

April 2, 1929.

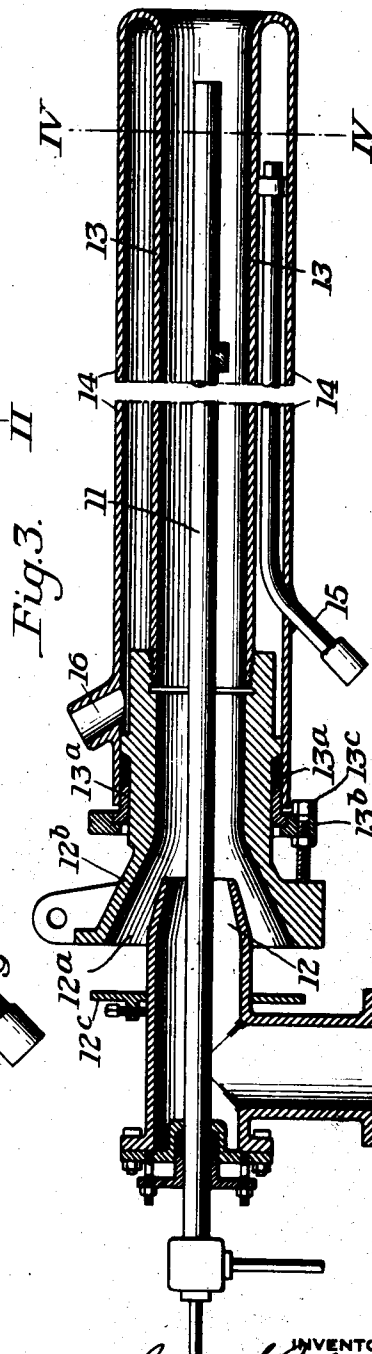
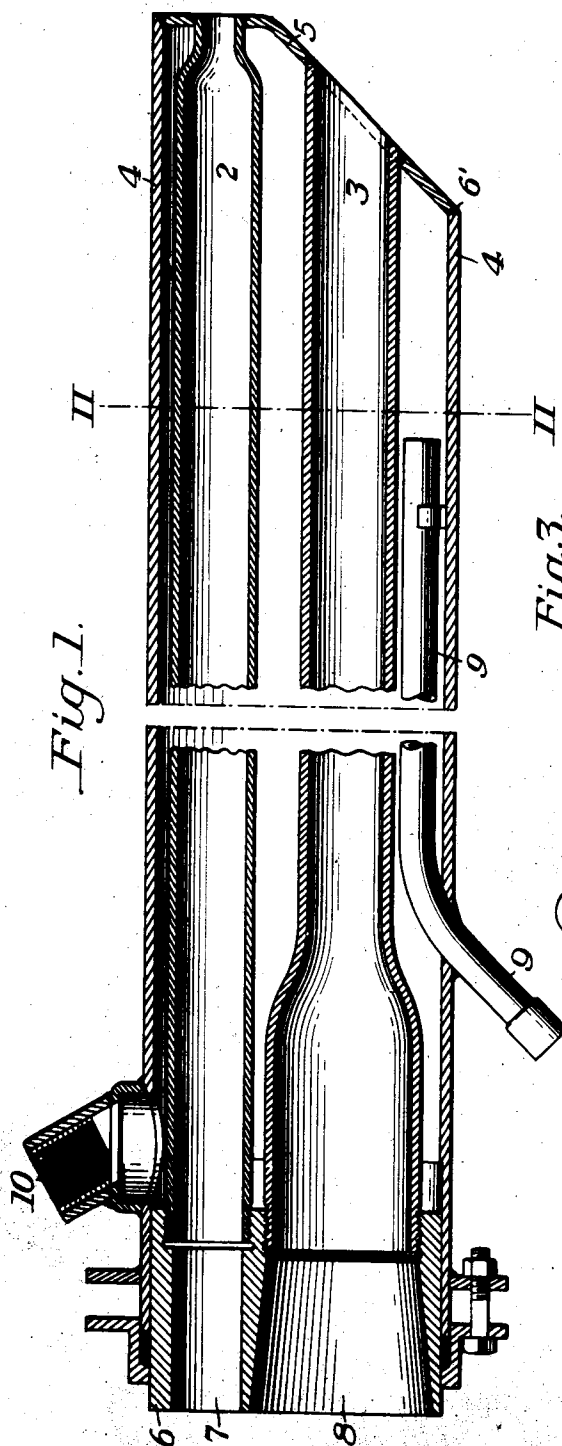
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1,707,772

FUEL NOZZLE

Filed July 13, 1925

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

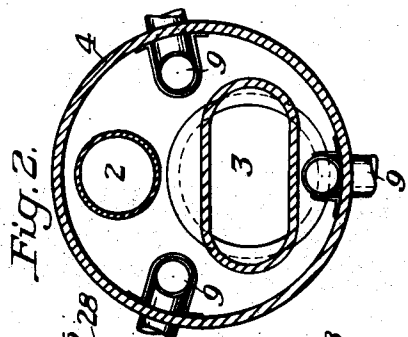


Fig. 5.

