Sept. 28, 1965 R. S. SHEEHAN 3,208,504

GAS-FIRED FURNACE ELEMENT

Filed June 21, 1963 2 Sheets-Sheet 1

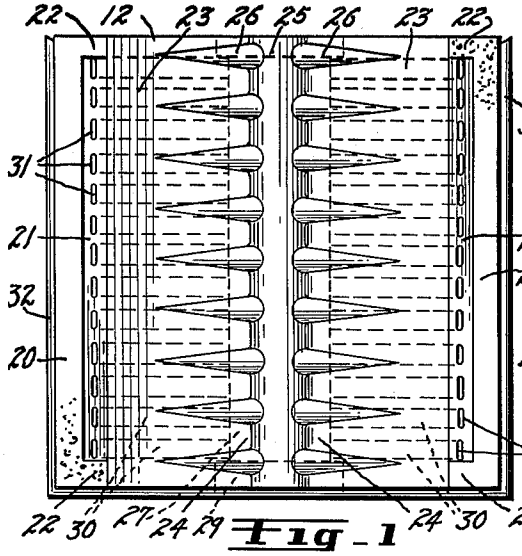

Fig_1

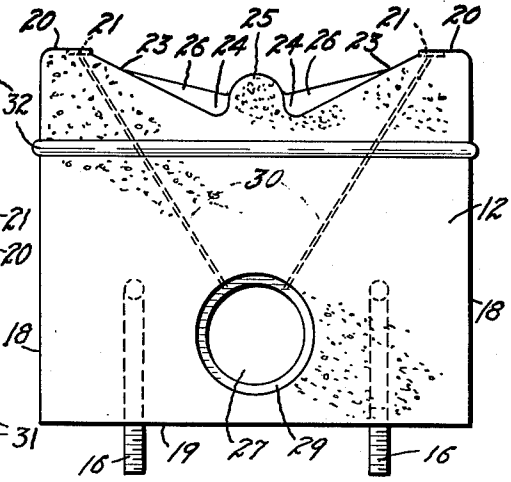

Fig_2

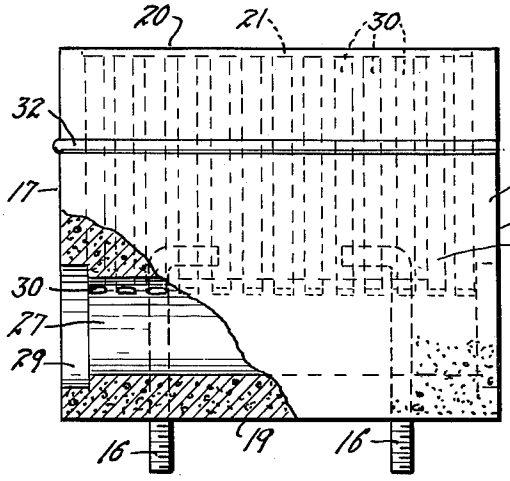

Fig_3

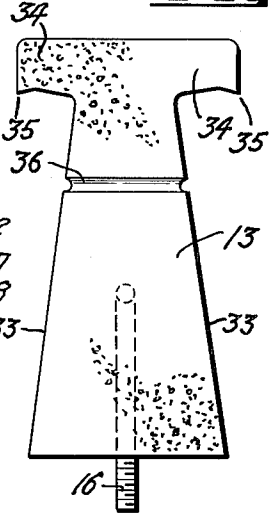

Fig_4

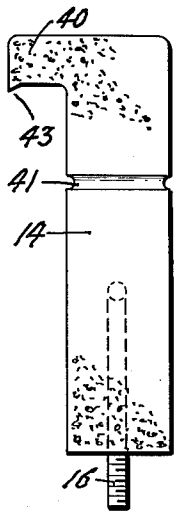

Fig_5

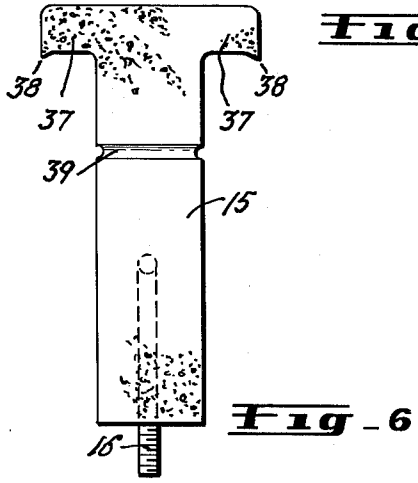

Fig_6

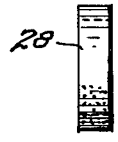

Fig_7

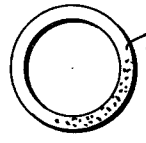

Fig_8

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Sept. 28, 1965 R. S. SHEEHAN 3,208,504

