

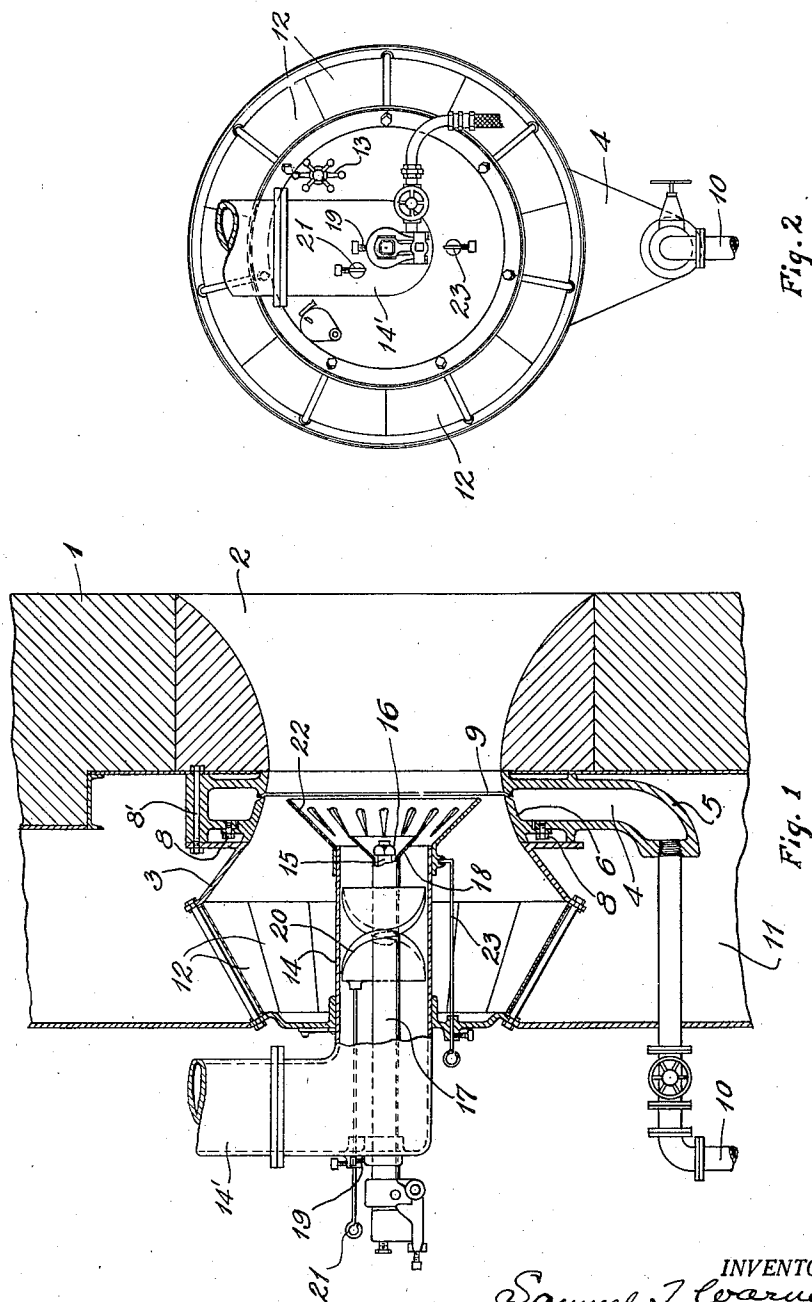
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S. T. WARNER

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FUEL BURNING APPARATUS

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INVENTOR.
Samuel T. Warner
 BY *Charles S. Jones*
 161 ATTORNEYS.

UNITED STATES PATENT OFFICE

SAMUEL T. WARNER, OF NEW YORK, N. Y., ASSIGNOR TO PEABODY ENGINEERING CORPORATION, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

FUEL BURNING APPARATUS

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My invention relates to fuel burning apparatus in which one object is to provide a unit in which pulverized coal, oil or gas may be burned separately or in any desired combination without any change either in the unit or in the boiler furnace. This and other objects of the invention will appear from the following description, taken in connection with the accompanying drawing, in which

Fig. 1 is a vertical section of the unit attached to a furnace front, certain parts being in elevation; and

Fig. 2 is a front view with the details of the various connections omitted.

