

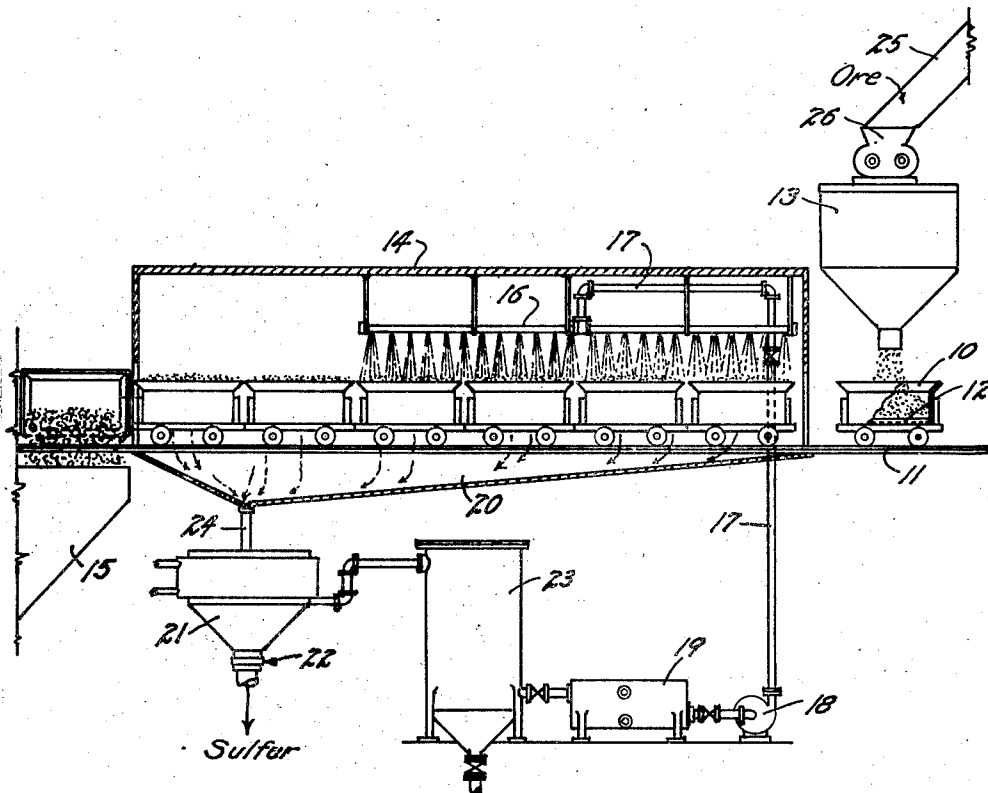
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METHOD OF DISSOLVING SULPHUR FROM ORES

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METHOD OF DISSOLVING SULFUR FROM ORES

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1 Claim. (Cl. 23—312)

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This invention relates to the extraction of sulfur from free sulfur ores by a solvent method and provides an alternative method and means to that illustrated in applicant's copending application Serial No. 512,839.

The principal object of this invention is to provide a method and means for extracting sulfur from free sulfur bearing ores in which the end product of the extraction will be commercially pure, crystalline sulfur, so that recourse to further purification or refining steps for the removal of arsenic, and other impurities will be unnecessary.

Other objects of the invention are:

To employ economical, easily available reagents in the process;

To provide a method in which the extraction solvent can be continuously reused in a closed circuit with very little loss thereof;

To provide a solvent having a relatively high saturation point so as to obtain maximum recovery from a minimum of solvent; and

To provide a method and means which will recover substantially all of the sulfur content of the ore.

Other objects and advantages reside in the improved solvent and the method of use thereof. These will become more apparent from the following description of the methods and means employed.

In the following detailed description of the invention reference will be had to the accompanying drawing which forms a part hereof. The drawing illustrates diagrammatically one method of carrying out the improved process.

The solvent employed is a fractionation of petroleum, or a mixture of petroleum fractionations, occurring below gasoline and down to and including Diesel oil. The preferred solvent is the hydrocarbon known as "kerosene" a commercial mixture of several hydrocarbons more particularly of the methane series. In fact, hot kerosene forms a highly satisfactory solvent for dissolving sulfur from its ores without the use of any additional reagent or catalyst. The kerosene is heated to approximately 140° C. and the ore is either immersed therein or the hot kerosene is flowed through the ore.

