

May 21, 1946.

R. HERMANN

2,400,508

GAS COOKER

Filed May 22, 1943

3 Sheets-Sheet 1

FIG. 1

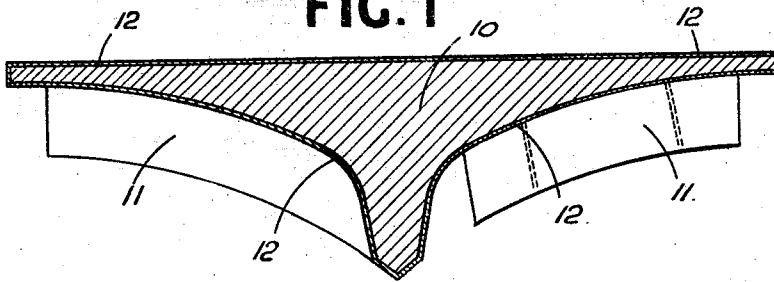


FIG. 2

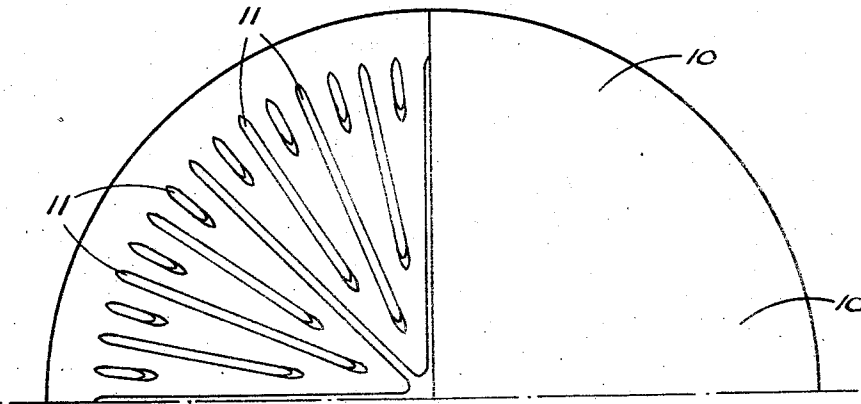
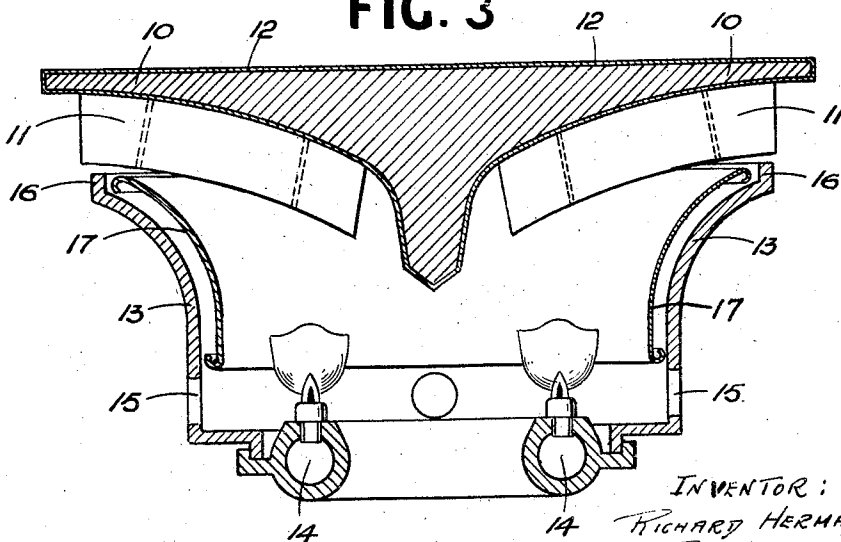


