J. GEHRING & R. D. CONRAD.

BURNER.

APPLICATION FILED APR. 3, 1908.

943,927. Patented Dec. 21, 1909.

FIG. 1.

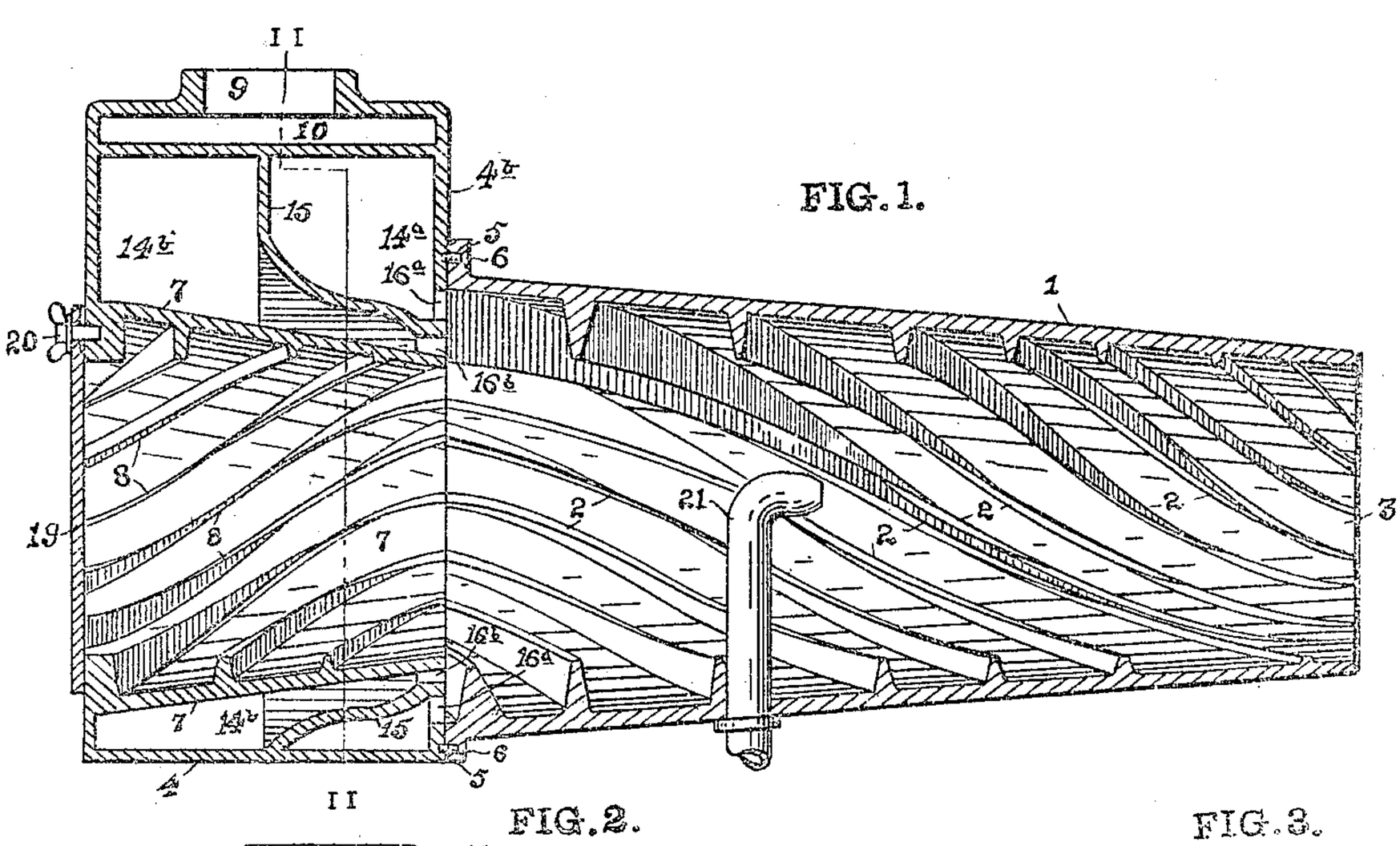


FIG. 2.

