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1,546,752

J. ROHR

HYDROCARBON BURNER

Filed Aug. 11, 1921

Fig. 1.

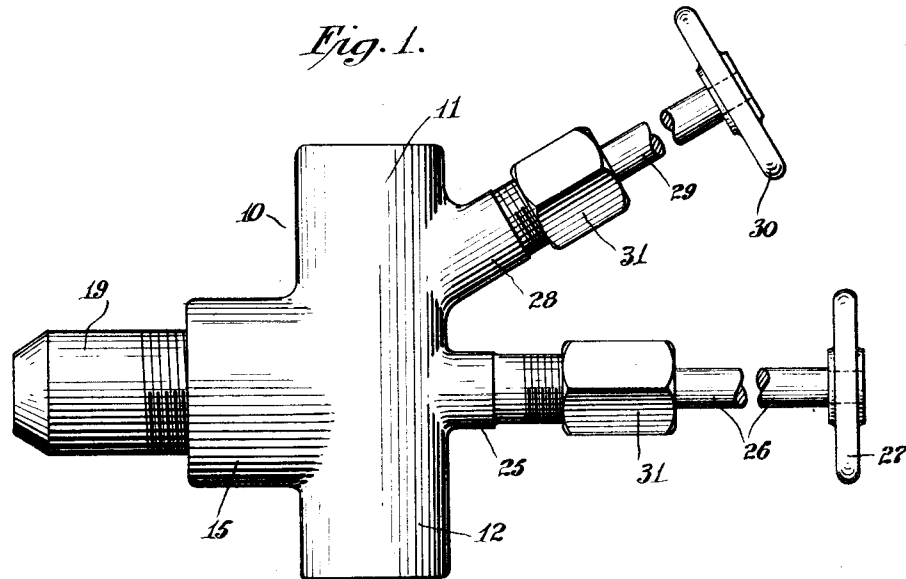
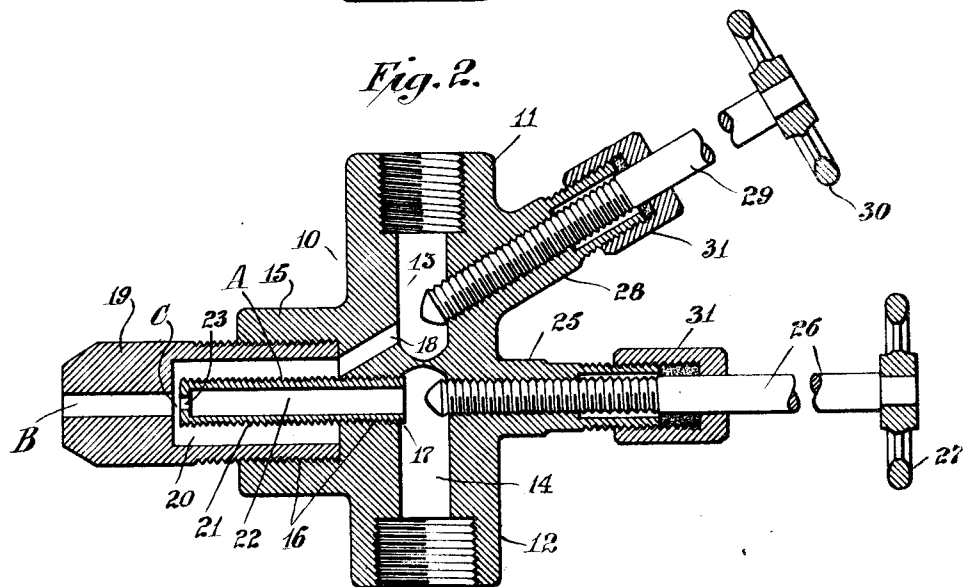


Fig. 2.



Inventor
Joseph Rohr

By his Attorney

Otto Munt

UNITED STATES PATENT OFFICE.

JOSEPH ROHR, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO JOSEPH PERITT, OF BROOKLYN, NEW YORK.

HYDROCARBON BURNER.

Application filed August 11, 1921. Serial No. 491,327.

To all whom it may concern:

Be it known that I, JOSEPH ROHR, a citizen of the United States of America, residing at Brooklyn, in the county of New York and State of New York, have invented certain new and useful Improvements in Hydrocarbon Burners, of which the following is a specification.

