

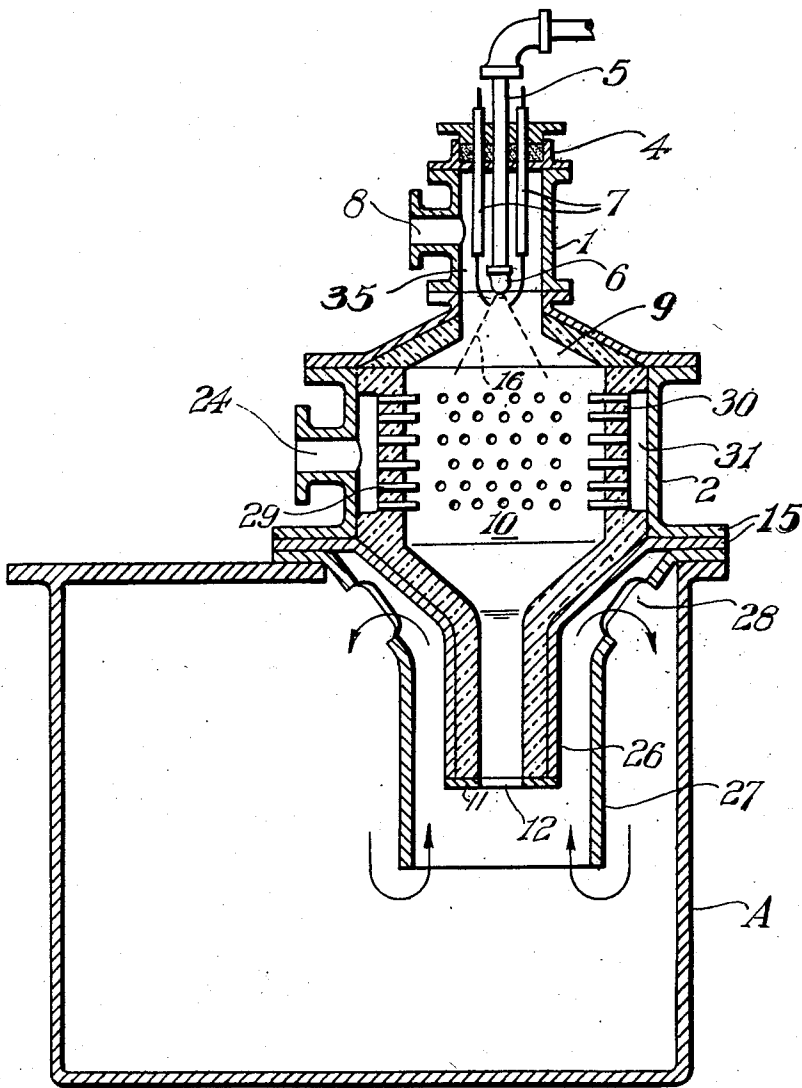
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N. SWINDIN

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SUBMERGED FLAME BURNER

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INVENTOR

INVENTOR
Norman Friedman
By Walter P. Peterson
ATTORNEYS

ATTORNEYS

UNITED STATES PATENT OFFICE

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SUBMERGED FLAME BURNER

Norman Swindin, London, England

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1 Claim. (Cl. 126—360)

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This invention relates to improvements in submerged flame burners and has for its object the provision of an effective submerged flame burner, which will employ liquid hydrocarbons as fuel instead of pre-admixed combustible gases, or separate supplies of combustible gases for admixture within the burner body, and which is suitable in particular for use in concentrating liquids, particularly corrosive liquids such as solutions of sulphuric or hydrochloric acid or mixtures thereof, or the spent liquors of acid pickling baths used in the manufacture of raw iron and steel goods.

A further object of the invention is the provision of means for preheating the air supply to the burner, and for admitting the air for admixture with the fuel in such a manner as to facilitate the mixture of fuel and air and the combustion of the said mixture.

According to the invention a submerged flame burner for operation with liquid fuel is provided comprising a combustion chamber having a downwardly directed flame orifice at its lower end adapted to be submerged in a body of liquid to be heated by said burner, and means at the upper portion of the combustion chamber for injecting and mixing liquid fuel and air therein and means for igniting the combustible mixture.

Also, according to the invention, means are provided for preheating the air prior to admission to the combustion chamber.

Reference will now be made to the accompanying drawing which is a sectional elevation of the preferred form of construction of a submerged flame burner according to the invention.