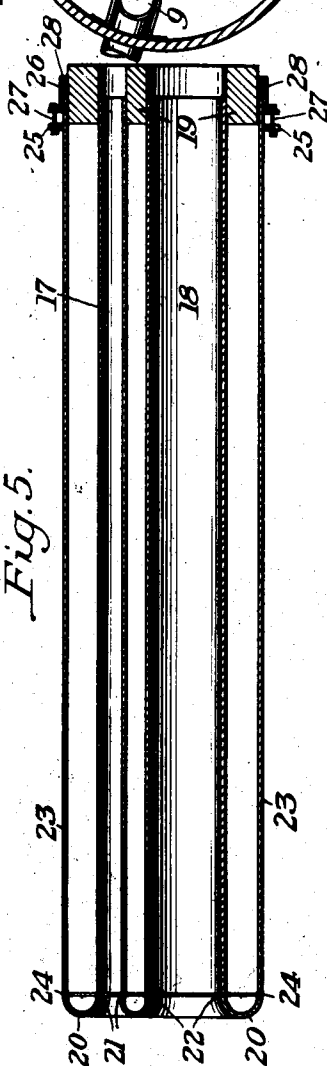


Fig. 6.



Fig. 4.

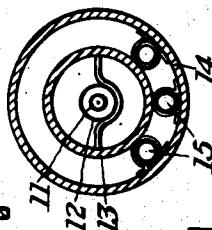
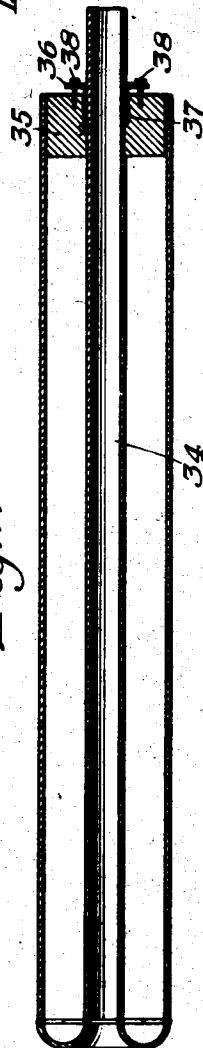


Fig. 7.



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1,707,772

UNITED STATES PATENT OFFICE.

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FUEL NOZZLE.

Application filed July 13, 1925. Serial No. 43,132.

The present invention relates to nozzles for introducing fuels into furnaces, and it particularly relates to means for introducing fuels into high temperature furnaces, such as O. H. Furnaces for melting steel, glass melting furnaces, and other high temperature furnaces, in which it is necessary to provide water-cooled jackets through which the fuels are introduced into the melting or heating chambers.

The fuels which are used for such purposes are natural gas, city gas, coke oven gas, water gas, producer gas, oil or tar, and often a combination of gaseous and liquid fuels is also used which sometimes complicates the water cooled jackets for introducing the fuels. These jackets have to withstand extremely high temperatures, sometimes as high as 3200° F., and due to their size, which sometimes may reach a length of 10 to 12 feet and a diameter of 12 to 16 inches, and also due to the sometimes complicated construction, it has in the past been extremely hard to prevent cracking up of these water cooled jackets. The reason for this is probably the strains set up in the various pipes and parts, of which the jacket is built up, by the intense heat, which causes different heat expansion in the various parts. The present invention overcomes the difficulties resulting from high temperature and expansion.

The burner jackets to which this invention applies consist of an outer steel shell or pipe and inner tubes or pipes through which the fuel flows into the furnace, these tubes being surrounded by water between the outer shell and the outside of the tubes in order that they may be kept from being destroyed by the intense heat. The invention embodies two main features, namely, the provision for unequal expansion, as the outer shell is subjected to higher temperature than the inner tubes, and the method for connecting the inner tubes and the outer shell together.

In the accompanying drawings:

Figure 1 is a longitudinal sectional view of a preferred form of burner embodying the features of my invention;

Figure 2 is a section on the line II—II of Figure 1, on a slightly reduced scale;

Figure 3 is a view similar to Figure 1 of a modified form of burner;

Figure 4 is a section on the line IV—IV of Figure 3; and

Figures 5, 6 and 7 are longitudinal sectional

views of nozzles showing three different arrangements of expansion joint at the rear end of the nozzle.

Referring to the construction shown in Figure 1, 2 and 3 designate separate tubes for injecting two different fuels into a furnace, say, tar and gas. These tubes are enclosed in an outer jacket 4 through which water or other cooling medium is circulated. The tubes and jacket are welded at the forward end of the nozzle to an end piece 5. At the rear end of the nozzle there is an end piece 6 to which the tubes 2 and 3 are connected by screw threaded connections as in ordinary pipe work, although the tubes might be connected thereto by welding. This end piece has passages 7 and 8 therein through which the fuel is supplied to the tubes 2 and 3. The water is introduced into the water jacket through inlet pipes 9 which pass through the jacket and are welded thereto to make the joints tight. These inlet pipes project towards the front end of the nozzle so as to supply the cold water as near to the front end thereof as possible. An outlet connection 10 for the outflow of cooling water is located close to the rear end of the nozzle.