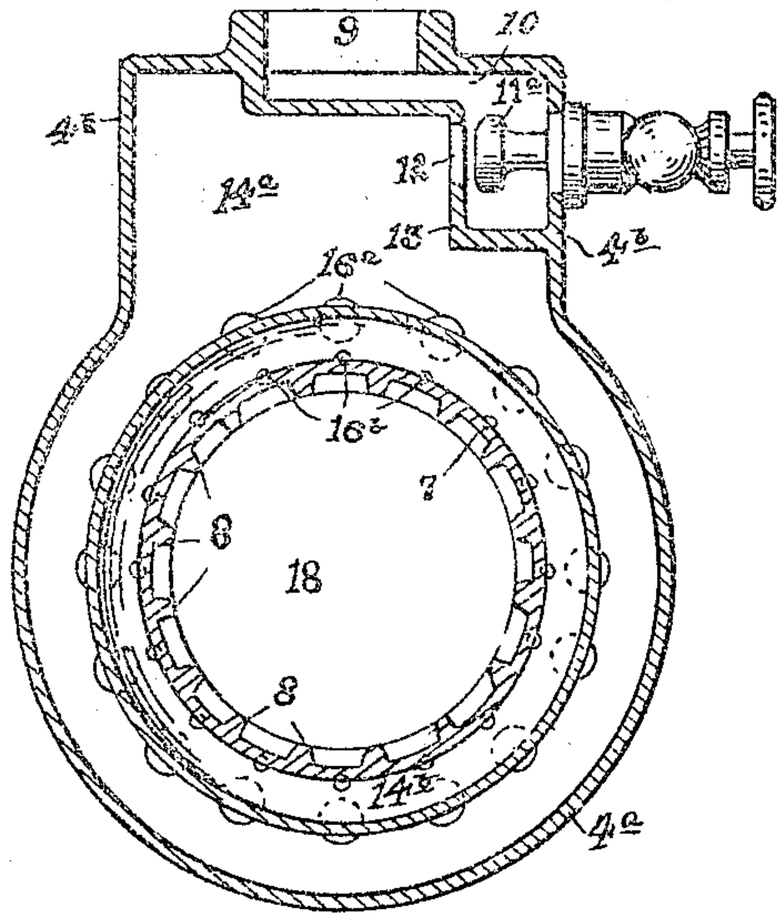
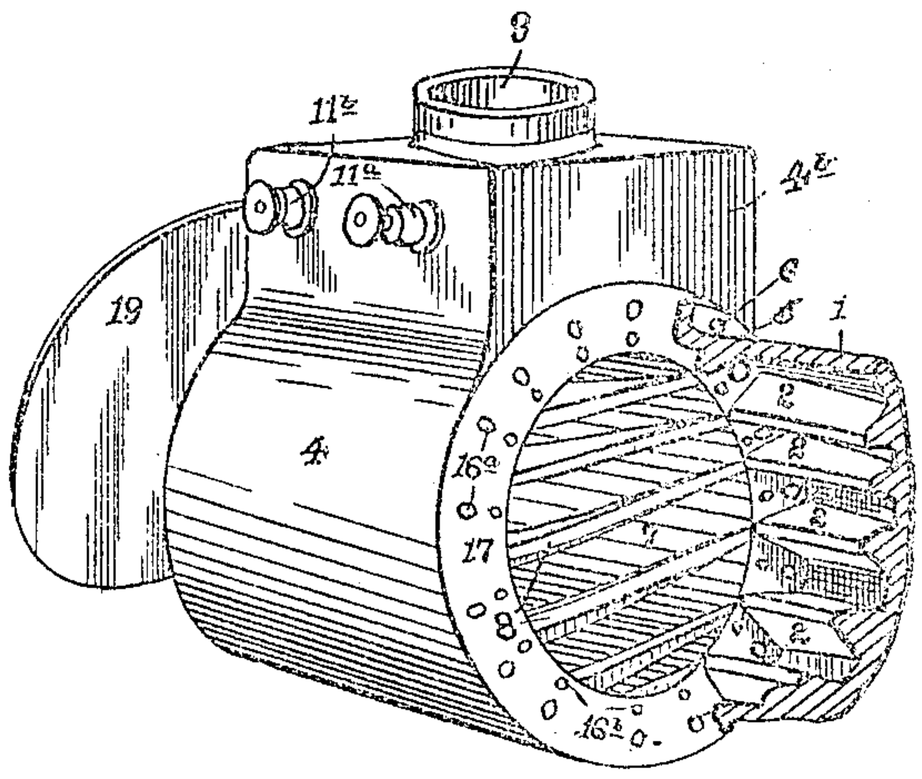


