July 21, 1953 A. H. BRODBECK 2,646,112

GAS BURNER HAVING PARTITIONED OUTLET PORTS

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Fig. 1

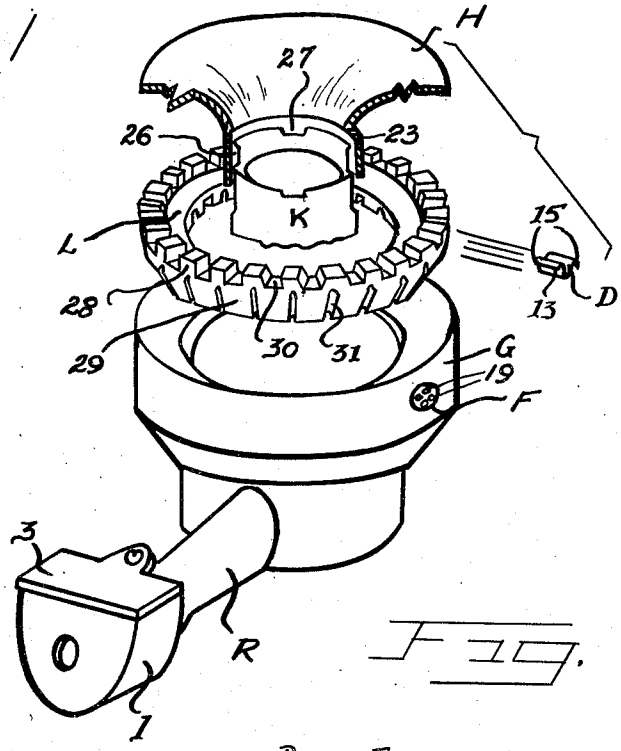


Fig. 2

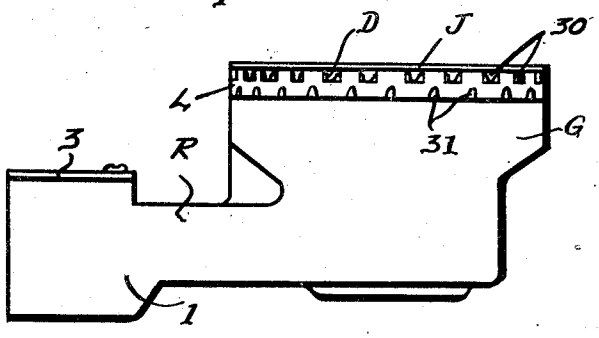
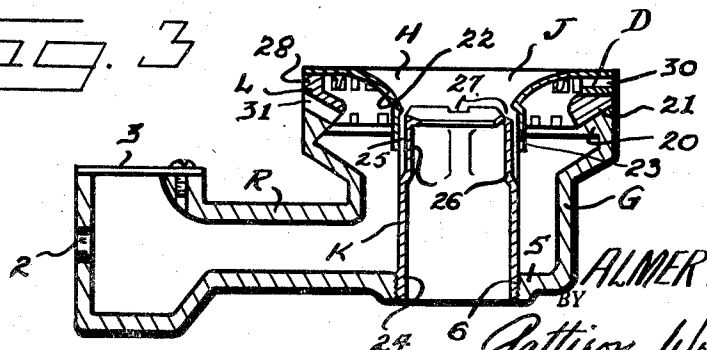


Fig. 3



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GAS BURNER HAVING PARTITIONED OUTLET PORTS

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5 Claims. (Cl. 158—116)

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This invention relates to a gas burner embodying improvements and novel features of construction whereby the following purposes and advantages as well as others, which will be understood by those skilled in the art, are attained.

First, the burning of a large amount of fuel with complete combustion in a circular burner of small diameter.

Secondly, a burner port arrangement and construction in which the flame will carry around the burner from one port or group of ports to the other when the burner is ignited at a single point.

Thirdly, a burner port arrangement and construction which will accomplish the immediately preceding purpose and in which flashback of the flame will not occur when a fast-burning gas is being burned.

Fourthly, the attainment of an excellent heat distribution from the peripheral ports of the burner when used in conjunction with central ports.

Advantages and benefits not specifically enumerated above are obtained as will be clear from the following description and obvious to those skilled in the art.

The production of a gas burner which will accomplish the listed purposes requires the embodiment of the inventive concept constituting the present invention. The production of such a burner has long been sought but to my knowledge has not been accomplished. The accomplishment necessitates the solution of difficult problems as will be understood by those skilled in the art and as will be hereinafter pointed out.

The burner must operate with completeness of combustion to be acceptable. The burner must be operable with many different kinds of gases which are used in different sections of the country. A definite gas input to a burner requires a definite amount of air for good combustion. The port area of a burner is a major determining factor in the amount of primary air which is delivered to the burner head along with the fuel but as the present type of domestic burners do not inject sufficient primary air for complete combustion provision for a supply of sufficient secondary air is necessary. The secondary air supply requirement has called for a spacing of the burner ports so that fresh secondary air can mix with or be delivered to the flames issuing from or burning at the burner ports. If the port spacing places the ports too close together there is insufficient supply of secondary air and incomplete combustion results. However, if the ports

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are spaced too far apart an undesirable burner having an extremely large head diameter results and the flames fail to carry from one port to another about the burner when the burner is ignited at a single point.