GAS-FIRED FURNACE ELEMENT

Filed June 21, 1963 2 Sheets-Sheet 2

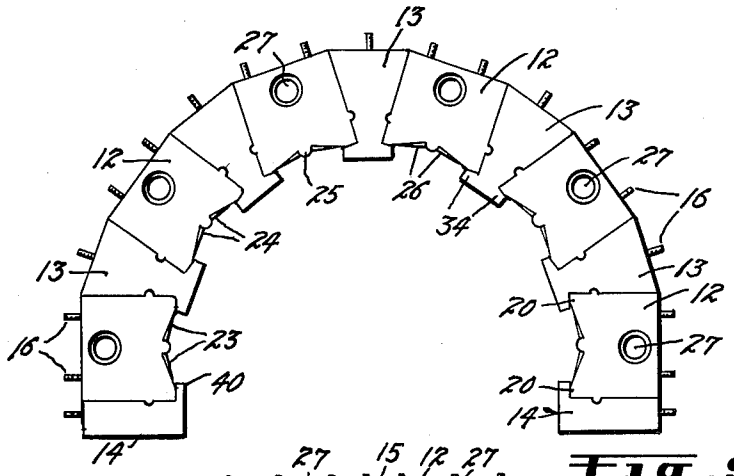

Fig_9

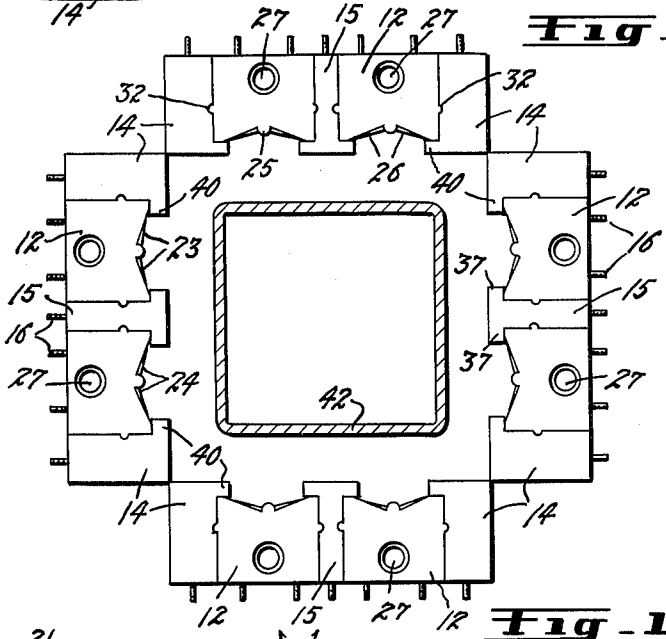

Fig_10

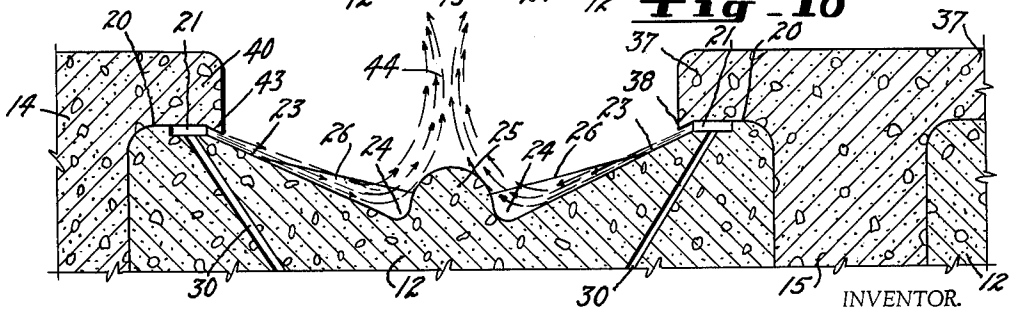

Fig_11

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3,208,504

GAS-FIRED FURNACE ELEMENT

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10 Claims. (Cl. 158—104)

This invention relates to gas-fired furnaces such as used in smelters, cement plant, aggregate sintering plants, tunnel kilns, etc., and more particularly to elements for building gas-fired walls for such furnaces for any desired use.

The principal object of the invention is to provide preformed units of refractory material which can be quickly and easily assembled to provide a complete ready-to-use furnace of any desired shape and size completely equipped with burners positioned at all desired points and with integral fuel conduits for feeding the fuel to the burners.

Another object of the invention is to provide burner units of refractory material which can be assembled in any desired wall arrangement; which will position the fire zone at the most efficient point relative to the work being done; which will provide uniform heating over the entire area of the assembled burners; which will space the fire zone away from the burner elements to avoid burnouts; which will result in complete combustion without waste; and which, when assembled, will unitarily form the necessary conduits for conveying the fuel gas to the burner orifices.

A further object is to provide refractory spacer elements for the above burner units for spacing the latter in a furnace wall which will form deflectors for directing and spreading the incoming fuel gases to the flames and which can be used to assemble the burner units into any desired shape, size or type of fire box, kiln, or furnace.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is made to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

The principal furnace building elements of this invention comprise: a burner unit **12**; an arch spacer unit **13**; a terminal unit **14** and a straight wall spacer unit **15**.

