

April 29, 1952

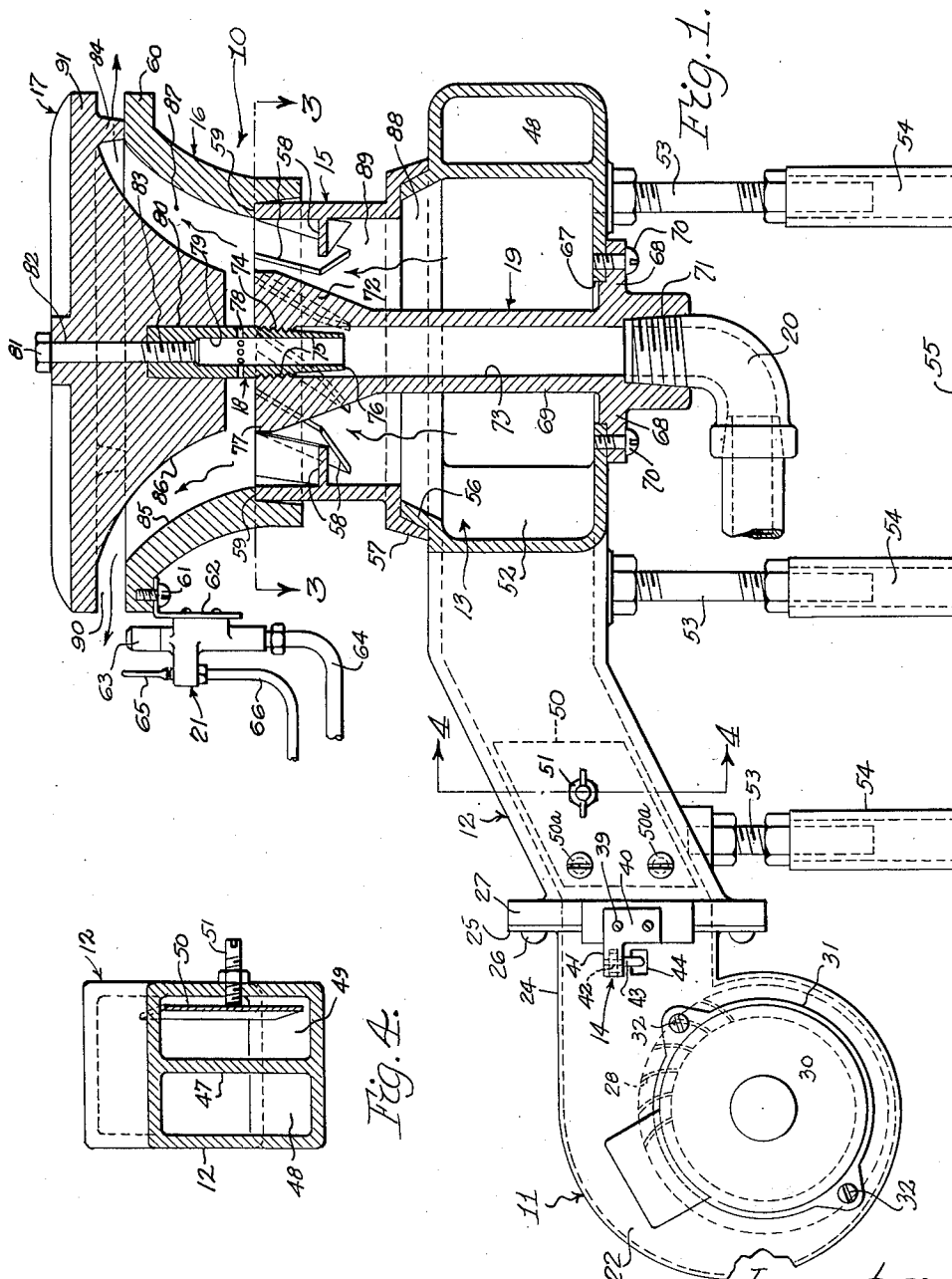
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FORCED DRAFT GAS BURNER

