July 30, 1963 S. A. RADLEY ET AL 3,099,312

GASEOUS FUEL BURNERS

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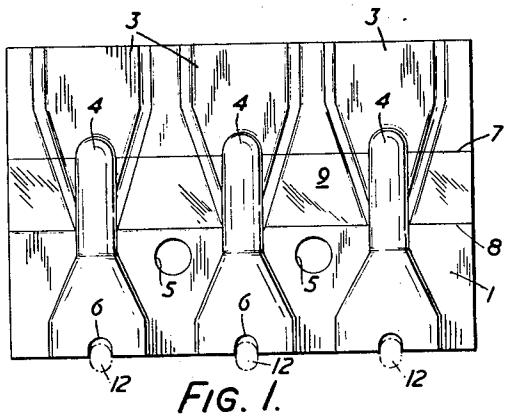


FIG. 1.

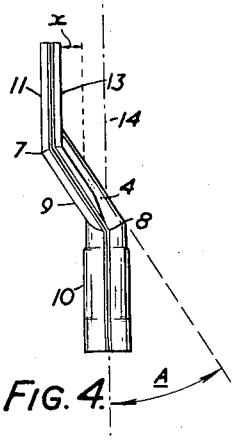


FIG. 4.

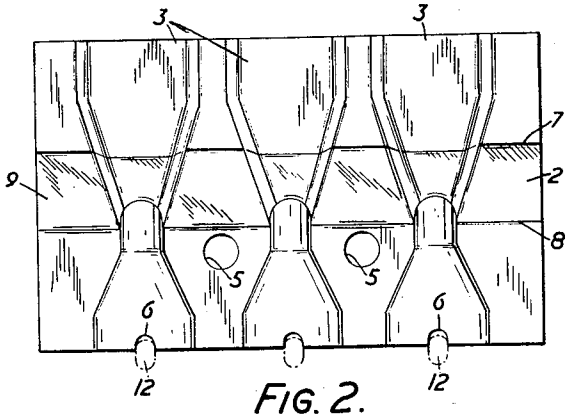


FIG. 2.

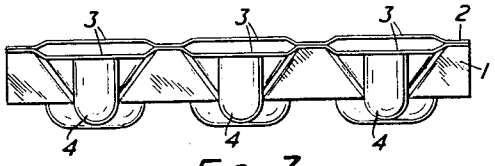


FIG. 3.

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GASEOUS FUEL BURNERS

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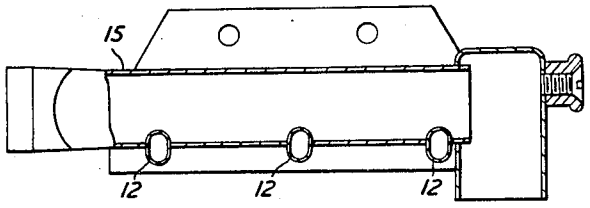


FIG. 5.

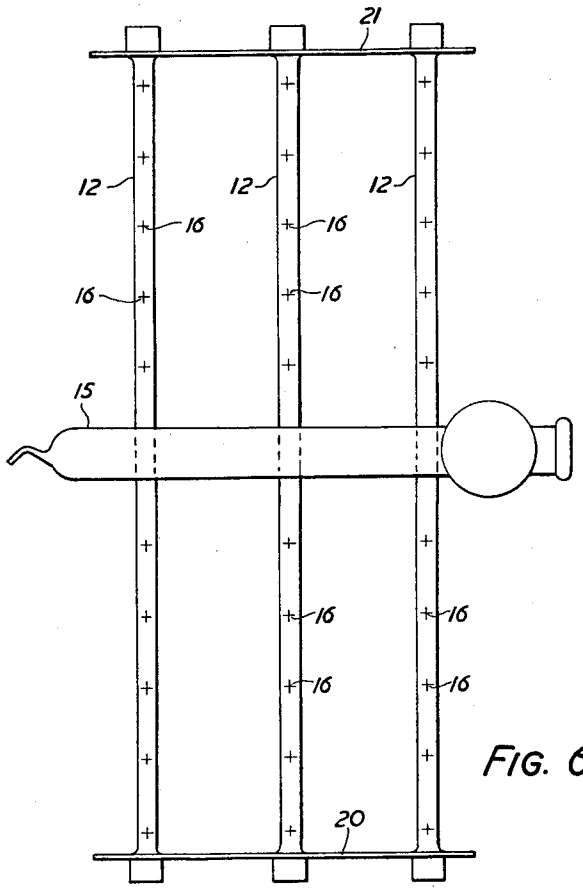


FIG. 6.

