May 21, 1963 J. E. DAVIS 3,090,371

COMBINED BAKING OVEN AND BROILER APPARATUS

Filed Oct. 10, 1960

2 Sheets-Sheet 1

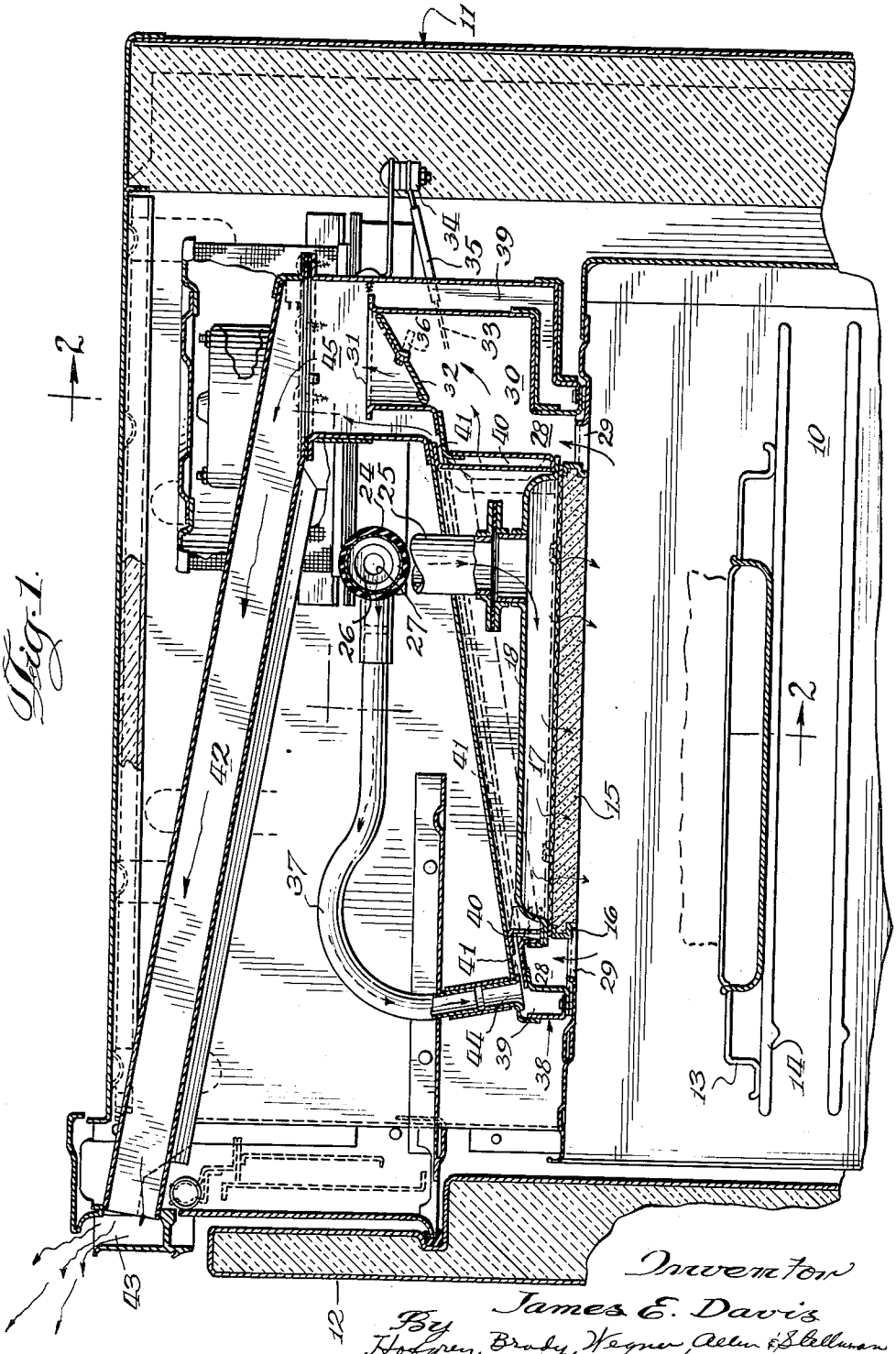


Fig. 1.

