

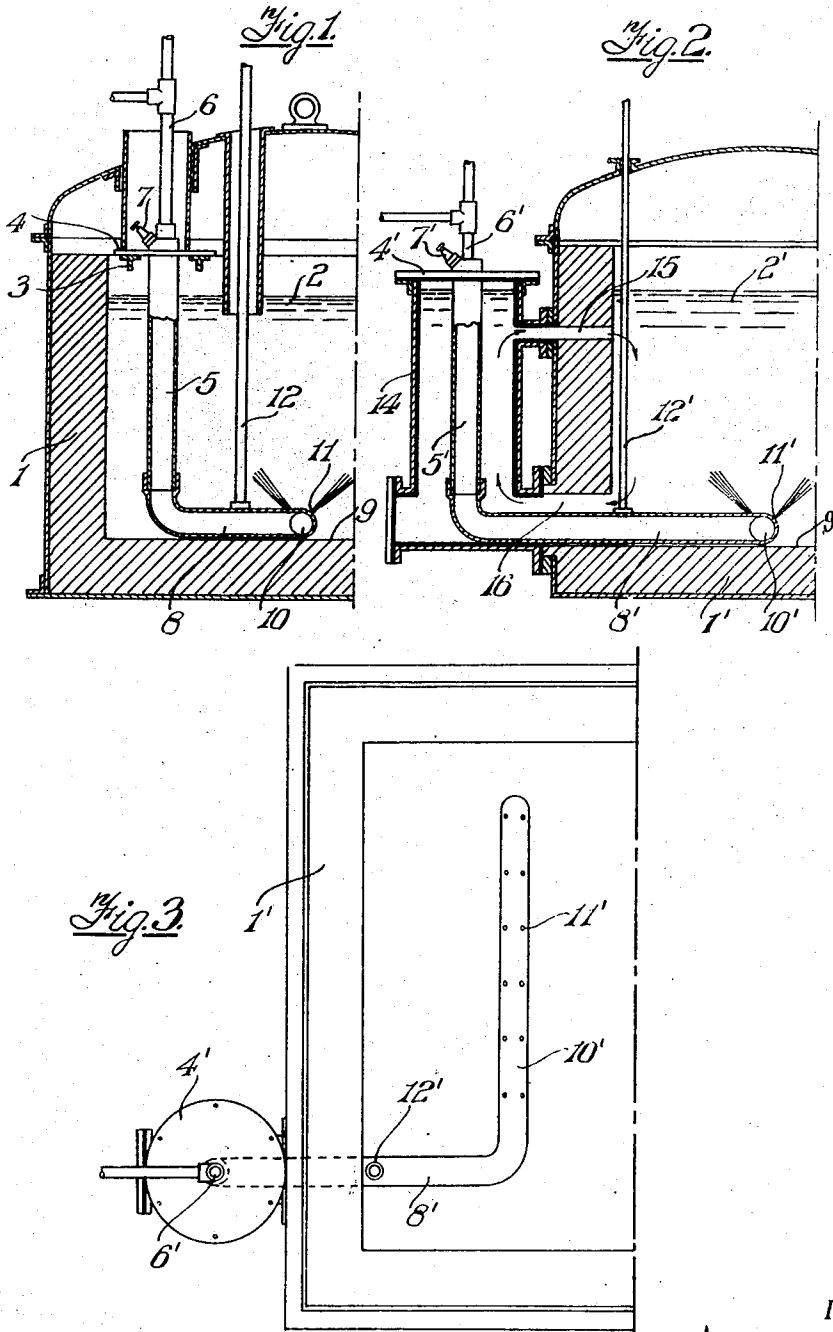
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SUBMERSIBLE BURNER

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SUBMERSIBLE BURNER

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This invention relates to improvements in submersible burners and has more particular reference to the type that are supplied with an inflammatory gaseous mixture, and that upon ignition thereof the resultant hot gases issue below the surface of the liquid.

The present invention finds particular application in the heating and agitation of the acid baths employed for the pickling of iron and steel and in other applications of a like nature.

