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VANADIUM CONTAINING BRIQUETTES

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1 Claim. (Cl. 75—133)

1

The present invention relates to a novel and improved addition material for the production of vanadium containing ferrous alloys, as well as to a novel and improved process for the recovery and utilization of vanadium containing materials.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the processes, steps and compositions pointed out in the appended claims.

The invention consists in the novel steps, arrangements, compositions and improvements herein shown and described.

Heretofore, it has been proposed to mix vanadium oxides with carbonaceous material and to briquette the mixture so as to form briquettes suitable for the production of ferrous alloys. In such briquettes, the mixture is usually an oxide of vanadium mixed with pitch, coke, calcium carbide or other carbonaceous material as the reducing agent. Prior patents on such briquettes are as follows: United States Patents Nos. 2,381,675 of 1945 and 2,470,935 of 1949 and Luxemburg Patent No. 25,762 of 1939.

However, the prior briquettes are formed by using relatively high grade vanadium oxide material obtained by concentrating, roasting, leaching and converting vanadium ore, entailing extra expense on that account. Such processes also involve some loss of vanadium and due to all of these factors, the cost of the briquettes is relatively high.

I have discovered that certain industrial wastes can be utilized for the formation of vanadium briquettes without the concentrating, leaching and converting steps heretofore required, and that these wastes which are rich in vanadium need only be roasted and briquetted, or may be used as the major source of vanadium. The roasted waste is then enriched with purified, concentrated or converted vanadium oxide in a minor amount, if desired, for the formation of the briquettes.

In particular, the wastes which I prefer to use are wastes from the processing and refining of certain petroleum products such as fuel oil, gasoline, in which waste products, particularly in the asphaltic petroleum wastes from certain of the oil fields, the ash, soot and flue dusts are exceedingly rich in vanadium.

Those petroleum wastes and residues which contain large amounts of vanadium compounds,

2

usually contain no harmful quantities of other elements and the vanadium contained is suitable for alloying use without any purification or refinement. With certain crudes, the ash from the oil wastes contains as much as 50% vanadium. In Oklahoma crudes, the ash often contains as much as 22%, in Iranian crudes it often contains from 14% to 39% of vanadium (calculated as V_2O_5), while in Venezuelan crudes the flue dust contains from 14% to 47% or more of vanadium, calculated as V_2O_5. Vanadium is an important constituent of the ash, flue dust and other residues of petroleum from other fields including those from Texas, Mexico, Egypt, Iraq, Peru, etc. and is a common constituent, although in many petroleums the vanadium content is too low to be of use in accordance with the present invention.

Heretofore the vanadium content of such crudes has been recovered by extraction or leaching, purification, and conversion as for instance in patent to Baldeschwieler 1,563,061 of 1925 and Oberle 1,570,170 of 1926.

Vanadium usually occurs in crude petroleum oil as a sulfide or as an organic sulfur containing compound of vanadium. It is usually accompanied by nickel and minor quantities of such harmless impurities as iron, calcium, sodium, aluminum, silicon and magnesium compounds which need not be removed from the residues. The petroleum flue dust or ash is substantially free of sulfur and needs no treatment, except drying, to render it suitable for briquetting with the reducing agents.

After the flue dust or ash has been analyzed to ascertain its vanadium content, it is then enriched with one of the purer vanadium oxides, preferably vanadium pentoxide, after which it is mixed with the necessary quantity of carbon in the form of pitch, coke, asphalt or other carbonaceous material sufficient to convert the oxide to carbon monoxide as the vanadium is reduced to its metallic form. The other reducible metals are also reduced and enough carbon must be present to reduce them at the same time, although the impurities such as the oxides of the first, second and third group metals (such as sodium, calcium, magnesium, aluminum) will not be reduced as the vanadium oxide is reduced.

Thus, using a thousand pounds of a petroleum flue dust or ash which contains about 42% of vanadium pentoxide and about 5.3% of nickel oxide, with the remainder of it being impurities such as oxides of iron, aluminum, silicon, calcium, magnesium and minor other constituents,