In the drawing:

FIG. 1 is a face view of the burner face of the burner unit;

FIG. 2 is an end view of the burner unit of FIG. 1;

FIG. 3 is a side view of the burner unit partially broken away to show internal structure;

FIG. 4 is an end view of the arch spacer unit;

FIG. 5 is a similar end view of the terminal unit;

FIG. 6 is a similar end view of the straight, wall spacer unit;

FIGS. 7 and 8 are side and end views respectively, of a refractory nipple employed for interconnecting and aligning a plurality of the burner units of FIG. 1;

FIG. 9 is a diagrammatic end view showing how the units of FIGS. 1, 4 and 5 can be assembled to form a furnace arch or tunnel kiln;

FIG. 10 is a similar diagrammatic end view showing how the units of FIGS. 1, 5 and 6 can be assembled to form a rectangular pit or fire box such as for heating a muffle chamber or the like; and

FIG. 11 is an enlarged, fragmentary sectional view showing the action of the flame in a furnace assembled from units of this invention.

All of the units are of equal length and all are pre-cast or pre-molded and preformed from suitable fire-clay or similar refractory, heat resisting material and all are

provided with imbedded, protruding anchor bolts **16** for mounting them on and securing them to any suitable supporting frame structure (not shown).

The burner unit is molded in the form of a rectangular block having two ends **17**, two sides **18**, and a flat back **19**. The front of the block is molded to form two side edge portions **20** lying in a common plane, there being one edge portion along, and extending inwardly from, each of the sides **18**.

An elongated, longitudinally-extending, gas groove **21** is indented in each side edge portion **20**. The gas grooves **21** are rectangular in cross-section and terminate short of the ends **17** to provide closed end portions **22**. The grooves are closed along their outer walls and are completely open along the inner edges of the edge portions **20** throughout the entire length of the latter.