Port area or port size and the disposition of one port in respect to its adjacent port is of extreme importance. If the ports are too large the flame flashes back through them and yet it is necessary to have large port area to consume the maximum amount of gas to obtain maximum heating. As mentioned, ports which are spaced too far apart cause a failure of ignition between adjacent ports. The greatest flexibility through a wide range of the smallest to the largest fuel inputs is obtained, in a circular or ring gas burner, where the physical dimension, that is the diameter, is reduced to the greatest possible degree. In small diameter burners however it has been difficult to obtain the port area required to consume the maximum amount of gas because of the closeness of the ports which leaves insufficient space between the ports to properly aerate the flame to obtain complete combustion.

To accomplish the enumerated results and at the same time solve the problems incident to the production of an efficient and properly operating burner I have provided a burner having a burner ring provided with a plurality of main burner ports of comparatively large size which ports are in spaced relationship around the burner and are subdivided so that they are not subject to the flashback of flame as is commonly the case with ports of large area. Intermediate the main large subdivided ports I have positioned intermediate ports of a size sufficiently large to operate satisfactorily in carrying the flame from one large subdivided port to an adjacent like port yet small enough to permit a sufficient flow of fresh secondary air to the burner ring between the flame stools of the main large subdivided ports to result in complete combustion.

Ports in a burner which are large enough to add up to the desired port area are too great in size to burn fast burning gas without the flame flashing back but this flashback is prevented at the large main ports of my burner because the subdivision of these ports create of each large port a group of small ports each of which is sufficiently small in size as to prevent flashback. The subdivision of these large ports is made in a manner so that the group of ports created by the subdivision burns as a single flame stool. The large ports are subdivided into a multiple of substan-

tially parallel small ports which are sufficiently closely adjacent for the flames burned by them to coalesce into one large flame which receives complete secondary air aeration by reason of the considerable space which exists between the groups of subdivided ports.

The subdivision of ports of substantially large areas is very important because it furnishes the required and desired port area, in a small diameter burner, to burn the maximum amount of gas. Should a drilled port burner be provided with enough ports of a size to prevent flashback and having a total port area sufficient to burn the maximum amount of gas such a burner would have too large a burner head diameter. This would be because sufficient wall thickness must be allowed between individual ports to prevent the drilled holes from running into each other. The same situation exists in respect to a cast burner ring or cap. Here again, manufacture requires that sufficient thickness of metal be allowed between ports as to result in a burner ring or cap having too large a diameter. With my subdivided large ports a large amount of port area can be obtained in a burner having a ring, cap, or head of small diameter.

In the accompanying drawings a burner construction embodying the inventive concept is illustrated but the invention is not to be limited to these specific arrangements as departures therefrom can be made without departing from the inventive concept.

In the drawings:

Fig. 1 is a perspective view of a modified form of burner, the parts thereof being in unassembled relationship.

Fig. 2 is a view in side elevation of the burner of Fig. 1.

Fig. 3 is a longitudinal vertical sectional view of the burner of Fig. 2.

In its broadest aspects the burner appearing in the accompanying drawing is of the type disclosed in United States Letters Patent 1,714,409, dated May 21, 1929, and issued to A. Stockstrom et al. This similarity resides in the fact that the burner has a bowl or chamber to which a mixture of air and gas is injected and from which it flows to the burner ring or head which closes the open upper end of the bowl and is provided with ports through which this gas escapes and burns in a plurality of burner stools exteriorly of and about the head. Specifically the burner differs however from the patent as will be clear from the following detailed description.

The burner bowl or chamber G has an upper inturned edge or end **20** the upper face of which is bevelled as at **21**. There is a mixing tube or manifold R with an inlet passageway **2** provided with an air control shutter **3**. The bottom **5** of the bowl is provided with a threaded opening **6**.

The burner head, designated as an entirety by H, comprises a cap J which is made of sheet metal. This cap in plan view is circular in configuration and is provided centrally with an opening the wall **22** of which is bent downwardly and outwardly to provide a curved surface. At its lower end the wall **22** is formed into a circular collar **23** having a lower open end. A hollow open-ended tube K has its upper end telescopically received by the collar and suitably secured therein, as by welding, and has its lower end provided externally with threads so that the tube has threaded engagement with the opening **6** of the burner bowl as at **24**.

The tube at spaced points about its circumference is depressed as at **25** to form a plurality of longitudinally extending passageways **26** between itself and the collar **23**. The lower ends of these passageways communicate with the burner bowl while the open upper ends **27** constitute inner burner ports for the burner head.