Referring to the drawing, the numeral 1 designates a portion of a furnace wall having an opening 2 therein constituting the throat of the combustion chamber. In carrying out my invention to provide a unit by means of which three different fuels may be burned either separately or in any combination, I employ a burner for pulverized fuel, another for liquid fuel, and the third for gaseous fuel. These burners are mounted and arranged as follows, with reference to each other and to the furnace. Interposed between the furnace wall and an air register 3 is an annular gas box 4, formed of two pieces 5 and 6. These pieces are secured together by bolts 8 and to the furnace front by stud bolts 8'. With the pieces 5 and 6 secured as shown, there is provided between them a narrow annular slot 9 in the inner wall of the box. The slot 9 is at an angle to the axis of the throat 2 so that the gas delivered through a valved connecting pipe 10 will issue at high velocity in the form of a converging cone and will penetrate the rotating column of air coming through the register 3, or the issuing pulverized fuel or atomized oil, if one or both are used with the gaseous fuel.

The air register 3 is of known construction, and, as shown, is supported between the gas box 4 and the front plate of a wind box 11. The doors or vanes 12 of the air register are adapted to impart a whirling or rotating motion of the air. By means of a wheel 13, the vanes 12 may be adjusted to any desired position. For a complete description of the air register reference may be made to U.S. Patent

No. 1,527,214. The back plate of the register is frusto-conical with its small end toward the furnace, and with the inner wall of the gas box, forms a contracted passage for the whirling body of air. The throat 2 increases in diameter from the front to the rear thus providing a passage of increasing cross-sectional area for the fuel after it is projected into the combustion air.

Coaxial with the throat 2 and supported in an opening in the front plate 3' of the air register is the horizontal extension 14 of a pulverized fuel pipe. This burner is adapted to use pulverized fuel delivered through pipe 14' from a unit pulverizer or by the central bin system with feeders. The pulverized fuel is supplied with the proper volume of carrier air.

Supported centrally of the burner pipe 14 is a liquid fuel pipe 15 adjustable longitudinally in its bearings and carrying an atomizer 16 of any well known type, the oil burner and the system employed may be that described in U. S. Patent No. 1,628,424, to which reference may be made for a more complete description. The rear end of the burner barrel or sleeve 17 screws into a fitting 17' which carries one member of a detachable coupling by means of which the oil burner is held in operative position and by which it may be removed when desired, all as fully described in said Patent No. 1,628,424, and also in U. S. Patent No. 1,523,079.

For the efficient operation of the several burners above described, they are assembled as shown, that is, with the fixed gas box surrounding the opening into the furnace throat and with the pulverized fuel and oil burners back of the plane of the slot 9 of the gas box. I also provide the following attachments to the pulverized fuel and oil burners. Surrounding the fuel burner pipe 15 is a burner barrel or sleeve 17 on the end of which is mounted a cone shaped spreader 18 which latter surrounds the atomizer 16. The sleeve 17 extends exteriorly of the pipe 14 and is held in adjusted position by a set screw 19. To impart a whirling or rotating movement to the pulverized fuel suspended in the car-

rier air, a spiral plate 20 is mounted within the pipe 14. This plate is slidably mounted on the sleeve 17 and may be adjusted to any desired position by the attached handle 21 which latter is held in adjusted position by set screw 21'. The pulverized fuel as it is discharged into the combustion chamber is spread into a thin sheet or hollow cone by the spreader 18 surrounding the oil atomizer. Mounted upon the discharge end of the pulverized fuel burner is a diffuser 22, preferably formed with openings for the passage of air therethrough. It may be adjusted longitudinally of the pipe 14 by the attached handle 23 and held in adjusted position by set screw 23'. The diffuser protects the pulverized fuel, oil or gas flames from the high drafts of the furnace throat.

From the foregoing description, it will be seen that I provide a pulverized fuel burner that is simple and easy to renew when parts are worn out. Also, that means are provided to give a whirling motion to the pulverized fuel and carrier air as the fuel is discharged from the frusto-conical member of the burner in a thin even stream into the throat of the furnace. The secondary air required for complete combustion is given a rotary or whirling motion by means of the register vanes. By this arrangement the pulverized fuel and the secondary air are thoroughly mixed at the point where they enter simultaneously into the furnace. This will produce the necessary turbulence in the furnace gases.

