

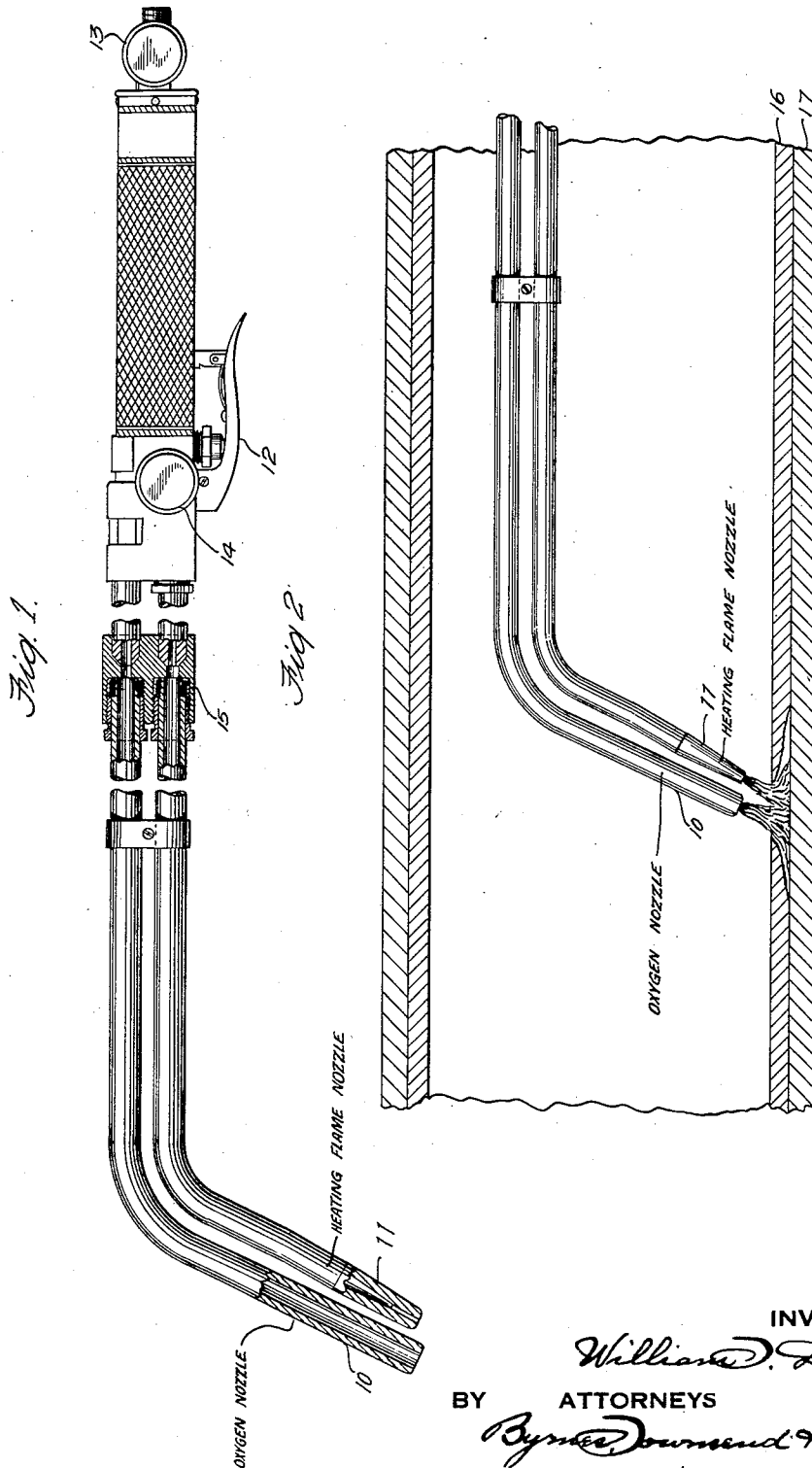
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METHOD OF DECARBONIZING OIL REFINING APPARATUS

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METHOD OF DECARBONIZING OIL REFINING APPARATUS

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This invention relates to a method of decarbonizing oil refining apparatus such for example as the tubular type of oil stills. These stills are usually made of lengths of pipe united at the ends by so-called "junction boxes", "return bends" or "headers". The oil is caused to flow through the tubes, while heat is applied to the outside thereof. The oil in the tubes, either in liquid or vapor phase, becomes heated. During this process a coating of so-called "petroleum coke" becomes deposited on the interior of the still and appurtenances thereof. This necessitates the shutting down of the still at frequent periods since the coke is a poor conductor of heat and also because the coke clogs the tubes, rendering the passage of the liquid and vapors therethrough difficult.

Heretofore, it has been the practice to remove the coke from the interior of the apparatus by one of two methods, the first consisting of mechanical removal by scraping or chipping, the second consisting of burning with a torch using industrial fuel gas and compressed air. Both methods had serious objections, the first was slow and required expensive apparatus; the second involving danger of damage of the walls to the apparatus by the heat of the burning coke.

An object of my invention is to provide a method whereby the coke may be removed rapidly and inexpensively and without danger to the refining apparatus. Upon experimenting with the removal of the coke with oxygen I have found, much to my surprise, that although oxygen produces a higher temperature, it is possible to remove the coke by burning in the presence of oxygen or air enriched in oxygen without injury to the walls of the apparatus.