The surface of the burner unit **12** is depressed to form inclined sides **23** extending from each side edge portion **20** to form flame pockets along each side of a medial, flame-deflecting ridge **25**, the top of which is depressed below the surface plane of the unit **12**. The two inclined sides **23** are provided with flame dividers **26** which are molded from the material of the block in uniform spaced relation throughout the length of the inclined surfaces **23** and which act to divide the flame pockets **24** into a plurality of individual, separated, flame pockets throughout their lengths. The flame dividers increase in width as they approach the deflecting ridge **25** so as to exert a compressing effect on the flowing gas.

A medial gas conduit **27** is molded in the block of the burner unit **12** below and parallel to the deflecting ridge **25**. When the burner units **12** are assembled in alignment in a furnace structure the gas is conducted from each unit to the next adjacent unit through the medium of a fire clay tubular nipple **28**, as shown in FIGS. 7 and 8. The ends of the conduit **27** in each unit are counterbored as indicated at **29** to receive the nipple **28**.

A plurality of inclined parallel, flattened, gas passages **30** extend upwardly and outwardly from the conduit **27** terminating in individual nozzle orifices **31** in the bottoms of the two gas grooves **21**. An assembling ridge **32** is molded on two sides and one end of the burner unit.

The arch spacer unit **13** comprises a pre-molded block of fire-clay or other suitable refractory material corresponding in length to the burner unit **12** and having two inwardly inclined side walls **33** substantially equal in height to the height of the sides **18** of the burner unit **12** and which create a block of narrower transverse width at the bottom than at the top. Two similar, top flange portions **34** extend oppositely outward from, and along the upper edges of, the two side walls **33**. Each flange portion **34** terminates in a downwardly extending edge lip **35** having an upwardly and inwardly inclined inner surface. The flange portions project outwardly from the inclined side walls **33** a distance slightly in excess of the width of the side edge portions **20** on the burner unit **12**. An aligning groove **36** surrounds the sides and ends of the spacer unit **13** to receive the ridge **32** of the burner unit **12**.

The straight, side-wall-spacer unit **15** is similar in every respect to the spacer unit **13** except that the side walls are vertical and parallel. The unit **15** also has flange portions **37** provided with edge lips **38** corresponding, respectively, to the flange portions **34** and edge lips **35** of the unit **13**, and with an aligning groove **39** similar to the aligning groove **36**.

The terminal unit **14** is similar to the spacer unit **15** except that one of the flange portions **37** has been omitted leaving a single flange portion **40** provided with a gas deflecting lip **43**. The latter unit is also provided with a peripheral aligning groove **41**.

Let us assume it is desired to build an elongated arched furnace for a tunnel kiln. The elements **12, 13** and **14** are assembled as shown in FIG. 9 in an assembly of any desired length. The units can be retained in place by a conventional metal frame work to which the anchor bolts **16** are connected. The aligned gas conduits **27** connected together by the nipples **28** can be plugged at one extremity of the assembly and connected at their other extremities to a conventional fuel gas supply manifold.

For a square pit or muffle furnace the units **12, 14** and **15** can be assembled, as shown in FIG. 10, to produce a furnace of any desired length or depth such as for enclosing a fire clay or muffle chamber **42**.

Any other desired shape or size of furnace can be quickly built by selected assemblies of the units.

The assembling ridges **32** and the aligning grooves **36, 39** and **41** accurately position, align and retain the units.

It is desired to call particular attention to the action of the burners in the assembled units, as shown in FIG. 11. The intermixed fuel gas and air or other oxidizing medium flows from the gas conduits **27** through the inclined gas passages **30** and discharges from the nozzle orifices **31** against the overhanging top flange portions **34, 37** and **40**. The deflecting lips on the latter direct and spread the gas, smoothly downward over the entire surfaces of all of the inclined sides **23**, as indicated by the arrows in FIG. 11. The flat, flowing streams of gas are divided and compressed into closely spaced streams by the decreasing spaces between the flame dividers **26**.