The yield can be increased and the time element reduced by combining a second carbonaceous solvent with kerosene.

It is believed that the second element acts as a catalyst to assist the action of the kerosene. It appears that any other hydro-carbon fractionation occurring between gasoline and Diesel oil

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and including the latter, will increase the efficiency of the kerosene. However, since commercial kerosene is not always a pure fractionation, but also contains more or less of the adjacent fractionations, the catalysts are present in the commercial kerosene. Other hydrocarbons, more particularly methylated hydrocarbons, appear to increase the effectiveness of the kerosene.

Kerosene or a mixture of kerosene, with its adjacent fractionations, has unusually high solvent power for sulfur and will quickly and easily dissolve in excess of one-third of its weight in sulfur without dissolving the arsenic or other impurities contained in the ore. Present used methods and solvents dissolve not over one-eighth of their weight in sulfur and produce an impure end product which must be subjected to further refining.

In use, the sulfur bearing ore, is ground to approximately one-quarter mesh. The ground ore, is either immersed or flooded with boiling solvent until complete extraction of the sulfur has been obtained. The hot, sulfur-containing solvent is then chilled to a point to cause crystallization of the sulfur to precipitate the latter from the solution. The loss of solvent is exceedingly low, averaging less than 2%. The precipitated crystals have a purity exceeding 99% and contain 99% of the sulfur content of the ore. Approximately one pound of precipitated crystals will be recovered from two and one-half pounds of the solvent provided the latter has reached full saturation. After precipitation the solvent can be immediately reused on the next batch of ore.

One method of employing the improved solvent is illustrated diagrammatically in the drawing, in which the ore to be treated is fed from a chute 25 to a crusher 26 and from thence to a storage bin 13. This method employs a series of filter-bottomed cars 10 traveling on a suitable endless track 11. These cars may be any of the standard types, arranged to dump their contents either by rotating the car body or having a dump bottom therein. The bottom of each car contains a screen or filter plate 12 of sufficiently small mesh to prevent the ground ore from sifting there-through. The cars are successively filled from the storage bin 13 and are then forced into a treatment compartment 14. Each car that enters the compartment 14 forces the innermost car therefrom to a discharge hopper 15 into which the exhausted ore may be dumped as illustrated. The car then returns to the bin 13 for refilling.

Spray pipes 16 are supported above the cars adjacent the entrance of the compartment 14.

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The spray pipes are connected by means of a pressure pipe 17 with a pump 18 which draws hot solvent from a heater 19 and sprays it upon the ore in the cars 12. The solvent percolates downwardly through the ore in the cars, dissolving the sulfur therefrom as it flows, and discharges through the filter bottoms of the cars into a receiver 20. The sprays do not extend over all of the cars so that the innermost cars are allowed to drain their excess solvent into the receiver 20 before they are discharged from the compartment 14.

The solvent with its dissolved sulfur flows to a collector pipe 24 thence to a cooling vat 21 where it is chilled in any desired manner, such as by means of refrigerated coils, to a temperature from 30° C. to 40° C., to crystalize the sulfur therein. The sulfur settles to the bottom of the cooling vat 21 and may be discharged at intervals therefrom through any suitable blast gate 22. From the cooling vat the supernatant solvent flows to a storage and settling tank 23 from whence it is drawn to the heater 19 for reuse in the spray pipes 16. The heater 19 may be of any desired type suitable for quickly bringing the solvent to a temperature of 145° C. or higher. The method could be carried out by simply immersing the ore in the solvent, but this involves difficulties which makes continuous operation impractical.

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While the preferred solvent has been described herein, together with a description of a method of using the same, it is to be understood that the invention is not limited to the exact proportions given nor to the precise procedure described, except insofar as such limitations are included in the terms of the accompanying claim in which it is the intention to claim all novelty inherent in the invention as broadly as is permissible in view of the prior art.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

A method for recovering sulfur from free sulfur bearing ores comprising: crushing said ore; placing said crushed ore in wheeled cars having screened bottoms; forcing each succeeding car beneath a spray of hot kerosene so that it will force the proceeding car from beneath said spray; collecting the solution flowing from the screened bottoms of said cars; chilling the collected solution to precipitate the sulfur therefrom; drawing off the supernatant fluid; heating said latter fluid to approximately 140° C.; returning the heated fluid to said spray; dumping the ore from each successive car after it leaves said spray; thence returning the dumped cars to a position to receive additional crushed ore.

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