My invention relates to certain new and useful improvements in hydrocarbon burners and has particular reference to a mixing valve or atomizer in which liquid fuel is mixed with air to form a highly combustible fuel; and the invention consists in the novel construction and arrangement of parts, all as hereinafter described and pointed out in the appended claims.

A device of the same general type, for mixing and burning atomized oil and steam, is disclosed in Patent No. 1,303,587, issued May 13, 1919, the present invention being an improvement thereon.

In various forms of hydrocarbon burners at present used, it is the practice to first raise the temperature of the oil to produce a gaseous substance and then to conduct this gas through a valve where it is mixed with superheated steam and the whole mixture permitted to issue in the form of a highly atomized spray, which when ignited will produce a hydrocarbon flame of great intensity. This form of apparatus is but partially effective, because large deposits of carbon collect in and about the mixing chamber thus indicating that the particles of oil have not been completely broken up or atomized. Other difficulties are met with where steam is not readily to be had, as for instance in connection with hot air or hot water furnaces. Therefore, it is the principal object of this invention to provide an apparatus of this character which may be adjusted to replace steam by air and to so arrange the parts that an exact preadjustment is possible in the atomizer so that the ratio of oil and air may be kept constant regardless of the volume employed.

Another object of the present invention is to provide a mixing valve or atomizer having a double adjustment of the mixing nozzles whereby the latter may be set to produce any given amount of heat units dependent on the quality of oil and air pressure employed.

The invention is illustratively exemplified in the accompanying drawing, wherein Fig. 1, is a plan elevational view of the mixing valve;

Fig. 2, is a substantially longitudinal sectional view through the body of the mixing valve.

Referring to the drawing, 10 denotes a valve casing comprising a substantially integral casting provided with oppositely extending nipples 11 and 12 for the connection thereto of the ends of pipes leading from an oil reservoir and air pump respectively. The nipples 11 and 12 are provided with axial bores or ducts 13 and 14 which extend toward each other into the body of the casting, but do not meet. The outer ends of the bores 13 and 14 are enlarged and threaded to receive the threaded ends of unions, not shown. The head of the valve is designated 15 and comprises an internally threaded chamber 16 communicating with the bore 14 through a smaller threaded opening 17. A second passage 18 extending tangentially to the edge of the small opening 17 establishes communication between the chamber 16 and the bore 13. A nozzle 19 having a portion of its outer wall threaded, to be received by the threads of the chamber 16, is provided with an axial bore 20 divided into two portions, the first, referred to hereinafter as the vacuum chamber A and which extends well into the interior of the nozzle itself and is of sufficient diameter to clear the outer edge of the passage 18, and the second which extends from the inner end of the larger portion or vacuum chamber A to the exterior of the nozzle comprises the outlet B through which the mixture of oil and air is emitted.

Adjustable in the threaded bore 17 of the valve head 15 is an exteriorly threaded nozzle 21 having an axial bore or duct 22 therein and provided with a restricted opening 23 at its outer end. It will be noted with reference to Fig. 2, that the opening 23 in the end of the nozzle 21 is closely adjacent the inner end of the vacuum chamber and any axial movement of either of the nozzles will vary the distance or size of the space between the two. It is therefore, in this space that the mixing of the two elements is effected, and such space will hereinafter be referred to as the mixing chamber C.

The flow through ducts 13 and 18, and 14 and 22, is controlled by valve mechanisms constructed substantially as follows:—Projecting rearwardly of the nipple 12 and in axial alignment with the axis of the bore 17 and nozzle 21 is a valve socket 25 in the bore of which is a partially threaded valve stem 26 provided with the usual hand wheel 27 at its outer end; and projecting rearwardly from the nipple 11 in axial alignment with the inclined bore or duct 18 is a second valve socket 28 in the bore of which is mounted a partially threaded valve stem 29 also provided with a hand wheel 30. To prevent leakage past the valve stems the valve sockets are exteriorly threaded to receive suitable packing members 31.