Filed Aug. 4, 1949

2 SHEETS—SHEET 1



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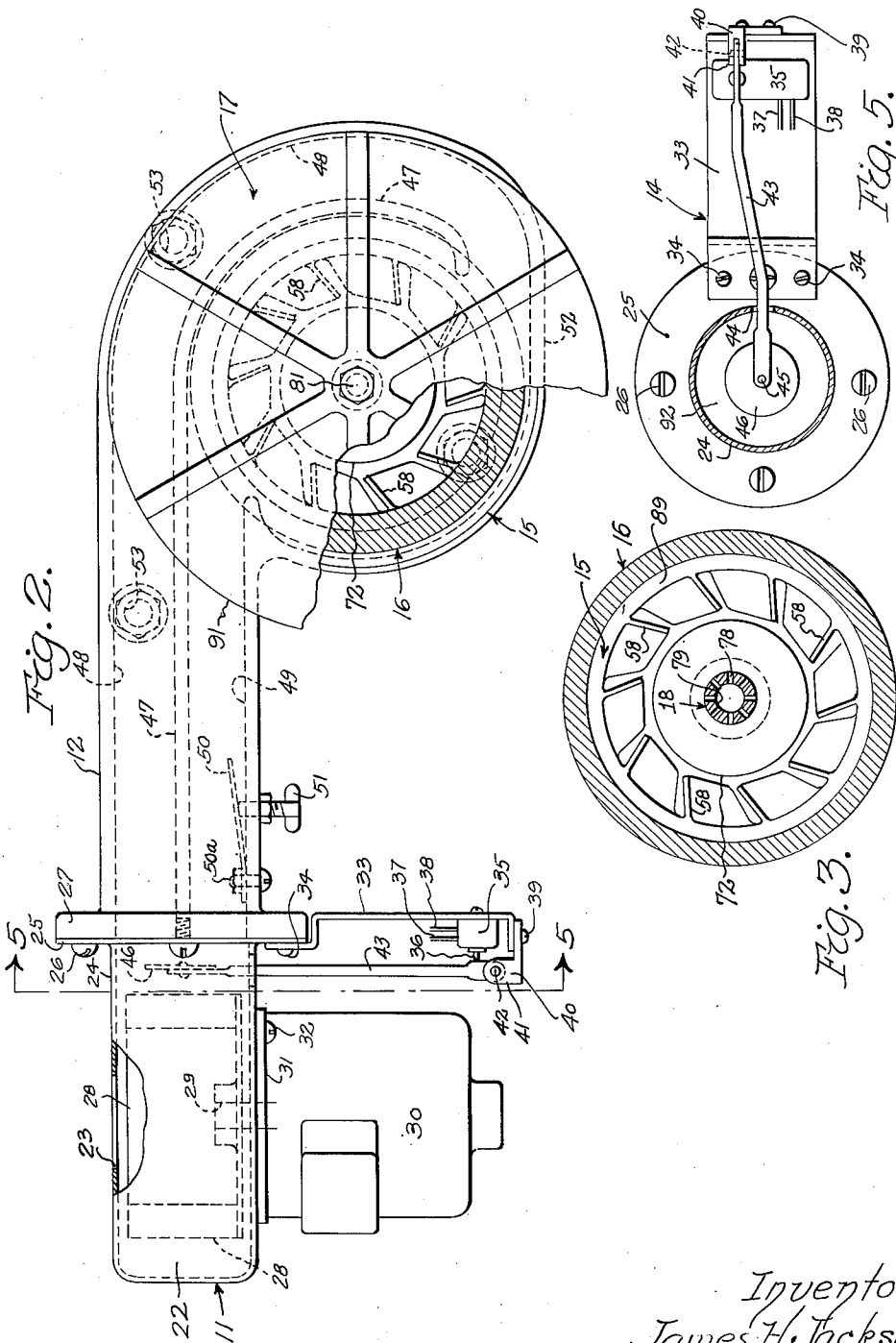
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UNITED STATES PATENT OFFICE

2,594,562

FORCED DRAFT GAS BURNER

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Application August 4, 1949, Serial No. 108,600

6 Claims. (Cl. 158—99)

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This invention relates to fuel burners and, in particular, to gas burners.