A burner ring L is secured to the underside of the burner cap in any suitable manner, such as by welding, and has an outer vertically disposed wall **28** and an inclined or tapered bottom wall **29**. The top of the ring at spaced points completely about its circumference is cut out to provide a plurality of large area main burner ports **30**. Each of the main large burner ports is subdivided into multiple ports by a port divider D. This divider is preferably made of stainless steel and made from a material which is extremely thin. Each divider is of a length similar to the length of a main port and of a height similar to the height of a main port. Specifically each divider is substantially U-shaped and comprises substantially parallel side walls **13** and **14** with the side walls terminating in rearwardly or return bend ends **15**. The ends **15** of the dividers are in slight compression when inserted into a burner port and by reference to the drawings it will be seen that a divider subdivides each main burner port into three passageways or ports which hereinafter are on occasion referred to as a group of ports.

The secondary or intermediate burner ports, one of which is disposed between each of the subdivided main burner ports, is in the form of a channelway **31** formed in the tapered bottom **29** of the ring. The inner ends of these ports are in communication with the burner bowl while the outer ends of the ports communicate with the atmosphere exterior of the burner head. When the burner head is in place and the tapered bottom of the ring is in engagement with the tapered top **21** of the bowl it will be seen that the bottoms of the intermediate ports are on a lower level than the bottoms of the main large area subdivided burner ports. It is to be noted however that no advantage has been found in having the intermediate ports on a different level rather than on the same level with the main burner ports.

When a lighter system is to be used in conjunction with the burner the burner bowl is provided in its side wall with a lighter port F which is composed of a plurality of grouped burner ports which receive fuel from the bowl. The lighter ports are disposed in ignition relationship with one or more of the burner ports of the burner head to cause ignition thereof when the lighter port is ignited by the lighter system. Upon one or more of the burner head ports being ignited the flame will travel from port to port around the head to cause complete ignition of the burner.

The use of a lighter port consisting of a plurality of small closely grouped ports has been found to be advantageous and to constitute an improvement. Where, as in the past, a lighter port consisting of a single orifice is utilized orifices of different sizes are required for the various gases used throughout the country, as for instance, a large port for natural gases; an intermediate sized port for mixed gases; and a small sized port for manufactured gases. The group type of lighter port of the present burner supplies sufficient fuel for slow burning gases such as natural gases, yet are individually small enough to prevent flashback of fast burning gases

such as manufactured gases. The arrangement therefore eliminates the necessity of supplying lighter ports of different sizes for use with different kinds of gases and presents an arrangement where the same lighter port can be used universally with all gases.

It is of importance to have the intermediate or secondary burner ports large enough yet small enough to function properly. These ports are large enough if they supply sufficient gas to burn a flame which will ignite the fuel issuing from the adjacent main burner ports and to remain burning at a very low turn-down of gas supply by the burner gas flow control valve. These ports are small enough when they are of such a size as not to interfere with adequate and complete secondary aeration of the adjacent main burner ports and to not flashback when the burner is operating on fast burning gases.

The assembly of the burner is extremely simple and is accomplished merely by bringing about threaded engagement between the lower end of the tube K and the threaded opening 6 in the bottom of the burner fuel bowl. The burner head is rotated until the bottom wall 29 of the burner ring L thereof is brought into engagement with the inturned upper edge 20 of the bowl.

The burner described accomplishes the enumerated advantages. The burner head is comparatively small as to diameter and yet there is sufficient port area to consume the maximum amount of gas to obtain excellent and efficient heating. There is complete secondary aeration of the flame stools at all of the burner ports with a consequent completeness of combustion. The novel arrangement of subdividing a too large main burner port into a plurality of proper size burner ports provides a large amount of port area with a burner head or ring of comparatively small diameter. The ignition of one burner port will carry around the burner ring from port to port and thus assure easy and proper ignition. The burner is comparatively simple of construction and therefore can be manufactured at a most reasonable cost. The burner head can be quickly removed from and replaced on a burner which facilitates cleaning the burners and also makes it possible to quickly substitute a burner head if for any reason the one in use requires replacement.

What I claim is:

1. An improved circular gas burner of small diameter but having a large aggregate burner port area, said burner comprising a circular fuel mixture receiving chamber having an open upper end, a circular burner head, said head comprising a metallic cap carrying on its bottom a cast

ring having a plurality of radially extending spaced apart channelways, the inner ends of said channelways communicating with the fuel mixture chamber and the outer ends of the channelways communicating with the atmosphere exterior of the chamber, alternate of said channelways being of large area and having open tops closed by the burner cap, the intermediate channelways being in the bottom of the ring and having open bottoms closed by the upper end of the side wall of the fuel mixture chamber, and means in the large area channelways subdividing each of them into a plurality of side by side small channelways, and all of the aforementioned channelways constituting the burner ports of the burner.

2. A construction as defined in claim 1 wherein, the means for subdividing the large area channelways comprises an element formed from an extremely thin piece of material, whereby the group of channelways formed in each large channelway are in close proximity to one another.

3. A construction as defined in claim 1 wherein, the means for subdividing the large area channelways comprises a U-shaped metallic element formed from an extremely thin piece of metal, and said element extending substantially throughout the height and depth of the channelways and dividing each of them into a group of channelways.

4. A construction as defined in claim 1 wherein, the bottoms of the large area channelways and the bottoms of the intermediate and small area channelways are on a different plane.

5. A construction as defined in claim 1 wherein, the intermediate and small area channelways are inclined upwardly and outwardly in respect to the fuel mixture chamber.

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