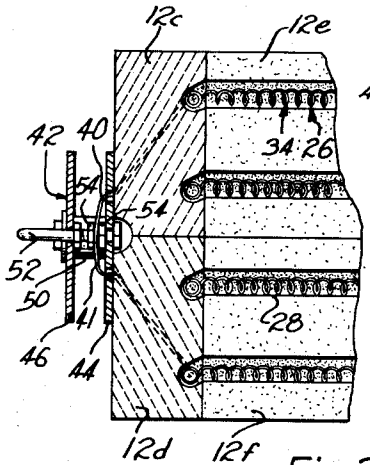

Fig. 3.

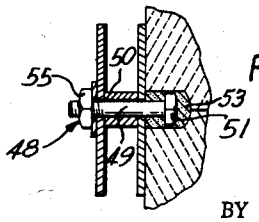

Fig. 6.

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ELECTRIC KILN

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5 Claims. (Cl. 13—22)

This invention relates to kiln structure and more particularly, to a highly versatile, lightweight, low cost, electrically operated kiln adapted for various operations such as firing of ceramic ware and enamel coatings on products, as well as melting of nonferrous materials.

The primary object of the invention is to provide a portable kiln formed of a plurality of individual refractory units adapted to be disposed in stacked relationship presenting an article-receiving heating chamber within the stack, with certain of the refractory units carrying electrical resistance elements whereby the chamber may be heated to a predetermined temperature by the simple expedient of connecting the resistance elements to a suitable source of electrical energy.

A further important object of the invention is to provide a portable kiln of the type referred to immediately above which may be readily assembled or disassembled without the use of tools or other implements by virtue of the fact that the refractory units are positioned in stacked relationship without interconnecting means of any kind being required.

An equally important object of the invention is to provide an electric kiln having electrical resistance elements secured to the normally innermost faces of at least two different refractory units forming a part of the kiln whereby the heat produced within the article-receiving chamber may be changed by varying the number of electrical resistance elements connected to the source of electrical energy or in the alternative, operably coupling the resistance elements to the electrical power line in either series or parallel relationship, depending upon the amount of heat required to effect the firing or melting operation.

An additional important aim of the invention is to provide a portable, electrically operated kiln which is constructed of a plurality of refractory bricks all of the same size and commercially available on the open market, whereby the kiln may be distributed at a minimum cost and without expensive machines being required in order to manufacture the heating structure.

Other important objects of the invention relate to the provision of a portable electric kiln wherein the individual refractory units adapted to be disposed in stacked relationship are relatively light in weight, and which may be compactly stacked for storage; to an electrically operated kiln which is adapted to be connected to a conveniently available source of electrical energy such as a power line of 115 volts and 30 amps. current, whereby the kiln may be used at any convenient location; to a kiln wherein repair or replacement of any of the refractory units adapted to be disposed in stacked relationship to present the article-receiving heating chamber, is facilitated by virtue of the fact that the units are not interconnected in any manner whatsoever during utilization of the same; and to other important objects and details of construction of the present kiln which will become obvious or be explained more fully as the following specification progresses.

In the drawing:

Figure 1 is an exploded, perspective view of a portable electric kiln embodying the principles of the present invention and illustrating the relative positions of the individual refractory units adapted to be disposed in stacked relationship to present an article-receiving chamber within such stack;

Fig. 2 is an enlarged, perspective view of one of the corner sections of the portable kiln and showing the normally innermost face thereof;

Fig. 3 is an enlarged, vertical, fragmentary, cross-sectional view through the plug connector and associated portions constituting a part of one of the corner sections, taken on the line 3—3 of Fig. 1;

Fig. 4 is a schematic representation of the way in which the resistance elements of the portable kiln may be operably coupled with a power line in parallel relationship;

Fig. 5 illustrates by schematic representation the way in which such resistance elements may be coupled to the power line in series relationship if desired; and

Fig. 6 is an enlarged, fragmentary, sectional view taken on the line 6—6 of Fig. 1.

A portable, electrically operated kiln embodying the preferred concepts of the invention is illustrated in the drawing and broadly numerated **10**. In order to maintain the cost of kiln **10** at a minimum figure as well as imparting flexibility to the same it is to be preferred that a plurality of refractory bricks **12** be employed as the basic components of kiln **10**. Refractory units or bricks **12** are preferably of the same size, insulating firebrick measuring 9" x 4½ x 2½" being suitable. This firebrick is resistant to temperatures of at least 2600° F. and is relatively light in weight, each unit weighing only 2¾ lbs.

Portable kiln **10** may be furnished as a kit comprising a number of refractory units or bricks **12**, thereby permitting the user of such kiln to arrange the bricks in predetermined relationship to present an article-receiving heating chamber of desired size. For purposes of illustration only, one kiln which may be formed from a plurality of refractory bricks **12** is shown in Fig. 1. In this type of kiln, six bricks **12** are disposed on a suitable supporting surface to thereby present a substantially rectangular kiln bottom **14**. In certain instances, it may be desirable to provide more than one layer of bricks **12** in forming kiln bottom **14**, this being particularly true if the supporting surface for such kiln is in the nature of a wooden table or the like. In any event, bricks **12** are merely disposed with certain margins thereof in abutting relationship and the same are not interconnected in any manner.