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GASEOUS FUEL BURNERS

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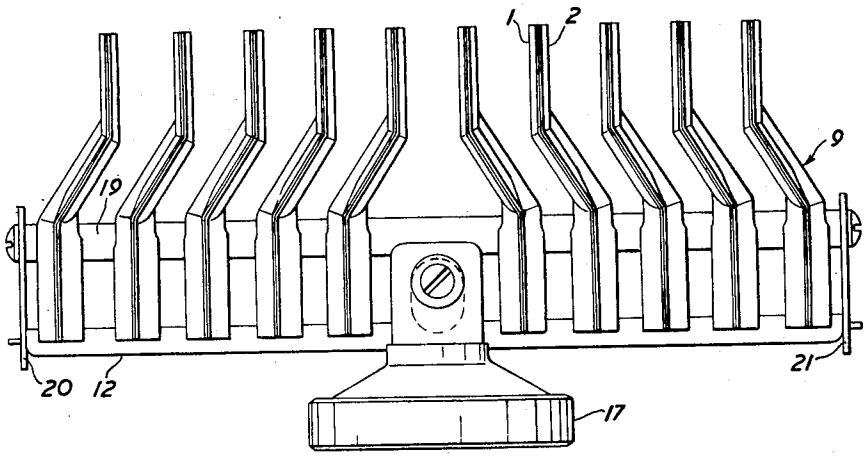


FIG. 7.

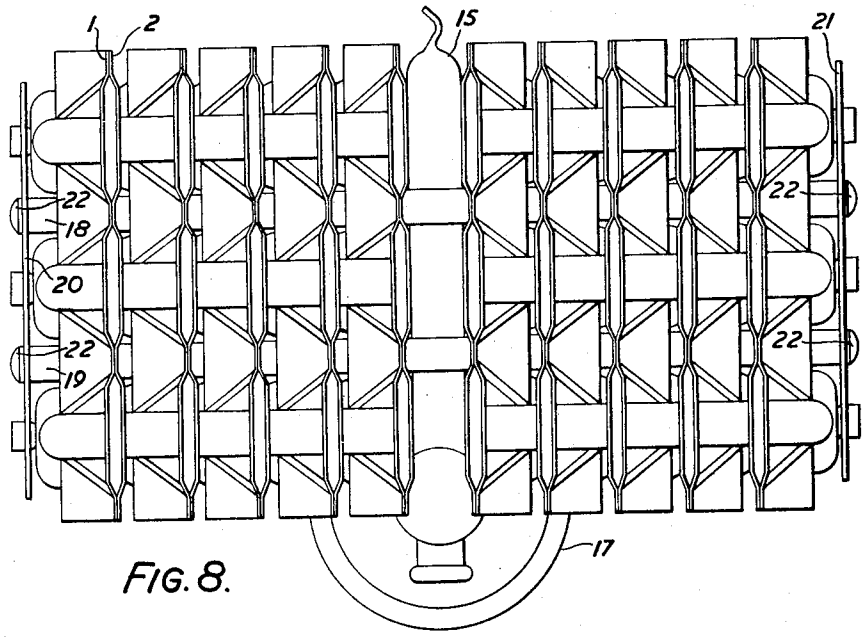


FIG. 8.

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3,099,312

GASEOUS FUEL BURNERS

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3 Claims. (Cl. 158—106)

This invention relates to gaseous fuel burners, that is to say, burners in which the fuel is in gaseous form when burnt although it may be stored in another form, for example, a liquid under pressure. The invention has particular reference to the so-called "aerated" burners in which the fuel is mixed with air prior to being burnt.

In the aerated burner, an undiluted stream of gas issues from an injector into a burner mixing head and air is entrained by the stream of gas, the mixture being burnt off at the exit of the burner head. It is important to secure adequate mixing of the air and gas and this is sometimes achieved by creating turbulence within the burner but previously proposed methods have not proved entirely satisfactory in all respects.

According to the present invention, a burner mixing head for a gaseous fuel burner has an entrance portion, an intermediate portion and exit portion, the entrance and exit portions lying in spaced parallel planes and the intermediate portion joining adjacent ends of the other portions, the arrangement being such that, in use, gas entering the entrance portion impinges on a wall of the intermediate portion and is deflected and spread thereby towards the exit portion.

Preferably, the intermediate portion is inclined at 33° to the plane containing one of the other portions although the inclination may lie within a range up to and including 90°.

The gaseous fuel burner may comprise a plurality of sets of burner mixing heads, each set being formed from co-operating metal pressings, means for securing the sets in spaced relationship above a set of burner tubes, the burner tubes having burner orifices each of which is positioned below a different burner mixing head.

