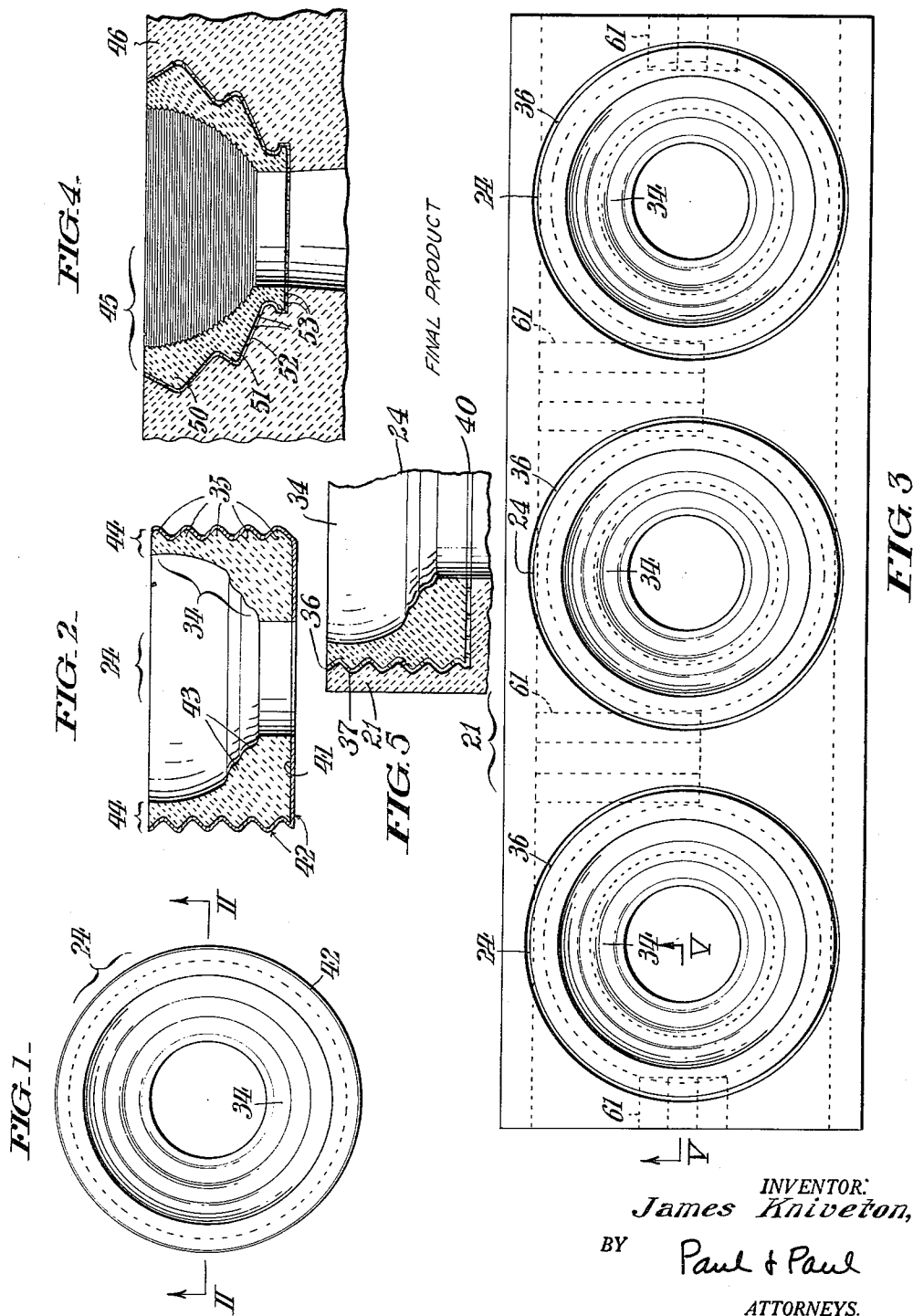


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METHOD OF PRODUCING A COMBINED RADIANT HEAT FUEL
BURNER BLOCK AND REFRACTORY CUP
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METHOD OF PRODUCING A COMBINED RADIANT HEAT FUEL BURNER BLOCK AND REFRACTORY CUP

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1 Claim. (Cl. 25—156)

This invention relates to a fuel burner, and more particularly concerns a method of making a radiant heat burner having a refractory cup which is heated to incandescence by a gaseous fuel flame and which is resistant to the effects of sudden heating or chilling.

It has become commercial practice when operating gas furnaces for heating iron, steel, tin plate and the like, to control the intensity of the heat directed against the work by regulating the distance between the work and the incandescent refractory surface of the gas burner. The patent to Karl L. Dietrich No. 2,668,701, for example, discloses a commercially accepted arrangement for heating a continuously moving tinned metal strip or sheet, wherein a plurality of radiant heat cups, which are often heated to temperatures of about 2800° F. or above, are automatically adjusted toward and away from the strip or sheet to control the intensity of the heat applied to the tin coating as it travels between parallel blocks of burners. In practice, because of production delays or breakdowns, or for other reasons, it is sometimes necessary or desirable to stop the sheet or strip between the blocks of burners. Since the stationary work would otherwise very rapidly become overheated and seriously damaged or destroyed, safety means are provided which automatically operate to draw the burners quickly away from the work. This withdrawal causes rapid chilling of the burner structure and has heretofore resulted in spalling of the incandescent refractories. Entire burners have heretofore been removed from service on this account, and substantial expense and time have been required to accomplish their repair or replacement. In other types of gas burner installations, sudden chilling has caused refractory failures, and this has been a serious problem in the radiant heating art. Spalling of refractories has also been caused by rapid heating of cold burner cups, and this has been a serious problem commercially.