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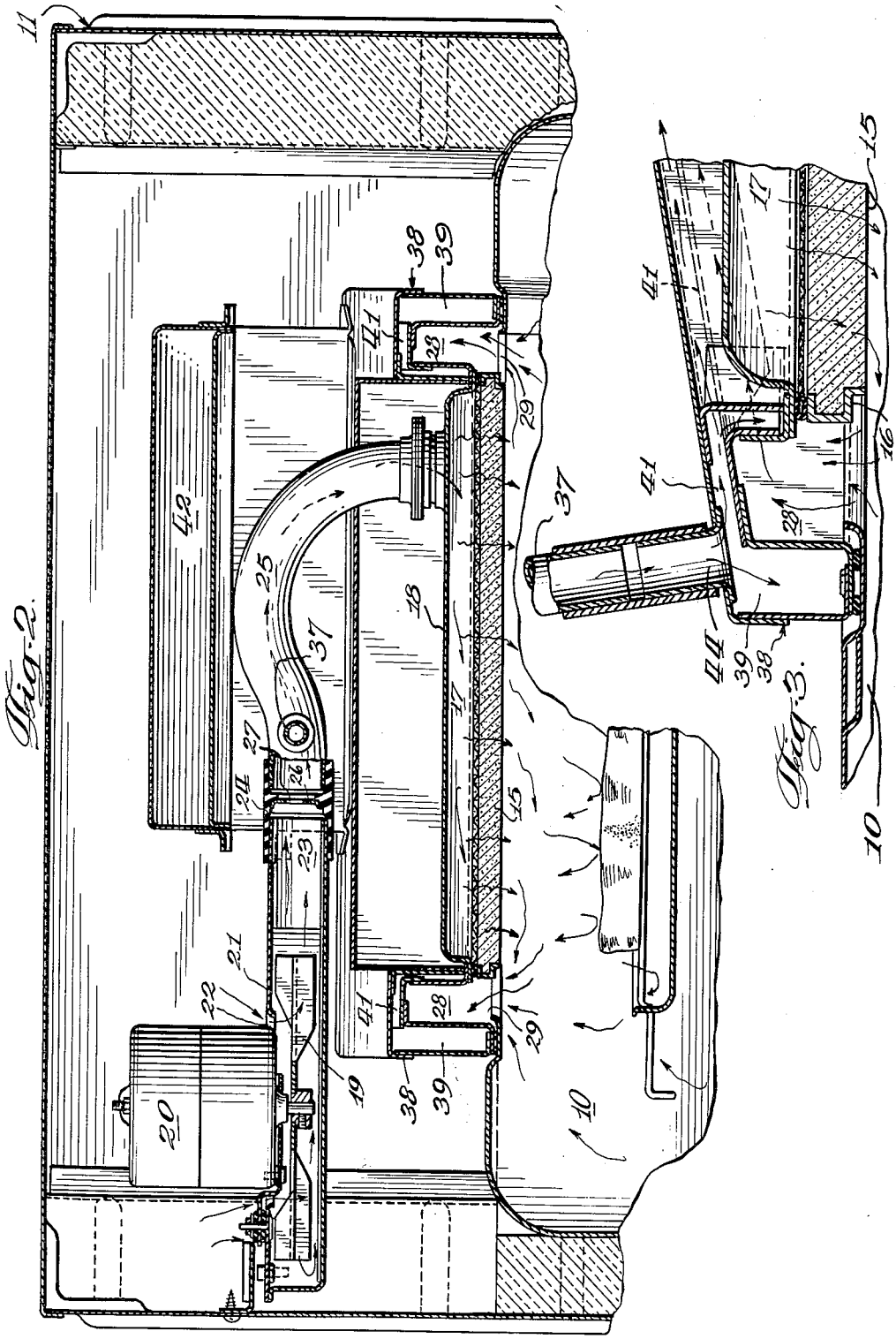


Fig. 2.

Fig. 3.

