

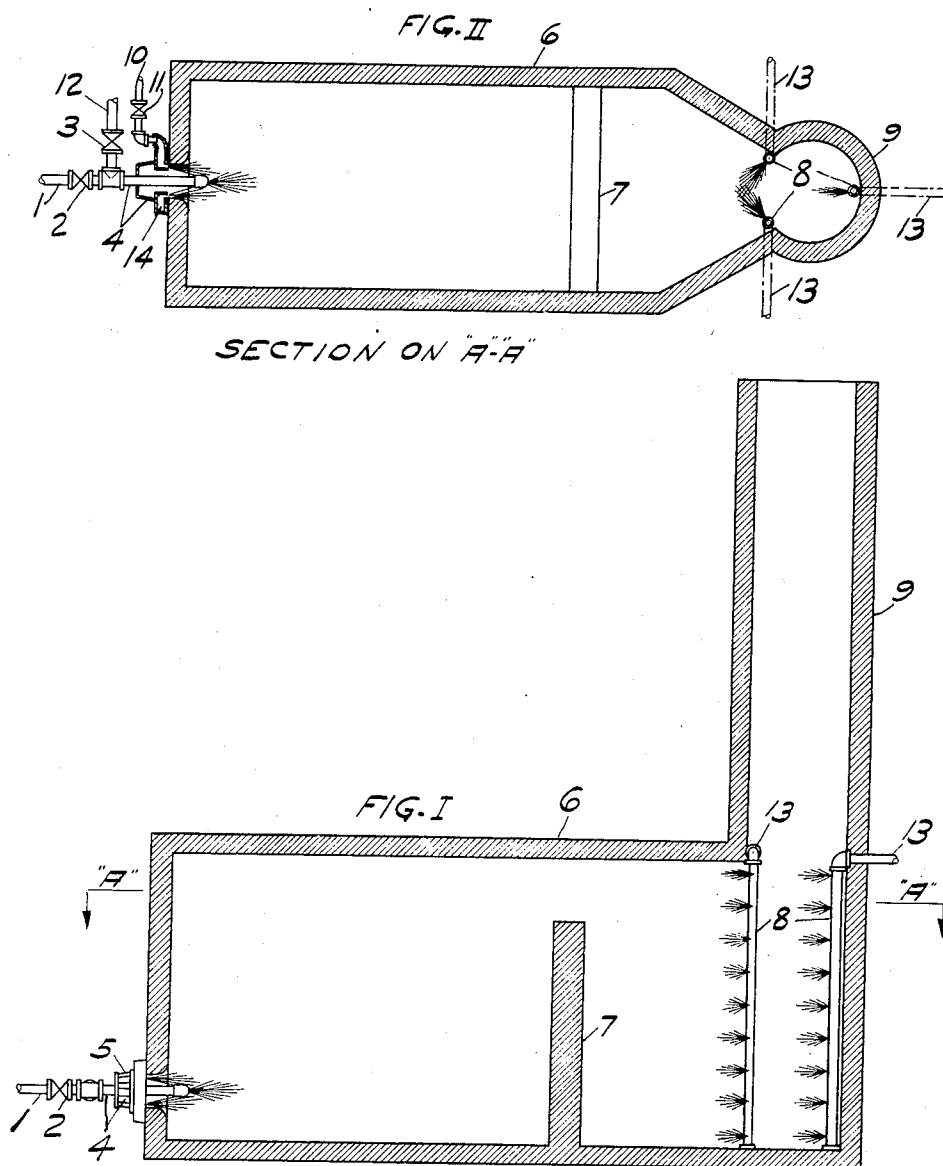
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METHOD OF DISPOSING OF REFINERY WASTES

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METHOD OF DISPOSING OF REFINERY WASTES

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This invention relates to an improved method for handling and disposing of objectionable wastes which result from the refining of petroleum oils or other organic products, in which various acid sludges, sulphur bearing tarry residues, various gases and vapors are encountered, which must be handled and disposed of in such a manner that the character of the surrounding atmosphere will not be polluted or adversely affected by contamination with poisonous irritants, malodorous gases or refinery aerosols.

The conventional method for the ultimate disposal of all acid sludges or odorous compounds occurring in the refinery is high temperature oxidation, in which the combustible products are burned to carbon dioxide, water vapor, sulphur dioxide and sulphuric acid mist, and are then discharged from high stacks into the atmosphere.

However, much trouble is experienced by these known methods after the combustion operation due to the formation of sulphur trioxide, which unites with some of the water present in the products of combustion, forming what is known as sulphuric acid mist, a heavy white irritant gas which rapidly settles to the ground and is detrimental to vegetation, animal and human habitation.