In operation the valve 10 is mounted in any suitable manner best determined by the class of work to which it may be applied, and when the valve is to be used as a blow torch only a handle of some sort need be attached to the body of the casting. Air under pressure is supplied to the duct 14 where its velocity is controlled by the valve stem 26 which may be moved either towards or away from the mouth of the bore 22. The air then flows through bore 22 and opening 23 across the mixing chamber C where the oil is atomized and driven outwardly through the outlet passage B to the exterior of the valve. It will be noted that as the jet of air crosses from the opening 23 to the entrance of the outlet bore B the air in the vacuum chamber A is exhausted whereupon the vacuum thus created will draw upon the oil feeding duct 18. Oil, therefore, is forcibly fed or drawn from its source of supply to the duct 13 and the volume admitted to the passage 18 will depend upon the adjustment of the valve stem 29. As might be supposed the migratory movement of the oil from the passage 18 to the vacuum chamber A is not en masse, but the oil is rather held in suspense as it travels in a thin film from the outlet end of the passage 18 through the vacuum chamber A to the mixing chamber C. This has been found to be true after numerous experiments in which the vacuum chamber was found to be entirely free from any deposit of oil after the supply of air had been closed off, but the oil valve still remained open. In assuming this to be the fact what actually takes place appears to be that, with a perfect adjustment of the two nozzles, as heretofore explained, the amount of vacuum created in the chamber A is sufficient to enable the incoming oil to expand into a more or less vaporiferous substance which moves at a more or less rapid rate of speed through the vacuum chamber A. From this point in its travel the volatile oil rushes into contact with the jet of air projected between the opening

23 and outlet chamber B, referred to hereinbefore as the mixing chamber C, where a complete atomization of the oil takes place and issues from the end of the outlet B in the form of a highly combustible fuel. This fuel, however, will not ignite until a sufficient quantity of oxygen has been made present to support the combustion which has been found to take place at from two inches beyond the mouth of the outlet chamber B to substantially any distance depending upon the relative adjustments made in the nozzles and valve stems.

It will be noted, therefore, that the invention resides primarily in the construction and adjustment of the two nozzles 19 and 21, and in order to explain briefly the result obtained by such adjustment of the parts, I might state it has been found possible to produce a hydrocarbon flame of 3500° F. without raising the temperature of the valve itself, which is due to the fact that the combustion of the fuel does not take place until it is substantially away from the nozzle. When this valve is used in the fire box of a heater, steam boiler, or the like, a tube is placed about the apparatus so that the combustion is supported in the air drawn into the tube from the outside of the fire box and the air thus circulating past the valve tends to keep the temperature down to normal. The combination, then, of a constantly cool mixing valve and a combustion chamber which is separated from the valve itself, does away with the possibility of any carbon deposited in or about the valve, and is conclusive proof that there is a substantially complete combustion of the fuel as the latter combines with the air present. Further experiments have been made by supplanting liquid fuel by pulverized coal which when the particles of carbon have been disassociated and issue from the mouth of the outlet chamber B may be ignited in the same manner as the oil spray. So complete is the atomization of the products issuing from the valve that the suspended particles do not have time to drop before they become ignited and the combustion takes place.

What I claim as new and desire to secure by Letters Patent is:—

1. In a mixing valve of the character described, a casing having an oil passage and an air passage therein, relatively adjustable nozzles mounted in said casing and communicating with said oil and air passages, said nozzles being telescopically disposed one over the other, the inner of said nozzles being in communication with said air passage and the outer of said nozzles being in communication with the oil passage, a cylindrically annular vacuum chamber of a width equal to the diameter of said oil passage in said outer nozzle between said oil

passage and the terminal of said air nozzle, and a mixing chamber at the end of said vacuum chamber between the terminal of said air nozzle and the opposite wall of said outer
5 nozzle.

2. A mixing valve of the character described, comprising a casing provided with air and oil inlet ducts extending toward each other, a valve head the bore of which
10 communicates with said air inlet and said oil inlet, a nozzle adjustably mounted in said valve head and adapted to receive oil from said oil inlet duct, a second nozzle adjustable in said valve head and extending
15 concentrically within said first named nozzle

and communicating with said air inlet duct, a valve stem axially aligned with said second nozzle and movable so that the end of the latter may form a seat for the end of said stem, and a second valve stem movable to-
20 wards the communicating passage between the oil inlet and the interior of said first named nozzle, whereby the velocity of air may be proportioned to control the quantity of oil admitted to the space between the end
25 of the second nozzle and the inside opposite wall of the first nozzle.

In testimony whereof I affix my signature.

JOSEPH ROHR.