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COMBINED BAKING OVEN AND BROILER APPARATUS

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This invention relates to a heating apparatus and particularly an apparatus for conveying heated gases away from a chamber such as a combined oven and broiler.

In the copending application of Hanson et al., Serial No. 47,188, filed August 3, 1960, and assigned to the same assignee as the present application, there is disclosed a combined oven and broiler construction specifically using a porous plate burner and including means for conveying heated gases such as those evolved during a broiling operation away from the burner. In this copending application these heated gases are directed in such a manner that combustible gases such as smoke are consumed before the gases are evolved from the unit.

In the present invention means are provided including a cooling air passage in thermal conducting relationship with the exit passage for the heated gases in order to extract heat from the gases. Subsequently this cooling air is then mingled with the heated gases to form a mixture that is cooler than the heated gases and this mixture is then ejected from the apparatus.

One of the features of this invention therefore is to proved an improved heating apparatus comprising means forming a chamber, a heat supply member therein, means forming an exit passage for heated gases from the chamber and means forming a cooling air passage in thermal conducting relationship with this exit passage means for extracting heat from the gases therein with the cooling air passage emptying into the heated gases exit passage at an area spaced from the entrance to the exit passage for intermingling the cooler air with the gases.

Other features and advantages of the invention will be apparent from the following description of one embodiment thereof taken in conjunction with the accompanying drawings. Of the drawings:

FIGURE 1 is a fragmentary sectional view illustrating the upper portion of a combined oven and broiler embodying the invention.

FIGURE 2 is a sectional view taken substantially along line 2—2 of FIGURE 1.

FIGURE 3 is an enlarged detail view of a portion of FIGURE 1.

In the embodiment of the drawings there is provided an oven 11 including a baking space chamber 10 formed in the oven 11, a front access door 12 and a movable rack 13 adapted to be supported in various positions on supporting members 14.

Located in the top of the chamber 10 is a porous plate burner 15 of conventional construction that is substantially rectangular in shape and that is supported by an inwardly grooved side sheet metal rim 16. The rack 13 for supporting food to be broiled in the manner illustrated in FIGURE 2 is adapted to be located beneath the burner plate 15. The top surface of the burner plate 15 is provided with a chamber 17 bound by the top surface of the plate 15 and an enclosing shell 18 of sheet metal.

The chamber 17 above the burner plate 15 is supplied with a mixture of combustible gas from an ordinary supply pipe (not shown) and air under pressure that is provided by a fan 19 operated by an electric motor 20. The fan 19 is located in a fan chamber 21 having an annular air inlet 22 around the circumference of the motor 20 which is positioned above the chamber 21. Fan chamber 21 is provided with an exit portion 23 joined by

means of a rubber sleeve 24 to one end of an air tube 25. Held within this sleeve 24 is an orifice plate 26 having an orifice 27 therein through which the air from the fan 19 flows. By proper selection of an orifice plate with the desired opening therein the rate of flow of air can be carefully controlled.

The air from the tube 25 which is mixed with gas in a customary manner (not shown) is forced into the chamber 17 by reason of the end of the tube 25 opposite the orifice plate 26 being connected by way of shell 18 to the chamber 17. The air and gas mixture from this chamber then flows through the porous plate 17 for burning in the customary manner.

As described in detail in the above copending Hanson et al. application a vent in the form of a duct 28 surrounds the peripheral edge of the burner plate 15 and extends thereabove. This duct is to convey heated gases from the space 10 particularly during a broiling operation. As is explained in this copending application the duct is provided with an entrance 29 adjacent the edge of the porous plate burner 15 so that combustible gases such as smoke and the like will be burned so that incombustible gases pass into the heated gases duct 28.

The duct 28 has substantially the same shape as the plate 15 because the duct follows the edges of this plate. As can be seen in FIGURE 1 the front of the duct is of relatively low height while the rear of the duct as illustrated at 30 is of great height. This rear portion 30 of the duct 28 has an open top as illustrated at 31 and this rear portion is adapted to be closed by means of a plate valve 32 hinged in the center.