FIG. 3



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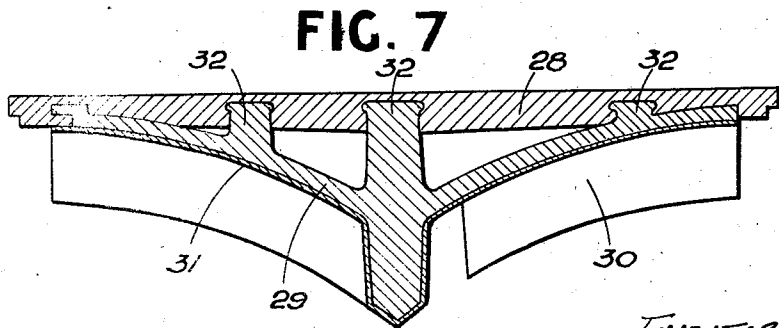
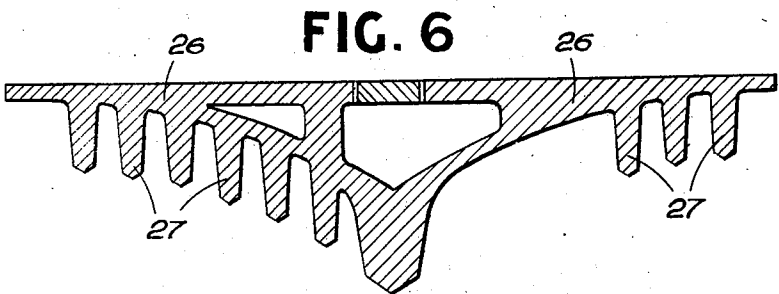
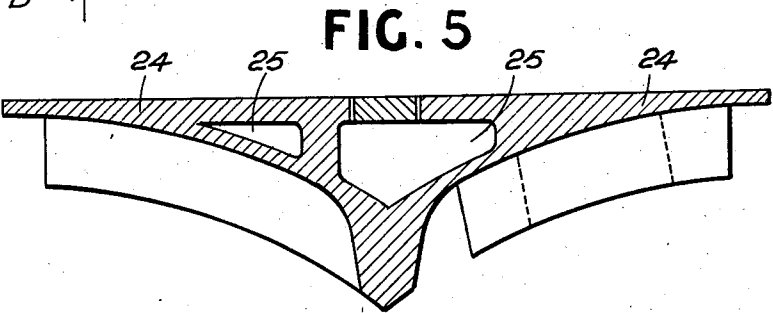
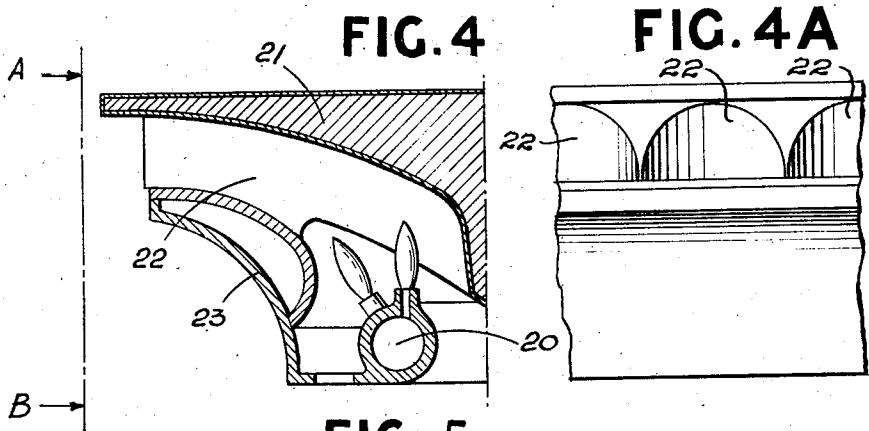
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GAS COOKER

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FIG. 8

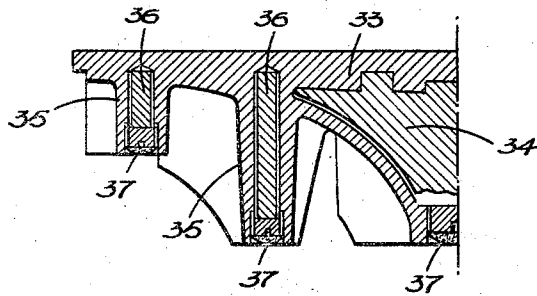


FIG. 9

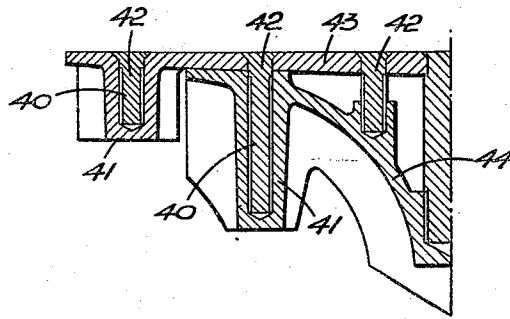
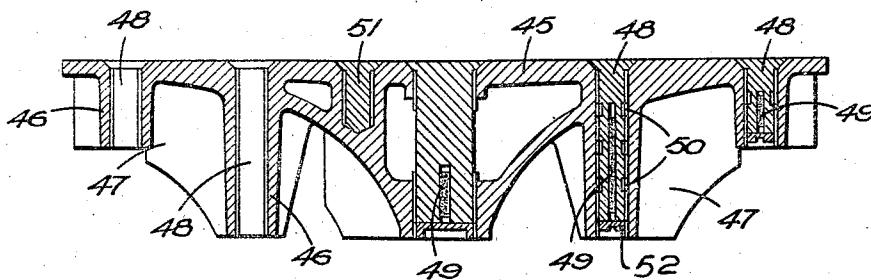