One object of this invention is to provide a power-driven or forced draft gas burner which is capable of burning either natural gas, manufactured gas or mixtures of gases, as well as bottled gas, such as propane or butane gas, in an efficient and economical manner.

Another object is to provide a forced draft gas burner wherein the air blast and the gas are efficiently and accurately mixed and regulated so that efficient combustion and an extremely hot flame are produced.

Another object is to provide a forced draft gas burner which is capable of being mounted in domestic heating furnaces and which will safely meet all the requirements of such furnaces in domestic and industrial heating.

Another object is to provide a forced draft gas burner having an improved safety device in the form of an air blast actuated switch for insuring that no gas will be admitted to the burner until or unless the air is flowing in sufficient volume into the air mixing chamber and thence to the gas jet.

In the drawings:

Figure 1 is a side elevation, partly in central vertical section, through a forced draft gas burner according to one form of the invention;

Figure 2 is a top plan view, partly in horizontal section, of the gas burner shown in Figure 1;

Figure 3 is a horizontal section taken along the line 3—3 in Figure 1 showing the air swirling vanes;

Figure 4 is a cross-section taken along the line 4—4 in Figure 1 showing the twin channeled air conduit with its regulating damper; and

Figure 5 is a cross-section taken along the line 5—5 in Figure 2, showing the safety switch mechanism.

Referring to the drawings generally, Figure 1 shows a forced draft or power-driven gas burner, generally designated 10, as consisting generally of a blower unit 11 connected to the inlet conduit 12 of an air mixing chamber 13 by way of an air-responsive safety switch mechanism 14. Mounted on the air mixing chamber 13 is a spirally vaned blast tube 15 surmounted by a hollow tubular trumpet-shaped hearth 16 which in turn is surmounted by an oppositely-shaped baffle 17. The latter carries an upper gas jet 18 which is threaded into a lower gas jet 19 supplied with gas by a gas supply pipe 20. A pilot burner 21 ignites the combustible mixture of gas and air emerging through the annular gap between the baffle 17 and hearth 16. The air mixing chamber 13 and blast tube 15 in assembly constitute an air container on which the hearth 16 is mounted.

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Referring to the drawings in detail, the blower unit 11 consists of a volute casing 22 (Figures 1 and 2) with a central air inlet port 23 and a tangential outlet conduit 24 which is flanged as at 25 and bolted as at 26 to the flanged portion 27 of the air inlet conduit 12 of the air mixing chamber 13. The casing 22 contains a fan 28 mounted on the shaft 29 of a blower motor 30, the latter being flanged as at 31 and bolted as at 32 to the side wall of the casing 22.

In order to insure safe operation of the gas burner 10 and to prevent any gas from being supplied thereto until a sufficiently strong blast of air is being delivered from the blower 11, the air-responsive safety switch 14 is provided at approximately a junction between the blower 11 and air mixing chamber 13. In particular, a bent bracket 33 is secured as at 34 to the flange 25 and near its outer end carries a normally open switch 35 having an operating plunger 36 and wires 37 and 38 leading to the control circuit of an electromagnetically operated gas supply valve (not shown) which is interposed between the gas main and the gas supply pipe 20. The electro-magnetic valve forms a part of a gas manifold assembly (not shown) which is conventional and which in its details is beyond the scope of the present invention.