The object of the present invention is to prevent incrustation and obstruction of the orifices from which the heating and agitating gases enter the bath, and to prevent the lowering of the level of the bath which would otherwise take place due to evaporation of the liquid.

It has been ascertained that if a suitable amount of water is supplied by an inlet to the combustion chamber, so that it admixes with the inflamed gases or in the flame path of the gas, that the generation of steam in the chamber ensues and the issue of such steam at the mouth of the burner orifice or orifices is sufficient in its action to prevent concentration at said orifices of crystalline or other matter, which otherwise forms and in the case of steel pickling baths mainly consists of ferrous sulphate, either anhydrous or containing only a small proportion of water of crystallisation, and it also compensates for evaporation of water from the bath.

According to a preferred form of the invention a burner of the type generally conforming to that set forth above is mounted in the main pickling tank or alternatively accessibly mounted in an independent tank so as to provide better access for the burner head and valves, whilst its combustion chamber is led into the interior of the tank. In either type an extension of the said combustion chamber is arranged to issue from its tank housing and enter in a horizontal direction in or about the floor level of the acid pickling bath, there being circulation of said liquor between the main pickling tank and the independent tank.

In order to keep clean the exit orifices of the gases means are provided for the generation of steam within the combustion chamber of the burner and conveniently this is accomplished by introducing through a suitably disposed conduit a small stream of water which is vapourised by the inflammation of the gases within the chamber.

The invention is not necessarily restricted to the case in which the combustion chamber is housed in a separate tank communicating with the pickling tank by two ports as already described. The burner may equally well be placed at one end or corner of the bath with a perforated pipe extending centrally along the bottom of the bath or otherwise, as desired.

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The invention consists in a submersible burner more particularly for use in iron pickling tanks wherein access to said burner is provided above the liquor level of said tank and the combustion chamber extends into and is submerged within the body of the liquor heated and wherein an independent supply of water is admitted to said combustion chamber in advance of gas or flame issue orifices thereof.

The invention further comprises placing said burner in an independent but communicating tank adjacent said main pickling tank whereby an extension of the combustion chamber enters and extends into said pickling tank with conduits between said independent tank and pickling tank for thermosyphon or forced flow of liquid from one tank to the other.

In order that the invention shall be more fully understood reference is made to the accompanying drawings wherein:

Fig. 1 represents in part sectional elevation the burner mounted in an acid pickling tank,

Fig. 2 is a part sectional elevation showing the burner mounted in an independent adjacent tank but communicating therewith for fluid circulation,

Fig. 3 is a plan view of Figure 2.

Referring to the drawings and to Fig. 1 the iron pickling tank 1 is of normal construction, and above the level of the pickling liquor 2 is a supporting structure 3 carrying the head plate 4 of the submersed burner combustion chamber 5. The burner combustion chamber 5 is supplied with a combustible mixture through pipe or pipes 6 and electrical ignition of the mixture is effected by sparking plug 7. The gases from the burner combustion chamber 5 pass to an extension of chamber 5 comprising a tube 8 which is supported upon the base 9 of the pickling tank 1, and a pipe 10 running centrally along the bottom of the tank, said pipe 10 being perforated at 11 permitting the hot gases of combustion and steam from the added water to enter the body of liquor. Water is introduced through conduit 12 and is converted into steam and passes away with the gaseous products of combustion to the liquid treated. In operation the supply of water to the burner has a threefold effect, since its admission to the combustion chamber 5 inhibits or prevents the growth of crystals (in this case ferrous sulphate) around the issue orifices 11 by saturation of the products of combustion with water vapor and equally can be adjusted in a manner to equal substantially the rate of evaporation of water from the liquid pickle and thereby maintain the level of liquid pickle in the tank 1 by compensating for the losses due to evaporation. The forceful issue of the hot gases provides excellent agitation of the liquid.

The materials employed for construction of the

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said burner and its components are acid resisting and for those parts not subjected to intense heat, such as the water feed pipe, may be of metal coated with ebonite or like hard vulcanised rubber compound.