It will also be noted that in the present structure one standard air register with regulating vanes is used to give the violent whirling or rotary motion of the air at the furnace throat, whether burning pulverized fuel, liquid fuel or gas, either together in any desired combination, or separately.

The three burners are installed intact as a unit. These can be used for carrying the entire load with either pulverized fuel, oil or gas.

I claim:

1. In combination, a furnace having a wall with an opening therein constituting the throat of the combustion chamber, a gas box and means for mounting the same about the entrance to said opening, an air register secured to said box, said register having a front plate, a pipe for pulverized coal extending through and supported by said front plate, a liquid fuel atomizer extending through and supported by said pipe, means for supplying liquid fuel to said atomizer, said parts being so mounted as to discharge the fuel either from the gas box or from the atomizer or the pulverized coal supply pipe into the combustion air at substantially the entrance to the furnace throat, and means for giving the combustion air a whirling motion.

2. In combination, a furnace having a wall with an opening therein constituting the throat of the combustion chamber, a gas box and means for mounting the same at the entrance to the throat, said box having an opening the walls of which are inclined to the axis of the box, an air register secured to said box at the front thereof, the back plate of said register and the inner wall of the gas box forming a contracted passage for the air entering through the register, a pipe for delivering pulverized coal passing through and supported upon the front plate of said register, a liquid fuel atomizer passing through and supported upon the coal supply pipe, means for supplying liquid fuel to said atomizer, a spreader mounted upon the inner end of said atomizer, and a diffuser mounted upon the inner end of the pulverized coal supply pipe, said parts being so mounted as to discharge the fuel at substantially the entrance to the furnace throat.

3. In combination, a furnace having a wall with an opening therein constituting the throat of the combustion chamber, a gas box and means for mounting the same about the entrance to said opening, an air register and means for securing the same in position to deliver secondary air for combustion to the furnace, said register having a front plate with an opening therein, a pipe for delivering pulverized coal and carrier air supported in said plate opening and extending through said register so as to terminate in proximity to the furnace throat, and means for directing the discharged fuel into the combustion air at substantially the entrance to the furnace throat.

4. In combination, a furnace having a wall with an opening therein constituting the throat of the combustion chamber, a gas box and means for mounting the same about the entrance to said opening, an air register and means for mounting the same in position to deliver air for combustion to the furnace, said register having a front plate, a pipe for pulverized coal extending through and supported by said front plate, a liquid fuel atomizer extending through and supported by said pipe, means for supplying liquid fuel to said atomizer, said parts being so mounted as to discharge the fuel either from the gas box or from the atomizer or the pulverized coal supply pipe into the combustion air at substantially the entrance to the furnace throat, and means for giving the combustion air a whirling motion.

5. In combination, a furnace having a wall with an opening therein constituting the throat of the combustion chamber, a gas box and means for mounting the same about the entrance to said opening, an air register and means for mounting the same in position to deliver air for combustion to the

furnace, the back plate of said register and the inner wall of the gas box forming a contracted passage for the air entering through the register, a pipe for delivering pulverized
5 coal extending through and supported upon the front plate of said register, a liquid fuel atomizer mounted within and supported by the coal supply pipe, means for supplying liquid fuel to said atomizer, a spreader
10 mounted upon the inner end of said atomizer, and a diffuser mounted upon the inner end of the pulverized coal supply pipe, said parts being so mounted as to discharge the fuel from either of said pipes or the gas box
15 at substantially the entrance to the furnace throat.

6. The structure of claim 5 wherein the diffuser is of greater diameter than the spreader and is provided with openings.

20 7. The structure of claim 4 wherein means is provided in the pipe for the pulverized coal for imparting a whirling movement to the pulverized coal as it leaves the pipe, said means being longitudinally adjustable in the
25 pipe.

8. In combination with a furnace having a wall with an opening therein constituting the throat of the combustion chamber, an air register mounted in position to deliver a
30 column of air through the throat into the combustion chamber, a gas box between the furnace wall and air register around said throat, conduits for delivering pulverized fuel and vaporized fuel respectively, said
35 gas box and conduits having discharge openings adjacent the front end of the throat and arranged so that fuel discharged from either of the conduits or the gas box will meet the column of air at substantially the
40 entrance to the throat.

Signed at New York city, in the county of New York and State of New York, this
6th day of May, A D. 1927.

SAMUEL T. WARNER.

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