Mounted on the outer end of the bracket 33 and secured thereto as at 39 is a sail lever bracket 40 having spaced ears 41 carrying a vertical pivot pin 42 (Figures 1, 2 and 5). Pivotally mounted on the pivot pin 42 is a sail arm or lever 43, the end portion of which is flattened to engage the switch plunger 36 and to fit between the ears 41. The opposite end portion passes through a hole 44 in the outlet conduit 24. Secured as at 45 to the end of the arm 43 is a sail disc 46. Consequently, when the blower 11 is operating so as to force a blast of air through the discharge conduit 24, this blast engages the sail disc 46 and swings the sail arm 43 to the right (Figure 2), closing the normally open switch 35 and therefore closing the circuit to the electromagnetic gas valve (not shown). When, however, the blower 11 is not operating and no air is flowing through the outlet conduit 24, the usual spring (not shown) within the switch 35 urges the plunger 36 outward and consequently swings the arm 43 and sail disc 46 to the left (Figure 2).

The air mixing chamber 13 and its inlet conduit 12 are of the type disclosed and claimed in the Jackson Patent No. 2,420,598 of May 13, 1947 for Liquid Fuel Burner, and its details are beyond the scope of the present invention. For the purposes of the present disclosure, the air inlet conduit 12 is provided with a central internal partition 47 (Figure 4) dividing the in-

terior of the conduit 12 into twin air channels or passageways 48 and 49. One of these channels 49 (Figure 4) contains a damper 50 which is bolted as at 50a to the side wall thereof. The damper 50 is of spring material, such as spring steel, and is adjusted to and fro by an adjusting screw 51. The air inlet conduit 12 is disposed approximately tangentially to the approximately cylindrical air mixing chamber casing 52 (Figure 2). The air mixing chamber 13 is supported on threaded studs 53 (Figure 1) which in turn are threaded into legs 54 resting upon a suitable supporting surface 55 within the furnace.

The top of the air mixing chamber casing 52 is open, and is provided with an upwardly-projecting conical flange 56 which telescopes with a downwardly projecting conical flange 57 upon the lower end of the blast tube 15. Mounted within the blast tube 15 near the upper end thereof are multiple spiral vanes 58 preferably cast integral with the blast tube 15 and serving to direct the air in a swirling or vortex path as it moves upward through the blast tube 15 (Figures 1 and 3). Resting on the upper edge of the blast tube 15 is the annular shouldered groove or counterbore 59 within the lower end of the trumpet-shaped hearth 16. The hearth 16 flares upward and outward to provide a trumpet-shaped cavity and terminates in a flange 60 at its upper edge (Figure 1). Secured as at 61 to the flange 60 is a bracket 62 on which a conventional pilot burner 63 is mounted, and which is supplied with gas from a pilot burner supply pipe 64. Mounted on the arm projecting from the pilot burner 63 is a thermostat 65 to which is connected the conduit 66 which leads to the control circuit and which also serves to cut off the gas supply in a known manner in case the pilot burner 63 should become extinguished or fail to ignite.

The bottom wall of the air mixing chamber casing 52 is provided with a central opening 67 in which is mounted the flanged lower portion 68 of the upstanding lower gas jet 69 and secured thereto as at 70. The gas supply pipe 20 is threaded into the threaded port 71 at the lower end of the lower jet 69 (Figure 1) and supplies gas thereto. The lower gas jet 69 near its upper end is provided with an outwardly flaring conical portion 72, and a gas passageway or bore 73 extends upward from the threaded port 71 through the flared portion 72 and terminates at its upper end in a threaded portion 74. The flared conical portion 72 of the lower jet 19 thus projects toward the blast tube 15 and forms a constriction in the blast tube 15. This causes an acceleration in the speed of the air passing therethrough, as a result of the Venturi effect created by this constriction, the annular air passageway between the flared portion 72 and the blast tube 15 widening immediately above the upper end 77 of the flared portion 72. Threaded into the threaded portion 74 is a correspondingly threaded portion 75 on the tubular upper gas jet 18, and extending downward below the threaded portion 75 is a skirt 76. Above the upper end 77 of the lower jet 19 the upper jet 18 is provided with a multiplicity of radial gas ports 78 extending through its side walls from its internal bore 79 (Figure 1).