In Figs. 2 and 3 an alternative method is shown for mounting the submersible burner. In this form an independent tank 14 is provided immediately adjacent the main iron pickling tank 1' said tank 14 being provided with communicating passages 15 and 16 respectively in the form of conduits between the two tanks, the liquid level 2' in both remaining thereby the same. The burner combustion chamber 5' is in like manner to the form shown in Fig. 1 provided with a tube 8', which latter passes through the conduit 16 into the tank 1', and is supported on the base 9' of the tank 1'. Water is admitted to the hot gases by pipe 12'. In this form of the invention the hot liquor in operation circulates between the two tanks as indicated by the arrows.

I claim:

1. The method of heating pickle liquors, which comprises burning a combustible mixture, mixing water with the combusted gases to generate a water vapor content in said gases, and discharging the combusted gases and their water vapor content into a body of the liquors below the upper surface thereof, and passing the gases and vapors through the liquors to compensate for the water evaporated from said liquors and prevent incrustation in the zone of discharge of the combusted gases.

2. The method of heating and agitating an acid bath of pickle liquor containing crystallizable matter and for maintaining the level of liquor in the bath, comprising burning a combustible gaseous mixture to form a stream of combusted gases, mixing water with the stream of combusted gases, heating the water thereby and generating steam, and passing the combusted gases admixed with steam through the bath of liquor below the upper surface thereof in the form of numerous small streams to heat and agitate said liquor, said water being introduced to the stream of combusted gases at a rate substantially equal to the rate of evaporation of water from the heated bath to compensate for such evaporation and to prevent concentration of crystalline matter in the zones of said small streams.

3. A submersible burner for heating iron and steel pickling liquors, comprising in combination, a combustion chamber arranged to depend into a body of pickling liquor, means on the upper end of said combustion chamber for supplying a mixture of combustible gases thereto, means extending within said combustion chamber for igniting said combustible gases, an extension tube connected to the lower end of said combustion chamber to receive combusted gases therefrom and arranged to extend in the lower portion of said body of liquor, said extension tube being formed with a plurality of outlet orifices, and a conduit connected with said extension tube in advance of said outlet orifices for delivering a supply of water to said tube for heating by the combusted gases and generating steam for discharge with said gases through said orifices.

4. A submersible burner according to claim 3, including main and auxiliary tanks intercommunicating for circulation of said body of pickling

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liquor between them, and wherein said combustion chamber depends in liquor in said auxiliary tank, said combustible gas supply means and igniting means are mounted on said auxiliary tank, and said extension tube is in the lower portion of said main tank.

5. Apparatus for heating a bath of pickle liquor, comprising a pickle liquor tank, a burner having a combustion chamber, means for supplying a combustible gaseous mixture to the burner for ignition to produce combusted gases, means for supporting the burner in a submerged position relatively to the level of liquor in the tank, an extension of the burner combustion chamber connected thereto and disposed in the tank below the level of liquor therein and having orifices for discharging combusted gases from the burner combustion chamber and the extension of said combustion chamber, and means connected to said extension of the combustion chamber and closely adjacent thereto in heat exchanging relation and in advance of said orifices for introducing water to the combusted gases from the combustion chamber and thereby generate steam for admixture with the combusted gases and discharge with the combusted gases from said orifices.

6. Apparatus for heating and agitating iron and steel pickle liquors, comprising a tank to contain a bath of pickle liquor, a burner having a combustion chamber, means for supplying a combustible gaseous mixture to the burner for ignition to produce hot combusted gases, means for supporting the burner in a submerged position relatively to the level of liquor in the bath, an extension connected to the combustion chamber of the burner to receive combusted gases therefrom and disposed in the lower portion of the tank below the level of liquor therein and having orifices distributed along its length for discharge of the combusted gases into the bath of liquor, and means connected to the combustion chamber extension closely adjacent to the burner and in advance of the orifices for introducing water to the combusted gases to generate steam for admixture with the combusted gases and for discharge of the steam and combusted gases through said orifices.

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