It is an object of this invention to overcome the foregoing difficulties and disadvantages. Other objects and advantages of this invention, including the simplicity and economy of the same, and its adaptability to a wide variety of uses, will further appear hereinafter and in the drawings, whereof:

FIG. 1 represents a plan view of a radiant heat cup or liner comprising an important part of this invention;

FIG. 2 represents a sectional view taken as indicated by the lines and arrows II—II which appear in FIG. 1;

FIG. 3 represents a plan view of a burner block embodying features of this invention;

FIG. 4 represents a sectional view similar to FIG. 2 illustrating a combined burner block and refractory cup constituting a modified form of the invention; and

FIG. 5 shows a sectional elevation, on line V—V of FIG. 3, of the burner cup of FIG. 2 after the cup has been fired with a burner block.

The burners of the present invention are of the general type shown in Hess Patent 2,215,079, and comprise, as shown in that patent, a distributor tip for discharging jets of fuel and air radially from the base of the cup along the surface thereof. The fuel and air jets burn

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along the surface of the cup to heat it to incandescence. The burner cup may be formed in a burner block that is placed in a furnace wall, or the cup unit may be made separate from the burner block and cemented thereto as shown in Hess Patent 2,287,246.

Means are provided in accordance with this invention for creating a loose fit between the cup 24 having a bowl-shaped refractory surface 34 and the burner block 21. It will be observed that the surface of cup 24 carries screw threads 35, and that the corresponding recess in block 21 is similarly threaded, the respective sets of threads being so dimensioned that a substantial clearance space 36 is provided between them. As shown in FIG. 5, ash particles 37 are located in the clearance space 36. At the back of the cup 24 is another clearance space 40, between the cup and the burner block. Space 40 also contains ash particles 37.

Although various methods may be employed for providing the loose fit just described, it is highly preferred to proceed in the following manner. A refractory material is pressed into the shape of the cup 24 shown in FIGS. 1 and 2. The cup is fired and cooled. The threads 35 and back 41 are painted with a layer of combustible paint 42. The cup is then placed in a fixed position and the block 21 is poured or moulded around the back of cup 24. The block 21 is air-dried, and the block and cup are fired together. This burns off the combustible paint layers, producing the clearance spaces 36 and 40 which contain the ashes of the combustible paint. It is desirable in some cases to substitute a combustible paper layer for the combustible paint, and other equivalent means may be substituted.

FIGS. 1 and 2 show in further detail the preferred form of the removable cup or liner 24. The bowl-shaped refractory surface 34 includes a plurality of curved depressions 43 which serve to pilot the flame. The wall 44 of cup 24 is of thin cross section.

FIG. 4 shows a modified construction wherein the cup 45 is locked in position relative to the burner block 46. The outer surface of cup 45 is not threaded as is the cup shown in FIGS. 1 and 2, but has two ring-shaped projections 50, 51, each having an upper surface that extends outwardly away from the axis of the bowl and a lower surface that extends inwardly toward the axis of the bowl. The intervening space 52 contains ash 53. The structure of FIG. 4 may be produced by pouring the burner block around the cup (utilizing an intervening layer of combustible material), allowing the block to dry, and firing.

FIG. 3 discloses a fabricated multiple-bowl set which is adapted for installation in a furnace wall. Three burner cups 24 are combined with a single burner block 21. The burner block 21 has recesses 61 adapted to house anchor bolts which serve to secure the block to the outer shell or wall of a furnace. Making a plurality of cups in a single block expedites the construction of a furnace and also assures accurate placement of the cups relative to one another, without requiring the use of templates, etc., which are usually necessary. Preferably, each block is provided with a plurality of cups and the blocks are made to hold the cups in sets of two or three. By alternately spacing the two- and three-cup blocks in a furnace, desirable temperature distribution characteristics can be obtained. Additionally, the use of the blocks reduces the number of bricks to be laid in forming the furnace, and permits the use of skilled labor more efficiently.

It will accordingly be appreciated that the combination of features including removable cups, thin cup walls, spacing between the cups and burner block, and means for maintaining said spacing, provides for the first time a practical radiant heat gas burner which is highly resistant

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to the effects of sudden chilling, even if this occurs at incandescence. The combination also resists the effects of sudden heating, even when the burner cups are cold. In either case of cooling or heating, thin walls of the cup do not build up excessive internal stresses, and they have capacity to expand and contract independently of the burner block or furnace wall. And even if the new refractory cup should become damaged, which is almost never caused by thermal shock alone, it can in many cases readily be removed from the burner block and replaced without tearing down the wall of the furnace. When a cup is being replaced, the new cup is preferably given a coating of combustible paint or the equivalent and then fired after insertion to burn off the combustible coating.

Although this invention has been described by reference to specific embodiments thereof, it will be apparent to those familiar with gas heated furnaces that the burners may be modified in many respects, and that they may be arranged in different ways in a furnace. The burners may be mounted in the walls, ceiling, or floor of a furnace, for example, or any desired combination of these. Accordingly, the term "walls" is used herein in a broad sense, and is intended to include ceilings, floors, and the like.

It will further be appreciated that various changes other than those referred to in the specification may be made in the form of the apparatus, that equivalent elements may be substituted for those illustrated in the drawings, and that certain features of the invention may be

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used to advantage independently of the use of other features, all within the spirit of the invention as defined in the appended claim.

Having thus described my invention, I claim:

In a method of producing a radiant heat burner structure, the steps which comprise firing an externally threaded refractory cup, applying a coat of combustible paint to the external threads, pouring an insulating block around said painted threads, air-drying said block, and firing the resulting structure thereby burning off said combustible paint and forming a loose fit between said cup and said block with ashes between the threads.

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