Referring to the drawing, the burner consists of a jet housing 1 and a combustion chamber housing 2 which are arranged externally of a liquor tank A on which they are mounted. The jet housing 1 is closed on top by a packing gland 4 and has an annular passage 35 therein through which extends a liquid fuel supply pipe 5 terminating in a jet nozzle 6. The electrodes 7 of a known type of spark ignition device also extend through said packing gland 4 and the annular passage 35 which is formed between the housing 1 and pipe 5 and terminate adjacent to the jet nozzle 6. Formed integral with the jet housing 1 is a lateral air inlet pipe 8 through which compressed air is admitted to the passage 35 in the jet housing at a level above the jet nozzle 6. From the base of the jet housing 1 the upper portion of the combustion chamber widens to form a throat 9 which leads from the passage 35 in the jet housing 1 and is coaxial and continuous with the passage 35 and the cylindrical main portion

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of the combustion chamber 10. The combustion chamber 10 is continuous with a flame tube 26 which has an end wall 11 at its lower end provided with a downwardly directed flame orifice 12 the cross sectional area of which is smaller than that of the main portion of the combustion chamber 10.

The combustion chamber housing 2 is formed with flanges 15 by which the burner may be bolted to the cover of the tank A in which the burner is to be mounted with the axis of its cylindrical main portion upright and with the flame tube 26 depending into the tank and the flame orifice 12 submerged in a body of liquor in the tank.

The flame tube 26 is enclosed by a shroud 27 the lower end of which is open and the upper end of which is provided with a series of perforations 28 so as to assist heating, agitation and circulation of the liquor within the tank.

The means for preheating the air consists of a plurality of pipes 29 of refractory material mounted in an annular wall 30 of refractory material which is concentric with the combustion chamber housing 2, an annular space 31 being provided between the wall 30 and the combustion chamber housing to which compressed air is admitted through an inlet port 24.

In the operation of the burner, the liquid fuel is delivered to the jet nozzle 6 under controlled pressure, which may be of the order of 100 lbs. per square inch. The nozzle 6 is of a known type and the liquid fuel issues therefrom in the form of an atomized spray cone 16 as shown. Compressed air supplied through the inlet pipe 8 passes through the annular passage 35 between the jet housing 1 and fuel pipe 5 and is admixed with the fuel spray 16. The relative proportions of fuel and air supplied to the burner will be adjusted, according to the type of fuel being used, so as to give complete combustion. Combustion of the mixture of fuel and air is initiated by means of the electrodes 7 of the high-tension spark ignition device. The compressed air admitted through the inlet port 24 is preheated in the annular space 31 and passes into the combustion chamber through the pipes 29 which are heated by the flames produced within the combustion chamber 10. A proportion of air is also admitted to the passage 35 of the jet housing 1 at a level above that of the jet nozzle 6 through the inlet port 8 in order to maintain a downward deflection of the atomized fuel spray 16.

It has been found that in order to ensure the maximum transfer of heat from the products of combustion in the burner to the liquor in which

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the latter is submerged, regard must be had to the depth of submergence and the diameter of the flame outlet of the burner. Thus, a larger nozzle requires a greater depth of submergence than a smaller nozzle.

For the purposes of the invention practically the whole range of fluid mineral hydrocarbons may be utilized from naphtha and paraffins to heavy crude oil, the said fuel if necessary being subject to filtration prior to its entry to the nozzle or jet. Thus the filtering device may be external to the burner or a filter may be embodied in an extension of the fuel inlet pipe 5 to the spraying jet 6.

The air admitted through port 8, in addition to maintaining a downward deflection of the fuel spray assists in the cooling of the oil pipe 5 and the electrodes 7.

I claim:

A submerged flame burner for operation with liquid fuel for heating a liquid, comprising a combustion chamber having a cylindrical main portion and a downwardly directed flame orifice at its lower end of smaller cross sectional area than that of the main portion of the combustion chamber, and having means for mounting it with the axis of its cylindrical portion upright and with said orifice submerged in a body of liquid, said main portion of said combustion chamber being formed with concentric walls having an annular space therebetween, means for supplying air to said space, the inner of said walls being formed of refractory material and provided with a plurality of tubes of refractory material extending therethrough, the inner ends of said tubes protruding into the combustion chamber and the outer ends of said tubes communicating with said annular space to adapt

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said tubes to pass preheated air to said combustion chamber, a housing fixed to and closing the upper portion of the combustion chamber and having a passage therein coaxial with and communicating with the upper portion of the combustion chamber, spraying means for supplying atomized liquid fuel to the passage in the housing, the combustion chamber having a throat in its upper portion which is coaxial and continuous with the main portion thereof and leads from said passage in the housing and widens toward the main portion of the combustion chamber, and means for supplying compressed air to said passage at a level above the level of supply of fuel thereto for deflecting the fuel introduced therein downwardly into the combustion chamber.

NORMAN SWINDIN.

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