The upper portion of the upper gas jet 18 is seated in a bore or socket 80 formed in the lower end of the trumpet-shaped baffle 17 (Figure 1) and is held in place by a bolt or cap screw 81 passing downward through a central bore 82 in

the baffle 17 and threaded as at 83 into the threaded upper end of the bore 79. The baffle 17 is provided with a series of downwardly projecting lugs 84 (Figure 1) which rest upon the upper surface of the flanged portion 60 of the hearth 16 and thereby determines the width of the opening therebetween. The inner surface 85 of the hearth 16 and the outer surface 86 of the baffle 17 are both of trumpet-shaped or arcuate cross-section, and are spaced apart from one another to provide an approximately annular upwardly and outwardly flaring passageway 87 which leads from the outlet opening 88 of the air mixing chamber casing 52 and the blast tube passageway 89 to the upper annular outlet gap 90 between the flange 91 of the baffle 17 and the flange 60 of the hearth 16.

In the operation of the gas burner of this invention, let it be assumed that the burner 10 has been set up in a suitable furnace and that the gas supply pipes 20 and 64 have been connected to a source of gas such as natural gas, manufactured gas, butane, propane or the like, and that the motor 30 has been energized from a suitable electrical circuit. When the motor 30 is started in operation, a blast of air is drawn in through the inlet opening 23 (Figure 2) and discharged through the air passageway 92 within the discharge conduit 24 into the passageways 48 and 49 (Figures 2 and 4) within the intake conduit 12 of the air mixing chamber 13. The proportionate distribution of the air between the two channels or passageways 48 and 49 is regulated by adjusting screw 51 against the damper 50.

The air blast, thus divided by the partition 47, emerges from the channels or passageways 48 and 49 into diametrically opposite portions of the air chamber 93 within the air mixing chamber casing 52, and thereby has acquired a swirling motion which continues as the air passes upward through the opening 88 and passage 89 within the blast tube 15. Here it encounters the spiral vanes 58, which further increases the vortex motion of the air. At the upper ends of the vanes 58 it encounters the streams of gas emerging radially from the ports 78 of the upper gas jet 18, the gas having passed upward from the supply pipe 20 through the bore 73 of the lower jet 19 to reach the upper jet 18. The gas mixes with the swirling air in the upwardly and outwardly flaring passageways 87 and the combustible mixture emerges through the annular gap 90 (Figure 1) where it is ignited by the pilot burner 63. The flame shoots outward and then upward from the edge of the baffle 17 and heats the interior of the furnace in the usual way.

The amount of gas reaching the mixing passageway 87 is regulated by the size and number of ports 78 in the upper gas jet 18, whereas the velocity of the gas release is regulated by the lower annular gap 94 between the lower jet 19 and the lower end of the baffle 17. The volume or rate of flow of the combustible mixture of air and gas is regulated by the upper annular gap 90 which in turn is regulated by the lengths of the lugs 84.

If, for any reason, the blower motor 30 does not start, or stops while gas is being fed to the burner, the blast of air from the fan 28 against the sail disc 46 ceases and consequently the air pressure exerted thereby to swing the sail switch arm 43 to the right to maintain the switch plunger 36 and switch 35 in a closed condition likewise ceases. The spring which normally

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urges the switch plunger 35 outward then does so, opening the switch 35 and consequently opening the safety circuit which closes the electromagnetic gas supply valve (not shown). This terminates the flow of gas through the gas supply pipe 20 and pilot burner supply pipe 64.

What I claim is:

1. A forced draft gas burner comprising an air container having an upwardly directed air conduit connected thereto, a power-driven air blower having its discharge connected to said air container, a hollow hearth structure connected to said air conduit and having an upwardly directed cavity therein communicating with said air conduit, a gas jet device including a gas conduit disposed within said air conduit and defining an annular air passageway therebetween having its outlet discharging outwardly into said cavity, and a baffle structure mounted over said cavity in spaced relationship therewith and having a peripheral burner gap therebetween.