The means for supporting the sets may include end plates secured to the ends of the burner tubes and to longitudinally extending supports to which the sets of burner mixing heads are secured.

The sets of mixing heads may be disposed in two sets of groups between which is located a header pipe to which the burner tubes are secured.

By way of example only, an aerated gaseous fuel burner embodying the invention will now be described in greater detail with reference to the accompanying drawings of which:

FIG. 1 is a front elevation of a set of burner heads,

FIG. 2 is a rear elevation of the set,

FIG. 3 is a plan view of the set,

FIG. 4 is a side elevation of the set,

FIG. 5 is an elevation partly in section of a gas supply pipe and burner tubes,

FIG. 6 is a plan view of the gas supply pipe and burner tubes,

FIG. 7 is a front elevation of the assembled burner, and

FIG. 8 is a plan view of the assembled burner.

The set of burner heads shown in FIGS. 1, 2, 3 and 4 consists of two metal pressings 1, 2 each having three depressions 3 which co-operate to provide three separate burner mixing heads of venturi-like formation as seen in FIGS. 1 and 2. The depressions 3 in the pressing 1 are each formed with semi-cylindrical recesses 4 whose function is described later. Both pressings are apertured at 5 and have cut away portions 6. The metal pressings are also bent at 7 and 8 to form a cranked portion 9.

Referring now to FIG. 4 of the drawings, it will be seen that each mixing head thus comprises three portions, an entrance portion 10, an intermediate portion—the cranked portion 9, and an exit portion 11. Portions 10 and 11 lie in spaced vertical planes as viewed in FIG. 4. The exit portion 11 is displaced with respect to the entrance portion 10, the extent of the displacement, indicated by x, in FIG. 4, is sufficient to ensure that the exit portion lies entirely to one side of the entrance portion. There is therefore no "straight through" path from the entrance to the exit.

The mixing heads are mounted above burner tubes 12 by means of rods which pass through the apertures 5. The header tubes have a number of orifices, each of which forms an injector for a different one of the mixing heads. Gas passing into the entrance portion 10 entrains air and the mixture strikes a wall of the intermediate portion 9 and is deflected in the direction of the exit portion 11 and spread thereby. This deflection and spreading creates turbulence inside the intermediate portion and thorough mixing of air and gas is ensured. Spreading and mixing are facilitated by the recesses 4 referred to above.

It is found that accurate centralisation of the injectors with respect to the mixing head entrances is not required and a degree of latitude is provided by the length of wall of the portion 9.

The length of wall of the portion 9 and the angle of the latter with respect to the vertical must be sufficient to ensure spreading and mixing and preferably that there is no straight through path for gas and air from the entrance portion to the exit portion. Thus, the dimension x can be reduced to zero without losing substantially effective mixing and spreading. Further, the angle between the portion 9 and the vertical, angle A, may be of a value up to and including 90° provided that the outgoing gas stream returns to a direction parallel with the incoming gas stream and that the entrance and exit portions lie in spaced parallel planes.

It will be appreciated that with the burner head positioned approximately centrally over its injector, the inside edge 13 as viewed in FIG. 4 of the exit portion can be brought up to the centre line of the head—indicated by the chain dotted line 14. Such an arrangement will not produce as efficient mixing and extension of the exit portion may be necessary. The construction shown in the drawings achieves effective mixing in a burner whose overall height is small and without noise.

FIGS. 5–8 show the details of a gaseous fuel burner embodying the mixing heads described above.

Referring first to FIGS. 5 and 6, the burner tubes 12 extend from a main header or supply pipe 15. Orifices 16 and tubes 12 are shown in FIG. 6. The embodiment shown in FIGS. 5–8 has three tubes 12 but other numbers of tubes may be employed. The header pipe 15 has a knurled ring 17 by means of which the pipe is secured to a gas supply conduit.

The pressings of which the sets of burner heads are made are mounted vertically upon tubes 18, 19 in spaced parallel relationship and then brazed in position. The tubes 18 and 19 are a force fit and form a "jig" for holding the mixing heads in position during the brazing or soldering of the tubes. In some circumstances, the force fit may be sufficient to hold the heads in place and the force fit may be assisted by expanding the tubes after the burner mixing heads have been placed in position. The tubes 18 and 19 are mounted between end plates 20, 21 secured to the ends of the transverse tubes 12 and are held in place by means of screws 22. The relationship between the positions of the burner mixing heads and the tubes 12 is such that the lower ends of the burner mixing

heads fit centrally over the orifices 16. The burner mixing heads are disposed in two spaced groups as can be seen in FIGS. 7 and 8 with the inclined portions and pointing towards one another, thereby providing accommodation for the header pipe 15 between the groups.