FIG. 3.



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UNITED STATES PATENT OFFICE.

JOSEPH GEHRING AND RICHARD D. CONRAD, OF PITTSBURG, PENNSYLVANIA; SAID GEHRING ASSIGNOR, BY MESNE ASSIGNMENTS, TO WINNER NATURAL GAS BURNER COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BURNER.

943,927. Specification of Letters Patent. **Patented Dec. 21, 1909.**

Application filed April 3, 1908. Serial No. 425,028.

To all whom it may concern:

Be it known that we, JOSEPH GEHRING and RICHARD D. CONRAD, citizens of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Burners, of which the following is a specification.

Our invention relates to burners and particularly to burners adapted for use in furnaces and the like where natural gas, artificial gas or oil in a volatilized state is used as fuel.

The object of our invention is to provide a burner which will be more efficient than those already known to the art. We attain this increased efficiency by means of more complete mixing of the gas with the air supplied thereto, accomplishing this end by the devices and construction set out in the accompanying specification.

In the accompanying drawings which form part of this specification: Figure 1 is a longitudinal sectional view of our improved burner. Fig. 2 is a cross section thereof on the line II—II. Fig. 3 is a perspective view of the burner with the greater part of the nozzle broken away to show the double rifling and the orifices through which the gas is admitted to the nozzle.

Referring again to the drawings for a detailed description of our invention: The mixer tube or nozzle 1, tapered slightly as shown, is provided on its interior surface with the raised walls or ribs 2 winding spirally along the length of said interior surface of the mixer tube and tapering toward the outlet 3 and constituting the walls of channels which, accordingly, also taper toward the outlet 3, as shown. The mixer tube as outlined by the innermost edges of said spiral walls or ribs 2 is of uniform diameter while the bore of the mixer tube measured by its interior wall is tapered toward the nozzle outlet 3. The mixer tube 1 has a suitable flange 5 by which said mixer tube is attached to a gas reservoir 4 by means of the screws 6, said gas reservoir 4 is composed of an outer shell 4^a and an inner shell or wall 7 which tapers in the direction of the mixer tube and preferably provided with spiral walls or ribs 8 somewhat similar to the spiral walls 2 but winding in the opposite direction. A portion of the shell 4^a is enlarged to form the valve box 4^b and is provided with an inlet nipple 9 for attachment to the supply of gas or similar fuel. The gas or other fuel received into the chamber 10 through the nipple 9 is admitted by means of the valves 11^a and 11^b through their respective openings 12 in the wall 13 to the chambers 14^a and 14^b, said chambers 14^a and 14^b being separated from each other by the division wall 15. The view shown in Fig. 2 (a section through the line II—II) passes through the chamber 14^a and shows the valve 11^a. A section through chamber 14^b would be similar and show the valve 11^b with its opening 12. The gas may therefore be admitted to either the chamber 14^a or 14^b or both by their appropriate valves 11^a and 11^b.