2. A forced draft gas burner comprising an air container having an upwardly directed air conduit connected thereto, a power-driven air blower having its discharge connected to said air container, a hollow hearth structure connected to said air conduit and having an upwardly directed cavity therein communicating with said air conduit, a gas jet device including a gas conduit disposed within said air conduit and defining an annular air passageway therebetween having its outlet discharging outwardly into said cavity, and a baffle structure mounted over said cavity in spaced relationship therewith and having a peripheral burner gap therebetween, one of said conduits having an annular portion projecting toward the other conduit and forming a constriction in said air passageway, said cavity above said constriction being wider than said constriction whereby to provide a venturi effect causing an acceleration of the speed of the air passing therethrough.

3. A forced draft gas burner comprising an air container having an upwardly directed air conduit connected thereto, a power-driven air blower having its discharge connected to said air container, a hollow hearth structure connected to said air conduit and having an upwardly directed cavity therein communicating with said air conduit, a gas jet device including a gas conduit disposed within said air conduit and defining an annular air passageway therebetween having its outlet discharging outwardly into said cavity, a baffle structure mounted over said cavity in spaced relationship therewith and having a peripheral burner gap therebetween, and a multiplicity of inclined air directing vanes disposed within said annular air passageway.

4. A forced draft gas burner comprising an air container having an upwardly directed air conduit connected thereto, a power-driven air blower having its discharge connected to said air container, a hollow hearth structure connected to said air conduit and having an upwardly directed cavity therein communicating with said air conduit, a gas jet device including a gas conduit disposed within said air conduit and defining an annular air passageway therebetween having its outlet discharging outwardly into said cavity, a baffle structure mounted over said cavity in spaced relationship therewith and having a peripheral burner gap therebetween, one of said conduits having an annular portion projecting toward the other conduit and forming a constriction in said air passageway, said cavity

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above said constriction being wider than said constriction whereby to provide a venturi effect causing an acceleration of the speed of the air passing therethrough, and a multiplicity of inclined air directing vanes disposed in said constriction in said annular air passageway and adjacent said hearth structure.

5. A forced draft gas burner comprising an air container having an upwardly directed air conduit connected thereto, a power-driven air blower having its discharge connected to said air container, a hollow hearth structure connected to said air conduit and having an upwardly directed cavity therein communicating with said air conduit, a gas jet device including a gas conduit disposed within said air conduit and defining an annular air passageway therebetween having its outlet discharging outwardly into said cavity, a baffle structure mounted over said cavity in spaced relationship therewith and having a peripheral burner gap therebetween, one of said conduits having an annular portion projecting toward the other conduit and forming a constriction in said air passageway, said cavity above said constriction being wider than said constriction whereby to provide a venturi effect causing an acceleration of the speed of the air passing therethrough, and a multiplicity of inclined air directing vanes disposed in said constriction in said annular air passageway and adjacent said hearth structure and terminating adjacent said jet device outlet.

6. A forced draft gas burner comprising an air container having an upwardly directed air conduit connected thereto, a power-driven air blower having its discharge connected to said air container, a hollow hearth structure connected to said air conduit and having an upwardly directed cavity therein communicating with said air conduit, a gas jet device including a gas conduit disposed within said air conduit and defining an annular air passageway therebetween having its outlet discharging outwardly into said cavity, and a baffle structure mounted over said cavity in spaced relationship therewith and having a peripheral burner gap therebetween, said hearth structure cavity being of concave trumpet-shaped configuration with a substantially horizontal internal peripheral surface and said baffle structure having a portion of convex trumpet-shaped configuration projecting into said cavity in spaced relationship therewith and having a substantially horizontal internal peripheral surface spaced above and facing said hearth structure internal peripheral surface.

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