The formation of sulphuric acid mist usually takes place after the combustion operation, and is principally due to contact of the heated sulphur dioxide bearing gases, which may contain from approximately 5 to 17 per cent by volume excess oxygen, with the heated brick work forming the stack, at temperatures between 900 and 1650 degrees F.

The formation of sulphuric acid mist will not take place to any appreciable extent below 900 degrees F. At temperatures above 1650 degrees F. sulphuric acid mist is decomposed into sulphur dioxide and oxygen.

Now, we have discovered that if the combustion of acid sludge and other refinery wastes is effected with an excess quantity of air at temperatures above 1650 degrees F., and the combustion products quickly cooled by means of water sprays or other fluid cooling agents to approximately 900 degrees F. or lower as they enter the stack, the formation of sulphuric acid mist is substantially prevented.

An object of the invention is to dispose of re-

finery waste products by combustion with excess quantities of air at high temperatures without any substantial formation of sulphuric acid mist, and then discharge the products of combustion through high stacks into the atmosphere.

Another object of the invention is to dispose of acid sludge by combustion with air at high temperatures without the formation of appreciable amounts of sulphuric acid mist.

Other objects and advantages of the present invention will be apparent from the preferred embodiment, which will now be more fully explained by reference to the accompanying drawing, which is a diagrammatical representation of apparatus embodying the invention.

In the drawing, Figure I is a sectional elevation of apparatus adapted for the practice of the process of the invention.

Figure II is a sectional plan view taken on line "A"—"A" of Figure I. In the Figures I and II similar numbers represent similar parts.

In the drawing, 6 represents a brick furnace, with a burner 4 and a bridge wall 7, constructed so as to divert the products of combustion in turbulent flow to the top of the furnace, and cause them to pass through the opening between the top of bridge wall 7 and the roof of furnace 6.

Pipe 1, controlled by valve 2, connects burner 4 to a supply of refinery waste products not shown. Pipe 12, controlled by valve 3, connects burner 4 to a steam supply not shown. Pipe 10, controlled by valve 11, connects burner 4 to a supply of hydrocarbon gas or oil not shown. Burner 4 is provided with air inlet passages 5 and a gas or oil inlet passage 14.

9 represents a flue or stack connected to furnace 6, through which the combustion products pass and are discharged into the atmosphere. 8 are water spray pipes connected to pipes 13. Pipes 13 are connected to a source of water supply not shown.

The preferred process as carried out in the apparatus just described is as follows:

Furnace 6 is first heated to a temperature in excess of 1650 degrees F. by the introduction and combustion of a hydrocarbon oil or gas with air. The hydrocarbon oil or gas is introduced into furnace 6 through passageway 14 of burner 4 from pipe 10, controlled by valve 11. The air is introduced through air inlet passageways 5 of

burner 4, and the flow is controlled by shutters or other mechanical means known in the art.

When furnace 6 has been heated to a temperature of approximately 2000 degrees F., the flow of hydrocarbon oil or gas passing through passageway 14 into furnace 6 is reduced or discontinued by closing or partially closing valve 11 in pipe 10. Then objectionable wastes, such as acid sludges, sulphur bearing tarry residues, malodorous gases and refinery aerosols, either alone or mixed with hydrocarbon oil, are caused to pass from their source of production or from storage through pipe 1 and into burner 4, the flow being controlled by operation of valve 2. At the same time a regulated flow of steam from pipe 12, controlled by valve 3, is introduced into burner 4, which sprays the waste products into furnace 6 in a finely divided condition, wherein they are commingled with air coming through air inlet passages 5 in quantities sufficient to completely consume or burn the spray of waste products with the formation of carbon dioxide, water vapor and sulphur dioxide gases.

Furnace 6, as heretofore stated, is maintained at a temperature in excess of 1650 degrees F. by regulating the flow of gas or oil passing into furnace 6 through passageway 14, in order to prevent the formation of sulphur trioxide or sulphuric acid mist, and also to decompose any sulphuric acid which may be present in the waste products into sulphur dioxide and water.

The quantity of air introduced into furnace 6 through air inlet passages 5 is regulated so as to maintain an excess volume of oxygen in the combustion gases. Preferably, the combustion gases passing from furnace 6 into stack 9 should contain not less than 5 per cent by volume excess oxygen in order to prevent the formation of black smoke. The quantity of excess air introduced depends upon the waste products being burned.