The gas reservoir has communication with the mixer tube, and when the reservoir comprises two compartments said compartments have independent communication with said mixing tube. The communication is preferably, and as shown, by means of perforations 16^a; and when the reservoir is a two compartment one, also by means of perforations 16^b. Said perforations are arranged in series, and the series communicating with one compartment is of considerably greater area than those communicating with the other compartment. Air is admitted through the bore 18 of the cylinder 4 which bore is formed by the shell 7, and a shutter 19 pivoted at 20 regulates the quantity of air so admitted. A steam jet nozzle 21 may be inserted as shown in Fig. 1 to be used if desired to create a forced draft.

The two sets of perforations 16^a and 16^b are provided for use with low or high pressure respectively or if desired may be used together. The gas from the perforations 16^a and 16^b enters, as will appear from the drawings, well within the spiral channels formed by the spiral walls or ribs 2 which impart to the gas a whirling motion which tends to throw the gas out centrifugally to the wall of the mixing tube and to keep the gas well within the channels between the spirals 2. It will be seen from the view shown in Fig. 3 that there is a separate channel for each pair of perforations 16^a and 16^b from which it will appear that the gas is finely divided and as it whirls toward the outlet 3 of the mixing tube 1 it is thoroughly mixed with

the air from the bore 18, which air is whirling in the opposite direction. As the spiral ribs 2, and the channels formed thereby, approach the opening 3 they diminish in depth until at the opening 3 they practically disappear, so that at this point the gas and air as they leave the mixer tube are most intimately mixed, producing a highly efficient fuel.

It will be apparent that the purpose of the spiral channels formed by the ribs or walls 2 is not merely to give the gas a whirling motion to mix it with the air, but the primary function of these spiral channels is to provide separate ways for the fine streams or jets of gas issuing from each perforation or pair of perforations 16^a and 16^b, to spread out the gas in a finely divided state around the inner wall or surface of the mixer tube where it may be the more readily taken up by the inflowing air to form a perfect mixture. For this purpose the taper to the channels formed by the spiral walls or ribs is an important and essential element of our invention.

Having thus fully described our invention, we claim as new and desire to protect by Letters Patent of the United States:

1. In a burner, the combination of a gas reservoir having a wall forming an air tube, and a mixer tube provided with tapering spiral ribs forming tapering channels in communication with said gas reservoir.

2. In a burner, the combination of a gas reservoir having an inner wall forming an air tube, a mixer tube attached to said reservoir in line with the air tube and in communication with said gas reservoir by means of openings, and spiral ribs on the inner surface of said mixer tube separating said openings and forming tapering spiral channels extending from the perforations in the gas reservoir to the end of the mixer tube.

3. In a burner, the combination of a gas reservoir divided into two compartments and having an inner wall forming an air tube, a mixer tube attached to said reservoir and in line with the air tube, the compartments of said gas reservoir communicating with the mixer tube by independent perforations arranged in pairs, and spiral projections on the inner surface of said mixer tube separating said pairs of perforations and forming tapering spiral channels in said mixer tube.

4. In a burner, the combination of a gas reservoir divided into two compartments and having an inner wall forming an air tube, a mixer tube attached to said reservoir and in line with said tube, the compartments of said gas reservoir communicating with the mixer tube by independent perforations arranged in pairs, spiral projections on the inner surface of said mixer tube separating said pairs of perforations and forming tapering spiral channels in said mixer tube, and means for selectively admitting gas to said compartments, substantially as described.

5. In a burner, the combination of an air tube, a gas reservoir surrounding the same, and a mixer tube having tapered spiral ribs forming separate channels communicating with the gas reservoir.

6. In a burner, the combination of a gas reservoir having a wall forming an air tube, and provided with a series of perforations, and a mixer tube having spiral projections forming tapering spiral channels extending from the perforations in the gas reservoir to the end of the mixer tube.

7. In a burner, the combination of a gas reservoir divided into two compartments and having a wall forming an air tube, and a mixer tube having spiral projections forming separate tapering spiral channels, each channel having independent communication with the compartments of the gas reservoir.

8. In a burner, the combination of a gas reservoir divided into two compartments having a wall forming an air tube and provided with a series of perforations communicating respectively with the compartments of the reservoir and arranged in pairs, and a mixer tube having spiral projections forming separate tapering spiral channels leading from each pair of perforations.