The assembled burner operates in the well-known manner. Gas issuing from the orifices 4 is directed into the flared burners, air being entrained and burnt with the gas at the burner mouth. The stream of gas issuing from the orifices strikes the cranked portion 9 and is deflected towards the burner mouth as explained above.

The burner mixing heads may be held together by mounting strips secured to the edges of the pressings and removably secured to, for example, the burner header pipe.

Once the burner mixing heads are secured in position, the whole assembly is quite rigid. Longitudinal movement of the heads with respect to the burner tubes is prevented by the end plates and transverse movement by the slots referred to above.

When the calorific value of the gas with which the burner is used is changed, it is a simple matter to remove the assembly of burner mixing heads and mount it upon different burner tubes whose orifices are suitable for the different calorific value of gas.

Although in the embodiment described above the pressings provide three mixing heads, it will be understood that alternatively one, two or more mixing heads may be formed in co-operating pressings.

We claim:

1. A gaseous fuel burner having a mixing head comprising in combination an entrance portion having at least two parallel walls, an entrance open to the ambient air and a cross sectional area taken transversely with respect to the length of the burner mixing head which decreases from a maximum at said entrance to a minimum within a junction between said entrance portion and an intermediate portion having a substantially straight longitudinal axis inclined upwardly with respect to the parallel walls of said entrance portion, said intermediate portion comprising spaced walls one of which is bulged outwardly, an exit portion joined to said intermediate portion and having parallel walls lying in planes parallel to but spaced from the planes in which the parallel walls of the entrance portion lie, the cross sectional area of the exit portion taken transversely of the length of the mixing head increasing from a minimum at the junction between the exit and intermediate portions to a maximum at a point adjacent the exit from the exit portion, the width of said intermediate portion in a direction perpendicular to said parallel walls being at least as great as that of said exit portion, while its average cross-sectional area taken transversely of the length of the mixing head is less than that of either said entrance or exit portion, slots in said parallel walls of said entrance portion, a gas supply pipe positioned in said slots, and, in said gas supply pipe an orifice located within the confines of said entrance.

2. A gaseous fuel burner comprising a pair of metal pressings placed together to form a plurality of burner mixing heads each comprising in combination a parallel walled entrance open to the ambient air portion having an entrance and a cross sectional area taken transversely with respect to the length of the burner mixing head which decreases from a maximum within said entrance to a minimum within a junction between said entrance portion and an intermediate portion lying in a plane inclined upwardly with respect to the plane in which said entrance portion lies, said intermediate portion comprising spaced walls one of which is bulged outwardly, a parallel walled

exit portion joined to said intermediate portion and lying in a plane parallel to but spaced from the plane containing the entrance portion, the cross sectional area of the exit portion taken transversely of the length of the mixing head increasing from a minimum at the junction between the exit and intermediate portions to a maximum at a point adjacent the exit from the exit portion, the width of said intermediate portion in a direction perpendicular to said parallel walls being at least as great as that of said exit portion, while its average cross-sectional area taken transversely of the length of the mixing head is less than that of either said entrance or exit portion, slots in the parallel walls of each of said plurality of mixing heads, gas supply pipes, each of said gas supply pipes being positioned in the slots of one of said mixing heads, and, in each of said gas supply pipes, an orifice lying within the confines of the entrance of the mixing head associated with the supply pipe.

3. A gaseous fuel burner comprising in combination first and second sets of spaced parallel pairs of metal pressings placed together to form a plurality of burner mixing heads each comprising in combination a parallel walled entrance portion having an entrance open to the ambient air and a cross sectional area taken transversely with respect to the length of the burner mixing head which decreases from a maximum at said entrance to a minimum at a junction between said entrance portion and an intermediate portion lying in a plane inclined upwardly with respect to the plane in which said entrance portion lies, said intermediate portion comprising spaced walls one of which is bulged outwardly, a parallel walled exit portion joined to said intermediate portion and lying in a plane parallel to but spaced from the plane containing the entrance portion, the cross sectional area of the exit portion taken transversely of the length of the mixing head increasing from a minimum at the junction between the exit and intermediate portions to a maximum adjacent the exit from the exit portion, the width of said intermediate portion in a direction perpendicular to said parallel walls being at least as great as that of said exit portion, while its average cross-sectional area taken transversely of the length of the mixing head is less than that of either said entrance or exit portion, the intermediate portions of said first and second sets being inclined towards each other, slots in the parallel walls of the entrance portions of all the mixing heads, a gas supply pipe disposed between the first and second sets, a plurality of burner tubes secured transversely to said supply pipes, and positioned in the slots of mixing heads lying above the tubes, and, in the burner tubes orifices each of which is located within the confines of a different one of the mixing heads.

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