My preferred method of removing coke from the interior of an oil refining apparatus consists in burning it out in the presence of substantially pure oxygen. While I may do this in various different ways and with various types of apparatus I prefer to use a torch providing a pre-heating flame and a blast or jet of substantially pure oxygen. I may, of course, use separate torches should I so desire. The pre-heating flame is preferably an

oxy-acetylene flame, containing oxygen and acetylene in the proportions to give what is known as a "neutral welding flame", although of course other proportions may be employed. While I might use other fuel gases, such as illuminating gas, I prefer to use acetylene, since I find this most satisfactory. I have also found that carbon dioxide, which is formed during the burning of the coke, reacts with the heated coke adjacent thereto forming carbon monoxide, thus resulting in an economy of oxygen. The jet and pre-heating flame are directed against the layer of coke, which often is as much as $\frac{1}{2}$ inch in thickness, and a hole is rapidly burned to the wall of the still. The oxygen then apparently extends sideward, in a mushroom shaped formation, eating away the under part of the coke, giving an effect which may be called "underburning". This burns the coke away from the tube wall very rapidly in the presence of the oxygen atmosphere and there is no time to heat the walls of the still to such an extent that there is any possibility of injury thereto. Should the remaining portion of the coke burn it will be spaced from the still wall, and there will be no heat conduction to the wall. As a matter of fact, however, not all of the remaining coke is burned in place. Due to the underburning, together with differential expansion in portions of the coke, expansions of the products of combustion, or the force of the oxygen jet, large portions of the coke become detached and are either broken away or fall under influence of gravity. In order to strengthen this effect the oxygen is under comparatively high pressures being delivered to the torch at pressure as high as one hundred lbs. per square inch.

Before starting upon the operation of burning out the coke the oil refining apparatus is purged out by circulating steam or some neutral gas therethrough.

While I have discussed the use of my process as applied to oil still tubes and return bends it is to be understood that I include any parts of oil refining apparatus in which the so-called coke is deposited.

I am aware that it is old in the art to re-

move the so-called "carbon" from the cylinders of the internal combustion engines by burning in the presence of oxygen. My process differs from this in several important respects. Among these may be mentioned the material which is removed. The so-called "carbon" in automobile cylinders consists in a mixture of road dust, lubricating oil residues, and carbon resulting from imperfect combustion of the gasoline. The road dust may run as high as 80%. Thus it will be evident that the material to be acted upon is quite different. The so-called "carbon burning" is merely a burning of the residues of the lubricating oil and fuel mixture, resulting in a disintegration and a freeing of the road dust. Moreover, due to the fact that the automobile cylinder is almost completely enclosed, it is possible to fill the interior of the cylinder with oxygen. With oil refining apparatus this is rarely possible and, when possible, would involve a large waste of oxygen. Moreover, in internal combustion engines the carbon deposit is so thin and so diluted with inert matter that it may be completely burned before the cylinder wall is heated to a temperature above that which is found during the operation of the engine. For this reason it is unnecessary to provide the precautions against heating, which I have disclosed. Although it is not absolutely essential that the pre-heating flame be used during my entire process, I have found it more advantageous and prefer to use it, while in burning carbon from the interior of internal combustion engines the carbon once ignited burns without the use of a pre-heating flame. In my method the oxygen is directed against the coke deposit, preferably at the base, at high velocities, while in the old process this is not done.

The method of my invention is illustrated in the drawing, in which Figure 1 represents a suitable torch for decarbonizing and Figure 2 illustrates diagrammatically my method of applying the torch.

In Figure 1 an oxygen nozzle 10 is shown in convenient juxtaposition to the heating-flame nozzle 11. The flow of oxygen under high pressure through the nozzle 10 is controlled by a suitable valve arrangement 12. The flow of combustible gas for the heating flame is controlled by a valve 13, and the necessary oxygen for the heating flame is bled from the oxygen line into the stream of combustible gas through the control valve 14. The nozzles 10 and 11 and their supply tubes may be changed if desired by disconnecting them at the junction 15.

The method of using the above torch may be seen in Figure 2, wherein the preheating flame from the nozzle 10 raises a portion of the deposit 16 to its ignition temperature in oxygen, whereupon the stream of high-pressure oxygen from the nozzle 11 burns rapidly through the deposit 16 to the metal surface

17, undercuts the deposit 16, burns the underside of said deposit out of contact with the metal surface 17 and loosens and separates appreciable portions of the deposit 16 from said metal surface without completely consuming the material of the deposit.

I claim:

1. Method of decarbonizing the interior of an oil refining apparatus which comprises heating the coke-like residue to such a temperature that it will burn in an atmosphere containing more oxygen than normal and supplying an atmosphere rich in oxygen to the vicinity of said heated residue, said atmosphere being supplied at a high velocity and in such a manner that it detaches pieces of unburned coke from the walls of the apparatus.

2. Method of removing thick cokelike residues from the interior of an oil refining apparatus which comprises heating the coke-like residue with an oxy-acetylene flame and supplying an atmosphere of substantially pure oxygen to said heated residue and maintaining said heating flame during the removal of the residue, whereby the time during which any given portion of said apparatus is heated is substantially reduced.

3. Method of removing a coke-like residue from the interior of an oil refining apparatus which comprises purging the still with a non-combustible fluid, heating the residue and supplying the heated residue with an atmosphere richer in oxygen than air, said atmosphere being supplied at a high velocity and in such a manner that it detaches pieces of unburned residue from the walls of the apparatus.

In testimony whereof, I affix my signature.
WILLIAM T. DAVIS.