The side wall **16** of kiln **10** may be formed by a pair of opposed corner kiln sections **18** and **20** which are identical in construction, as well as a pair of spacer bricks **12***a* and **12***b*.

Inasmuch as corner sections **18** and **20** are identical in construction, only section **18** shown in Fig. 2 will be described in detail. It can be seen in this figure that section **18** comprises four bricks **12***c*, **12***d*, **12***e* and **12***f*, with bricks **12***c* and **12***e* disposed with one longitudinal edge thereof in abutting relationship to corresponding longitudinal edges of respective units **12***d* and **12***f*, and the narrow ends **22** of bricks **12***c* and **12***d* being disposed in abutting, overlapping relationship to one major rectangular face of corresponding bricks **12***e* and **12***f*. The edge and face portions of bricks **12***c*, **12***d*, **12***e* and **12***f* disposed in proximal, abutting relationship, are interconnected with a refractory cement. From the foregoing, it can now be appreciated that corner section **18** is substantially L-shaped and is adapted to be disposed at one corner of bottom **14** in substantially an upright position, with the L configuration thereof complemental with a respective corner of kiln bottom **14**.

The normally innermost faces **24** of bricks **12***c*, **12***d*, **12***e* and **12***f* are provided with a groove **26** therein of serpentine, longitudinal configuration and extending

across substantially the entire length and height of the innermost surface of corner section **18**. As best shown in Fig. 2, groove **26** includes a pair of parallel groove portions **28** in each face **24** of bricks **12***c*, **12***d*, **12***e* and **12***f* and disposed in longitudinally extending relationship thereto. Furthermore, groove portions **28** in brick **12***c* are in direct alignment with groove portions **28** in brick **12***e*, while groove portions **28** in brick **12***d* likewise align with groove portions **28** in brick **12***f*. A cross groove portion **30** in bricks **12***e* and **12***f* remote from bricks **12***c* and **12***d* connect proximal extremities of groove portions **28** therein, while a groove portion **32** in bricks **12***c* and **12***d* interconnect parallel, opposed, proximal groove portions **28** of bricks **12***c* and **12***d* respectively.

An electrical resistance element broadly numerated **34** is provided on corner section **18** and preferably comprises an elongated length of high resistance wire such as an alloy wire containing 60 percent nickel, 24 percent iron, 16 percent chromium and 0.1 percent carbon and sold under the trademark "Chromel A" or an alloy wire containing 80 percent nickel and 20 percent chromium and sold under the trademark "Nichrome" disposed in serpentine groove **26**. The length **38** of element **34** normally disposed in groove portions **28** of groove **26** are preferably spiral in longitudinal configuration, while the length **36** of element **34** located in cross groove portions **30** are of rectilinear configuration. Opposed end portions **40** and **41** of resistance element **34** extend through suitable passages (not shown) in respective bricks **12***c* and **12***d* and are operably coupled to an electrical connector **42** mounted on the normally outermost face of corner section **18**. Connector **42** may comprise a pair of asbestos plates **44** and **46** maintained in parallel, horizontally spaced relationship by bolt and nut means **48** including respective bolts **49** extending through respective sleeves **50** positioned between plates **44** and **46**. The heads **51** of bolts **49** are embedded within corresponding recesses **53** formed in bricks **12***c* and **12***d* at the zone of juncture thereof with refractory material placed in such recesses after heads **51** are inserted therein serving to maintain bolts **49** in laterally extending relationship to the outer faces of bricks **12***c* and **12***d*. Nuts **55** threaded over the outer ends of each of the bolts **49** serve to connect plates **44** and **46** to the outer faces of bricks **12***c* and **12***d* with plate **44** in flat, abutting relationship to the latter. It is to be understood that connector **42** may most conveniently be secured to corner section **18** at the time bricks **12***c* and **12***d* are joined by the cement referred to above.

Spaced, parallel prongs **52** are secured to and extend through plates **44** and **46**, with the outermost ends of prongs **52** projecting outwardly from the outer face of plate **46** in substantially perpendicular relationship thereto. The end portions **40** and **41** of resistance element **34** are operably coupled with respective prongs **52** with nuts **54** threaded over the innermost ends of corresponding prongs **52** between plates **44** and **46** receiving the ends of respective wires therebetween. It is to be understood that prongs **52** are spaced sufficiently so as to be received within a standard electrical receptacle forming a part of a line for operably coupling connector **42** to a suitable source of electrical energy such as power lines **56** and **58**.

Upon disposition of corner sections **18** and **20** on kiln bottom **14** at opposed corners thereof, spacer bricks **12***a* and **12***b* are stacked in longitudinally upright positions closing the space between proximal opposed ends of corner sections **18** and **20**.