9. In a burner, the combination of a gas reservoir, having a wall forming an air tube, a mixer tube communicating with the gas reservoir, said air tube and mixer tube being provided with reversely arranged tapering ribs forming tapering spiral channels.

10. In a burner, a mixer tube having interior spiral channels decreasing in depth toward the discharge end of said tube, and means for admitting air and gas to said mixer tube.

11. In a burner, the combination of an air tube, a mixer tube, means for admitting gas to the latter, said air tube and mixer tube provided with reversely arranged tapering ribs forming tapering spiral channels.

12. In a burner, the combination of an air tube, a mixer tube, said air tube and mixer tube being provided with reversely arranged tapering ribs forming tapering spiral channels, and means for admitting gas directly to the channels of the mixer tube.

13. In a burner, the combination of a gas reservoir divided into two compartments and having a wall forming an air tube, and provided with series of perforations, communicating respectively with the compartments of the reservoir and arranged in pairs, tapering spiral projections in said air tube, means for selectively admitting gas to said compartments of the gas reservoir, and a mixer tube having spiral projections forming separate tapering spiral channels leading from each pair of perforations to the

end of the mixer tube, said spirals running in a direction opposite that of the spirals in the air tube.

14. In a burner, the combination of a gas reservoir divided into two compartments and having a wall forming an air tube, and provided with series of perforations communicating respectively with the compartments of the reservoir and arranged in pairs, tapering spiral projections in the air tube, means for selectively admitting gas to either of the compartments of the gas reservoir, a mixer tube having spiral projections forming separate tapering spiral channels leading from each pair of perforations to the end of the mixer tube, the said spiral channels running in a direction opposite that of the spirals in the air tube, means for regulating the quantity of air admitted to the air tube, and a steam jet nozzle inserted into the mixer tube between the point of admission of the gas and the outlet, substantially as described.

15. In a burner, the combination of an air tube, a mixer tube provided with tapering ribs forming tapering spiral channels, and means for admitting gas to the mixer tube.

16. In a burner, a mixer tube provided with tapering ribs forming tapering spiral channels and means for admitting air and gas to said mixer tube.

17. In a burner, a mixer tube provided with tapering ribs forming tapering spiral channels, means for admitting gas to said channels, and means for admitting air to the mixer tube provided with reversely arranged spiral channels.

18. In a burner, a tapered mixer tube, provided on its interior surface with spiral channels decreasing in depth toward the discharge end of said tube, and means for admitting air and gas to said tube.

19. In a burner, a mixer tube or tip, an air tube delivering centrally of said tip, a gas reservoir delivering circumferentially of and substantially parallel with the inner wall of said tip, and means located within the confines of the burner casing for varying the gas supply.

20. In a burner, a mixer tube or tip, an air tube delivering centrally of said tip, a gas reservoir delivering a plurality of jets circumferentially of and substantially parallel with the inner wall of said tip, and means in said tip to control the direction of flow of the gas jets.

21. In a burner, a mixer tube or tip, an air tube delivering centrally of said tip, a gas reservoir delivering a plurality of jets circumferentially of and substantially parallel with the inner wall of said tip, and interior channels in said tip to control the direction of flow of the gas jets.

22. In a burner, a mixer tube or tip, an air tube delivering centrally of said tip, a gas reservoir delivering a plurality of jets circumferentially of and substantially parallel with the inner wall of said tip, and interior spiral channels in said tip to control the direction of flow of the gas jets.

23. In a burner, a mixer tube or tip, an air tube delivering centrally of said tip, a gas reservoir delivering a plurality of jets circumferentially of said tip, and interior spiral channels of gradual decreasing depth to control the direction of flow of the gas jets.

In testimony whereof we have affixed our signatures in presence of two witnesses.

JOSEPH GEHRING.
RICHARD D. CONRAD.

Witnesses:
JAMES A. NUGENT,
MILDRED CHILLEEN.