The tubes for supplying the two materials, such as tar and gas, may have different shapes in order to introduce the fuels in the most suitable way. In Figures 1 and 2 the pipe 3 which serves to introduce the gas is shown flattened so the gas will spread in a horizontal direction in the furnace. The front end of the nozzle may also be shaped to comply with the requirements of the particular furnace with which the nozzle is employed.

In the preferred form of nozzle shown in Figure 1, air used for combustion of the fuel enters the furnace around the nozzle and this air may be preheated. The modified form of nozzle shown in Figure 3 is constructed to supply part or all of the air required for combustion through the nozzle as well as to supply fuel. In this modified construction there is one small tube 11 through which the atomized tar or oil is introduced. This tube is surrounded by a water cooled jacket, made up of tubes 13 and 14. The cooling water is supplied through inlet pipes 15 and the outflow is through an outlet connection 16.

The gas is supplied through the nozzle 12, which is so shaped and placed that air is drawn into the ring shaped space 12^a between the nozzle and the casting 12^b, which forms

the outer end of the water-cooled jacket. The inflow of air can be regulated by a movable disc 12^c. The inner pipe 13 of the water-cooled jacket is threaded into casting 5 12^b, but the outer pipe 14 is allowed to slide on the casting 12^b, and tightness is obtained by a stuffing box 13^a which is pressed against the packing by a ring 13^b, which is held by screws 13^c of which one is shown in the 10 figure.

It is evident that any difference in expansion due to the heat between pipes 13 and 14 is taken up by motion of pipe 14 in the stuffing box 13^a.

15 While reference is made to supplying tar and gas through the tubes 2 and 3 in the construction shown in Figure 1 and tar, gas and air through the tubes 11 and 13, in the construction shown in Figure 3, it is immaterial 20 so far as the invention is concerned what materials are supplied through the tubes.

The outer jacket will, of course, expand more than the inner tubes when subjected to heat and one feature of the invention, as 25 already pointed out, consists in providing an expansion joint at the rear end of the nozzle so that the inner tubes and outer jacket may expand or contract relative to each other while water is kept from leaking from the jacket at 30 the expansion joint by means of a packing box similar to that in common use for the packing of piston rods. Figures 5, 6, and 7 show three locations for this sliding joint, the arrangement shown in Figure 5 corresponding to that shown in Figure 1. Refer- 35 ring first to Figure 5, the inner tubes 17 and 18 are connected to the end piece 19 in any suitable manner, as by screw connections or by welding. The end piece 20 is then welded 40 to these tubes by welds 21 and 22. The end piece is in this case a piece of plate pressed into the proper shape as shown, and it is feasible for the welder to get at the tubes 17 and 18 where they join the end piece 21 at 45 this stage in the manufacture before the water jacket 23 is placed in position. When the welds 21 and 22 have been made, the jacket 23 is slipped over the end piece 19 and likewise welded to the end piece 20 by the 50 weld 24. A water tight expansion joint is provided between the rear end of the jacket 23 and the end piece 19 by means of the

stuffing box which consists of a flange 25 welded to the jacket, a gland 26 sliding on the end piece 19 and bolted to the flange 25 55 by the bolts 27 and packing material 28.

In the construction shown in Figure 6 the stuffing box consists of a flange 29 integral with the end piece 30, a gland 31 sliding on the end piece and engaging packing material 60 32 and thrust rods 33 threaded into the flange 29 and engaging the gland 31.

Figure 7 shows a nozzle having only a single inner tube 34. This tube projects through the end piece 35 and has the gland 65 36 slidably mounted thereon. The gland is held against packing material 37 by screws 38 which pass through the gland and are screwed into the end piece.

It will be seen that by the present invention 70 I have provided a nozzle construction adapted to supply several different fuels through separate channels whereby the several kinds of fuel may be supplied at the same time but in different quantities and under 75 different pressures and that this nozzle embodies the features of the expansion joint and the method of welding as hereinbefore described.

While I have shown and described certain 80 embodiments of my invention it will be understood that the invention is not limited to its illustrated embodiments but that it may be otherwise embodied within the scope of the appended claim without departing from 85 the spirit of the invention.

I claim:

A fuel nozzle, comprising a plurality of inner tubes, a surrounding water jacket, an end plate welded to the forward ends of said 90 tubes and jacket, an end piece secured to the rear ends of said tubes and having the rear end of said jacket slidably engaging its outer surface, and an expansion joint between the rear end of said jacket and said end piece, 95 said joint comprising a packing gland slidable on said end piece, adjustable means securing said gland to the rear end of said jacket, and packing material between said gland and the rear end of said jacket, substantially as described. 100

In testimony whereof I have hereunto set my hand.

GEORGE L. ROBINSON.