FIG. 10



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GAS COOKER

Richard Hermann, Sutton Coldfield, England

Application May 22, 1943, Serial No. 488,101
In Great Britain May 22, 1942

9 Claims. (Cl. 126-215)

This invention relates to improvements in gas cookers.

In the ordinary gas cooker which is in general use the top or hot plate comprises a number of open gas rings or burners arranged below skeleton supports for cooking utensils. The utensils are heated directly by the flames and hot products of combustion from the burners. Tests show that the efficiency of this method of heating is between 40 and 50 per cent. Part of the loss is due to the fact that the rate of heat transference from a gaseous medium to a solid medium is comparatively low and the products of combustion are in contact with the surface of the utensil only for a relatively short period of time as they flow over it.

Cookers are also known in which the burners are arranged below imperforate plates or rings on which the utensils are placed, but the plates or rings are made of cast-iron to resist corrosion by the products of combustion and cast-iron is a comparatively poor conductor of heat so that there is a considerable heat loss between the burner and the utensil. Some of these known plates have been made with substantially flat tops but having the thickness varying progressively from a maximum at the center to a minimum at the outer edge in order to obtain an even distribution of heat over the whole area of the plate. Thus in a square plate the bottom surface has had the form of a shallow inverted pyramid and in a round plate the bottom surface has had the form of a shallow inverted cone. Such plates when heated by direct contact with the flames of an aerated or luminous gas burner are liable to undercool the impinging flames, leading to incomplete combustion of the gas and the formation of carbon monoxide. To overcome this the gas can be burned with an excess of secondary air so that the products of combustion contain only 20% instead of 80% of possible carbon dioxide content but such an excessive dilution of the products of combustion lowers the mean temperature of the gases and decreases the temperature gradient between the gases and the cold plate. It also introduces a fresh problem, namely the removal of the greatly increased volume of hot gases from around the plate without having recourse to artificial ventilation. Another way of dealing with this problem would be to mix gas and air in the correct ratio for combustion before their entry into the burner so that no secondary air is required. However, it has so far been impossible to design a burner with such high aeration which is flame-proof at all inputs. The rea-

son for this is that if the aeration is correct at full pressure the aeration is lowered at lower pressure and overheating of the burner occurs with lighting back. If a gauze is used to make the burner flame-proof the heating of the gas causes a big reduction in aeration with consequent incomplete combustion.

Another way of approaching the problem is to arrange the burner inside a bell spaced from the plate so that the combustion is complete before the hot gases reach the plate. The hot gases then have to rise upwardly until they reach the lower surface of the hot plate and are turned horizontally outwards. This diversion causes a back pressure in the stream of hot gases which will affect combustion if the draught within the bell, which acts as a draught inducing combustion chamber, is not greater than the sum of the resistance to the sudden change in the direction of the gases and the frictional resistance to flow over the underside of the cooker top surrounding the plate. In the case of a plate having a shallow pyramidal or conical underside, this combined resistance would require a bell of such depth that it could not be housed inside a normal domestic cooker without increasing the total height of the cooker beyond practical dimensions.

According to my invention the underside of a solid hot-plate is made of such a streamlined form that the hot gases are deflected in a smooth curve from a vertical to a horizontal direction while retaining enough inertia to overcome the resistance of the cooker top surrounding the plate against the rapid removal of the products of combustion. This enables a bell of reasonable dimensions to be used and also allows the burner to fulfill all the regulations on combustion at all inputs.

One object of my invention is to provide a solid hot-plate or ring in which the overall efficiency is considerably increased and which is free from the danger of warping or distortion.