Top **60** of kiln **10** preferably comprises three units **12***g*, **12***h* and **12***i*, interconnected at corresponding longitudinal edges thereof by cement, as defined above, and thereby of sufficient width to span the distance between opposed side portions of wall **16**. In order to completely close the top of the chamber presented by bottom **14** and side wall **16**, a pair of bricks **12***j* and **12***k* may be stacked on the upper edge of wall **16** in abutting relationship to interconnected units **12***g*, **12***h* and **12***i* in a manner to present a top of dimensions equal to bottom **14**. It is, of course, to be understood that all of the units **12** comprising top **60** may be suitably joined by cement or the like to thereby present a one-piece cover. However, by maintaining the number of cemented units to a minimum, the flexibility of the portable kiln is maintained at a maximum to thereby permit the user to form an oven having a heating chamber of any predetermined size.

One of the units **12** presenting top **60**, as for example brick **12***h*, is provided with a passage **62** extending entirely transversely through the same in order to permit the user of kiln **10** to observe the interior of the heating chamber. A plug **64** adapted to be disposed on unit **12***h* in closing relationship to passage **62** prevents heat from escaping from the chamber during operation of kiln **10**.

It is believed that the operation of kiln **10** is obvious from the above description, but it is to be pointed out that electrical connectors **42** are adapted to be coupled with power lines **56** and **58** in either parallel or series relationship as desired. In Fig. 4, the schematic representation shows how the connector **42** of section **18** may be coupled with respective power lines **56** and **58** by leads **66** and **68**, while connector **42** of section **20** is also operably coupled with power lines **56** and **58** by respective leads **70** and **72**. As an alternative arrangement, one prong **52** of the connector **42** of section **18** may be operably coupled with power line **58** by a lead **74**, and the opposite prong **52** of the connector **42** of section **18** may be joined to one of the prongs **52** of the connector **42** of section **20** by a lead **76**. The remaining prong **52** of connector **42** of section **20** is then coupled with power line **56** by a lead **78** to thereby place sections **18** and **20** in series relationship.

From the foregoing, it can be appreciated that the temperature to which the heating chamber within kiln **10** is raised during operation thereof may be changed by connecting sections **18** and **20** to power lines **56** and **58** in either parallel or series relationship. When high temperature is required, the parallel arrangement may be employed whereas when lower firing temperatures are expedient, the series coupling may be used.

It is also to be understood that after grooving and drilling of the bricks **12***c*, **12***d*, **12***e* and **12***f* from which corner sections **18** and **20** are connected, these brick units as well as the remaining bricks **12**, including the cemented units **12***g*, **12***h* and **12***i*, may be painted with a solution of diluted refractory mortar which subsequently hardens, thereby making units **12** wear-resistant and durable. The refractory mortar may be prepared by adding one part of refractory cement to three parts of water.

Upon stacking of refractory bricks **12** in a manner to present bottom **14**, side wall **16** and top **60**, the portable kiln thereby presented may be employed for various purposes such as firing ceramic ware, including pottery and sculptured figures, enamel coatings may be baked, and metals and alloys with a melting point below 2100° F. may be melted or otherwise subjected to heat treatment. In addition, kiln **10** may be utilized as a burn-out oven for lost wax casting procedures, as a drying oven and for other heat applications.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. An electric kiln comprising a plurality of individual refractory units disposed in stacked relationship and presenting a bottom, a side wall and a top defining an article-receiving chamber within the stack, the side wall including a pair of opposed, horizontally L-shaped corner sections comprising a number of interconnected units and spacer units between proximal opposed, upright ends of the corner sections, each of the corner sections being

provided with grooves of serpentine configuration extending across the inner, angularly disposed faces thereof defining a portion of the chamber; electrical resistance elements secured to each of the corner sections within and extending the length of respective grooves, opposed ends of each of the elements extending through a respective corner section and terminating exteriorly thereof; and electrical means interconnecting the externally disposed ends of each of the elements for permitting coupling of the latter to a source of electrical energy.

2. An electric kiln as set forth in claim 1, wherein one of the units is provided with an opening therethrough permitting viewing of the interior of said chamber.

3. An electric kiln as set forth in claim 1 wherein said L-shaped units having the elements secured thereto are disposed on opposed sides of said kiln.

4. An electric kiln as set forth in claim 1 wherein said L-shaped units each include a number of substantially rectangular blocks having certain margins thereof disposed in abutting relationship, there being heat-resistant adhesive means interconnecting said abutting margins of the blocks.

5. An electric kiln as set forth in claim 1 wherein said electrical means interconnecting the externally disposed ends of each of the elements includes a plug connected to said externally disposed ends of each of the elements, each of said plugs having prong means constructed and arranged to be received in an electrical receptacle operably coupled with said source of electrical energy.

References Cited in the file of this patent

UNITED STATES PATENTS

1,057,745	Kohn	Apr. 1, 1913
1,413,678	Moffat	Apr. 25, 1922
1,555,542	Young	Sept. 29, 1925
1,638,826	Brannigan	Aug. 16, 1927
2,744,946	Lewicki	May 8, 1956