In the illustrated embodiment the plate valve 32 is shown in closed position. This is the position when the oven is being used for baking and not for broiling. When the oven is to be used for broiling the plate valve is turned until it extends substantially vertically in order to let the heated gases pass from the duct portion 30 upwardly through the open top 31. As is explained in the above copending application this turning movement can be achieved either manually, mechanically or electrically. In the illustrated embodiment this turning is achieved by providing a bimetal strip 33 anchored at one end to an insulated fitting 34. When the strip 33 is heated as by the electrical resistance heater 35 wound around the strip, the strip curls toward and contacts an operating arm 36 on the valve 32 to open this valve in the manner described.

The heated gases within the duct 28 are at a relatively high temperature. In order to cool these gases the present invention includes cooling means including a supply of cooling air. In the illustrated embodiment this cooling air is supplied from a branch tube 37 leading from the main air tube 25.

The branch tube 37 communicates with a cooling air conduit 38 having side portions 39 and 40 on opposite sides of the sides of the heated gases duct 28 and a third side portion 41 on the side of the duct 28 opposite the heated gas inlet 29. Thus the side portions 39, 40 and 41 effectively surround the sides of the duct 28 so that cooling air forced through the air conduit 38 will effectively cool the gases within the duct 28. The side portions 39, 40 and 41 of the conduit 38 also surround effectively the rear part 30 of the duct 28 as is illustrated in FIGURE 1.

The duct 28 is divided into two parts, the first part includes the duct 28 including the rear portion 30 and the open top 31. The second part 42 extends from the rear of the structure to the front on an upwardly inclined slope as shown in FIGURE 1 and exits upwardly into the room as illustrated at 43.

During the broiling operation the plate valve 32 is

turned from the position illustrated in the drawings to a vertical position. During the broiling heated gases as illustrated by the arrows in FIGURE 2 pass into the heated gases duct **28** and through the rear portion **30** of the duct and out the open top **31**. In the meantime air from the fan **19** flows through the branch tube **37** of the air supply and into the cooling air duct **38** which surrounds the sides and top of the duct **28**. During its passage through the conduit **38** the air extracts heat from the heated gases to cool them.

As is shown in FIGURE 1 the air enters the conduit **38** at an area directly opposite the rear portion **30** of the duct **28**. The conduit has a consistently increasing volume brought about by an increasing height from the entrance **44** of the conduit **38** to the entrance to the second part **42** of the duct **28**. The duct **28** itself also has this consistently increasing volume brought about in the same manner from the front of the duct to the rear portion **30** also as shown in FIGURE 1.

The cooling air conduit **38** empties into the heated gases duct **28** at a section **45** of the heated gases duct **28** immediately adjacent the open top **31**. The heated gases and the cooling air are thereupon intermingled to flow through the second part **42** of the duct **28** and into the room by way of the exit **43**. Because of the provision of this cooling air and this intermingling the combined gases flowing out the exit **43** are relatively cool and do not noticeably raise the temperature of the room, particularly in the region adjacent the exit **43**. This intermingling of air with the gases also dilutes these gases to prevent or materially lessen objectional odors.

When the oven is being used for baking the plate valve **32** is turned to its closed position as illustrated in the drawings. However, even during baking cooling air is forced through the system in the manner described so as to carry away heat from the upper part of the stove or other unit in which the oven is located.

Having described my invention as related to the embodiment shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

I claim:

1. A combined baking oven and broiler apparatus comprising: means defining an oven and broiling chamber having a door closed opening therein; heat supply means in said chamber; duct means for exhausting effluent from said chamber, said duct means having an opening to said chamber adjacent said heat supply means, a mixing portion and a control portion between said opening and said mixing portion; means for forcing relatively cool air to said mixing portion of said duct means; and a control in said control portion selectively opening said duct means during broiling and closing said duct means during baking for selective delivery of effluent from said chamber.

2. The apparatus of claim 1 wherein said duct means further defines an outlet and said mixing portion is disposed remote from said outlet and closer to said opening whereby the duct means defines a substantially secondary mixing means downstream of said mixing portion.

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