According to my invention a heated ring or plate to receive a cooking utensil comprises a plate or disc which is preferably made of or incorporates a material of high heat conductivity and which has a substantially flat top but varies in depth from a maximum at the centre to a minimum at the outer edge so that there is a minimum temperature gradient over the area of the plate and the distribution of heat is substantially uniform so that the plate is not liable to warp in use.

Preferably the underside of the plate is formed with depending radiating ribs, fins or pegs to pro-

vide the necessary area for the reception of heat from a burner or burners located below the plate.

Any material such as copper having a high heat conductivity and having a melting point sufficiently far above the working temperature can be used for or incorporated in the plate but as these materials are liable to corrode rapidly, the whole surface of the plate, or at least that part of the plate which is exposed to the products of combustion from the burners or burners, is coated with a relatively thin layer of heat and corrosion resisting metal or with a layer of one or more metals. This coating may conveniently be applied by spraying.

The plate is preferably combined as a unit with a burner and support which considerably increases the efficiency, and the support may provide a surface by which heat is reflected back on to the plate.

Some practical forms of hot plates or rings in accordance with my invention are illustrated by way of example in the accompanying drawings in which:

Figure 1 is a cross-section of a simple form of plate.

Figure 2 is a plan view of one-half of the plate of Figure 1 in half-section.

Figure 3 is a vertical section of a plate, support and burner assembly.

Figure 4 is a section of one half of a modified form of assembly.

Fig. 4a is a partial side view taken on line A—B of Fig. 4.

Figures 5, 6 and 7 are vertical sections of modified forms of plate.

Figures 8 and 9 are vertical half-sections of further modified forms of plate.

Figure 10 is a vertical section of a further modification.

The plate 10 shown in Figure 1 is made as a casting, forging or hot stamping in copper or other metal of high heat conductivity. The plate is circular in plan and the upper surface is flat to receive a cooking utensil while the under surface is of inverted curved conical outline increasing progressively in depth towards the centre, the thickness of the plate diminishing gradually towards the edge, so that when the plate is heated by a burner or burners below it the temperature over the area of the upper surface of the plate is substantially uniform. On the underside of the plate are depending fins 11 of substantial depth, the lower edges of the fins being substantially parallel to the underside of the plate. These fins radiate from the centre of the plate and some of them extend as shown from the centre to the outer edge while shorter fins are interposed. The fins are shown as being made as integral parts of the plate but in an alternative method of construction the fins may be made of extruded or other copper strips which are located in a mould while the plate is cast on to them.

Ribs or pegs may of course be used instead of fins. The surface of the plate or at least the lower surface and the fins are coated by spraying or by any other convenient method with one or more thin layers 12 of metal resistant to heat and to acids and alkalis, the coating being sufficiently thick to protect the copper against corrosion without seriously affecting the transference of heat. The coating layers may be of alloys of iron or steel, chromium, aluminum or other metals.

The plate is conveniently combined as a unit

with a burner and support designed for it as shown in Figure 3. This support comprises a metal shell 13 of inverted frusto-conical or bell shape in the bottom of which is mounted a burner or ring of burners 14. Openings 15 for the admission of air are provided around the shell adjacent to its base, and the plate is supported on the shell by the engagement of a small number of spaced points on the ribs or fins 11 on the underside of the plate with an upstanding lip or flange 16 on the shell so that there is a minimum transference of heat by conduction from the plate to the shell. The tapered or curved underside of the plate in conjunction with the ribs or fins provides a large number of upwardly and outwardly curved semi-streamlined passages for the products of combustion, and the effective area of the fins progressively increases towards the outer edge of the plate in inverse ratio to the progressively decreasing temperature and velocity of the products of combustion.

The shell 13 may be lined with a moulded lining 17 of heat insulating material such as steatite or fireclay, as shown on the left of Figure 3, which reduces to a minimum the heat taken by the shell, and the smooth surface of the lining reflects back the heat radiated from the burner flames and from the underside of the plate. To increase this effect the surface of the lining may be coated with a bright or polished metal layer sprayed or otherwise deposited on it.

The burners 14 may be of the non-aerated or luminous flame type as shown in Figure 3 or they may be of the aerated Bunsen type, and the flame may or may not impinge directly on the fins and the underside of the plate.

The form of the plate gives substantially even distribution of heat over its area with consequent even heating of the utensil placed on it and freedom from warping of the plate. Further there is a minimum of risk of smothering of the products of combustion before complete combustion has taken place.