For refinery waste products containing a high percentage of incombustible materials, such as acid sludge, the percentage of air introduced into furnace 6 is such that the excess oxygen content in the products of combustion will be approximately 5 to 10 per cent by volume, and may range from 10 to approximately 17 per cent by volume in case the waste products contain a high percentage of combustible material, such as tarry residues or sludges containing small percentages of sulphuric acid or combined sulphur.

In general, the quantity of air and quantity of hydrocarbon oil or gas introduced into furnace 6 along with the waste products is governed by the temperature of the products of combustion passing between bridge wall 7 and the top of furnace 6, such temperature being preferably maintained between 2000 and 2500 degrees F., and must necessarily be in excess of 1650 degrees F.

The completely oxidized products of combustion, at a temperature of approximately 2000 to 2500 degrees F., pass from furnace 6 into the bottom section of flue or stack 9, and are therein immediately cooled to a temperature of 900 degrees F. or lower by water sprays from spray pipes 8, whereby the formation of sulphuric acid mist is substantially prevented and the cooled products of combustion pass up through flue or stack 9 and are discharged into the atmosphere at any desired height.

While the particular form of apparatus and method of disposing of objectionable waste refinery products is well adapted for carrying out

the objects of the present invention, various changes and modifications may be made without departing from the spirit of the invention, and the invention includes all such modifications and changes as come within the scope of the appended claims.

We claim:

1. In the method of disposing of waste products, containing sulphur compounds, by complete combustion in a heated zone with excess quantities of air, the improvement which comprises, maintaining the heated zone at temperatures above the decomposition temperature of sulphur trioxide, quickly cooling the heated products of combustion below a sulphur trioxide forming temperature by injecting sprays of water into the combustion products as they pass from the heated zone into a conduit, and discharging the cooled combustion products and vaporized water from the conduit into the atmosphere.

2. In the method of disposing of waste products, containing sulphur compounds, by complete combustion in a heated zone with excess quantities of air, the improvement which comprises, maintaining the heated zone at temperatures in excess of 1650 degrees F., quickly cooling the heated products of combustion to 900 degrees F. or less by injecting sprays of water into the combustion products as they pass from the heated zone into a conduit, and discharging the cooled combustion products from the conduit into the atmosphere.

3. In the method of disposing of refinery waste products, containing sulphur compounds, by oxidation and combustion in heated zones with excess quantities of air, the improvement which comprises, maintaining the heated zone at temperatures in excess of 1650 degrees F., quickly cooling the heated products of oxidation and combustion to 900 degrees F. or less by injecting sprays of water into the oxidation and combustion products as they pass from the heated zone into a conduit, and then discharging the cooled products and vaporized water from the conduit into the atmosphere at an elevated height.

4. The method of disposing of acid sludge containing sulphuric acid, comprising, spraying the acid sludge into a heated zone with steam, introducing air into the heated zone in excess amounts sufficient to convert the acid sludge by complete oxidation into carbon dioxide, water vapor and sulphur dioxide, maintaining the heated zone at temperatures above 1650 degrees F. by a regulated introduction and combustion of a hydrocarbon with air, quickly cooling the heated products of oxidation, combustion and decomposition to 900 degrees F. or less by injecting sprays of water into the heated products as they pass from the heated zone into a conduit, then discharging the cooled products and vaporized water from the conduit into the atmosphere at an elevated height.

5. In the method of disposing of waste products, containing sulphur compounds, by substantially complete combustion in a heated zone with excess quantities of air, the improvement which comprises, maintaining the heated zone at temperatures above the decomposing temperature of sulphur trioxide, quickly cooling the heated products of combustion below a sulphur trioxide forming temperature with a cooling agent as they pass from the heated zone into a fluid conduit, and discharging the cooled combustion products, mixed with the cooling agent, from the conduit into the atmosphere.

6. In the method of disposing of waste prod-

ucts, containing sulphur compounds, by combustion in a heated zone with air, the improvement which comprises, maintaining the heated zone at temperatures above the decomposing temperature of sulphur trioxide, quickly cooling the heated products of combustion below a sulphur trioxide forming temperature by a fluid cooling agent as they pass from the heated zone into a conduit, and discharging the cooled combustion products from the conduit into the atmosphere.
7. In the method of disposing of waste prod-

ucts, containing sulphur compounds, by combustion in a heated zone with air, the improvement which comprises, maintaining the heated zone at temperatures above the decomposing temperature of sulphur trioxide, and quickly cooling the heated products of combustion below a sulphur trioxide forming temperature by introduction of water into the combustion products as they pass from the heated zone into a conduit.

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