The closely spaced, rapidly moving streams of gas strike the opposite sides of the deflecting ridge **25** and swirl upwardly and outwardly to create a comparatively high combustion zone **44** between and in spaced relation to the side edge portions **20** throughout the entire assembled length of the abutted burner units.

While a specific form of the invention has been described and illustrated herein, it is to be understood that the same may be varied within the scope of the appended claims, without departing from the spirit of the invention.

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

1. A gas fired wall for furnaces comprising: a plurality of refractory burner elements; a plurality of refractory spacer elements, said spacer elements being interspersed between said burner elements to maintain the latter in spaced relation; an integral burner face on each of said burner elements; a raised side edge portion extending along the two sides of the burner face; a gas groove indented in each raised side edge portion; a medially positioned deflecting ridge projecting from said burner face intermediate and parallel to said side edge portions, said gas grooves opening toward said deflecting ridge so as to direct gas toward the latter; and means for conducting fuel gas to said gas grooves.

2. A gas fired wall for furnaces as described in claim **1** in which said spacer elements are provided with flange portions projecting outwardly from the sides of the forward edges of said spacer elements and overlying the gas grooves of the adjacent burner elements to direct the gas from the latter toward said deflecting ridge.

3. A gas fired wall for furnaces as described in claim **2** in which the surface of the burner face of each burner element inclines inwardly from each of said gas grooves to provide a depression on each side of said ridge.

4. A gas fired wall for furnaces as described in claim **3** having an edge lip formed along each flange portion and directed toward the adjacent inclined surface to direct the gas inwardly into said depression.

5. A gas fired wall for furnaces as described in claim **4** having flame dividers projecting from said inclined surfaces and projecting oppositely outward from said deflecting ridge to guide the gas flowing over said inclined surfaces substantially at right angles to said ridge.

6. A gas fired wall for furnaces as described in claim **5** in which the means for conducting fuel gas to said gas grooves comprises a plurality of individual gas passages molded into each burner element and opening to and along each gas groove; and means for supplying fuel gas to said gas passages.

7. A gas fired wall for furnaces as described in claim **6** in which the means for supplying fuel gas to said gas passages comprises a gas conduit molded in and extending longitudinally of said burner element behind said burner face, said gas passages individually communicating with said gas conduit.

8. A fired wall for furnaces as described in claim **7** in which the gas conduits of longitudinally-aligned burner elements align with each other to form a continuous gas conduit throughout the assembly of elements with refractory nipples connecting the conduits of adjacent burner elements.

9. A gas-fired burner element for furnaces comprising: a refractory block; an indented burner face on said block; a raised, medially positioned deflecting ridge on said indented face; a raised edge portion on opposite sides of said burner face; gas grooves indented in said edge portion; a flange overlying each of said gas grooves to direct gas from the latter toward opposite sides of said deflecting ridge; passages for conducting fuel gas into said gas grooves; and an edge lip on said flange directed toward said indented burner face for directing gas into the indentation therein.

10. A gas-fired burner element as described in claim **9** having flame dividers projecting from and extending oppositely outward from said raised deflecting ridge to divide the flow of gas from gas grooves.

References Cited by the Examiner

UNITED STATES PATENTS

971,117	9/10	Carver	158—104
1,259,215	3/18	Detrick	110—99 X
1,674,422	6/28	Allen	110—99 X
1,857,525	5/32	Beckett	158—106 X
2,274,240	2/42	Ladd	110—99
2,287,246	6/42	Hess	158—7
2,464,333	3/49	McGlaughlin	158—104 X
2,489,459	11/49	Ness et al.	263—2 X
3,141,426	7/64	Zachow	110—9 X

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