Figure 4 shows a modified arrangement in which an aerated burner 20 is used and the plate 21 is provided on its lower face with a series of radially extending curved concave channels 22 of such form as to give the bottom of the plate a stream-lined upwardly curved shape from the center to the outside thereof, the plate being supported on a shell similar to that shown in Figure 3.

Figure 5 shows a plate 24 in which a number of recesses 25 are formed to control the uniformity of the heat distribution.

Figure 6 shows a similar plate 26 in which the fins are replaced by pegs 27.

Figure 7 shows a composite plate in which the flat upper surface 28 of the plate on which a utensil is placed is of cast-iron while the lower surface 29 of the plate and the fins 30 are of copper, coated with a surface layer 31 of heat and corrosion resisting material. The two parts are keyed together by headed projections 32 on the copper embedded in the cast-iron, and the plate may be formed by placing the copper part in a mould and casting the iron on to it.

Figure 8 shows a cast-iron plate 33 having inserts of copper or other material of high heat conductivity. There is a central cavity in the plate into which is cast an insert 34 and on the underside of the plate are spaced integral pegs 35 into which are screwed copper or other studs 36, the lower ends of the holes being closed by

iron or other plugs 37 welded in position after the studs 36 have been inserted.

Figure 9 shows a modified arrangement in which copper or like studs 40 are screwed into openings drilled from the upper surface of a cast-iron plate into integral pegs 41 projecting from the lower surface of the plate. The upper ends of the inserts are rivetted over as shown at 42 into countersunk recesses at the upper ends of the openings. The plate itself is formed in two parts 43 and 44 for convenience in manufacture, and the studs 40 serve not only to transmit heat through the plate from the bottom to the top but also to secure the two parts of the plate together.

Figure 10 shows a cast-iron plate 45 having integral pegs 46 connected by fins 47 projecting from its lower surface. Copper or like studs 48 extend right through the plate and the pegs. The studs may simply be screwed in and rivetted over as shown on the left of Figure 10. Alternatively to ensure effective contact between the copper and the iron the studs may be slotted from the lower end and wedge strips 49 are forced into the slots to expand the studs as shown on the right of Figure 10. Annular grooves 50 may be formed around the studs to allow for unequal expansion. Shorter copper or like studs 51 may be imbedded in the plate at intermediate points. Where the studs extend through the plate their lower ends are protected by ferrous plugs 52.

I claim:

1. A cooking utensil supporting device for a gas cooker, comprising a plate having a substantially flat top and an inverted curved frusto-conical bottom surface, radially extending heat-receiving fins projecting downwardly from the bottom surface, means for supporting the plate, and gas burner means for heating the plate from below.

2. A cooking utensil supporting device for a gas cooker, comprising a plate having a substantially flat top and an inverted curved frusto-conical bottom surface, spaced pegs projecting downwardly from the bottom surface of the plate, means for supporting the plate, and gas burner means for heating the plate from below.

3. A cooking utensil supporting device for a

gas cooker, comprising a composite plate having an upper member of cast-iron with a flat top and a lower member of metal of high heat conductivity with an inverted curved frusto-conical bottom surface, heat receiving members projecting downwardly from said bottom surface, and a coating of heat and corrosion resisting material on said bottom surface and said heat receiving members, the upper and lower members being rigidly keyed together.

4. A cooking utensil supporting device for a gas cooker, comprising a built-up plate having an upper member of cast-iron with a flat top and a lower member of cast-iron with an inverted curved frusto-conical bottom surface, heat receiving projections extending downwardly from said bottom surface, and inserts of a metal of high heat conductivity incorporated in the plate and extending into both members to convey heat from the bottom to the top of the plate.

5. A cooking utensil supporting device for a gas cooker, comprising a composite plate having an upper member with a flat top, a lower member with an inverted frusto-conical bottom surface, heat receiving projections extending downwardly from said bottom surface, and inserts of a metal of high heat conductivity incorporated in and extending between said members and into said projections.

6. A device for supporting a cooking utensil, comprising a plate having a substantially flat upper surface and having a lower surface which is substantially vertical adjacent the center and progressively varies in inclination from the center to the outer edge at which it is substantially horizontal.

7. A device according to claim 6, comprising in addition radially extending fins depending from the lower surface and being shaped similarly thereto.

8. A device according to claim 6, in which the upper surface of the plate is formed of cast iron and the lower surface is formed of copper.

9. A device according to claim 6, comprising in addition a plurality of separated members attached to the lower surface and projecting downwardly therefrom.

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