

UNITED STATES PATENT OFFICE

FREDERICK G. MOSES, OF NEW YORK, N. Y., AND EDWARD J. CANAVAN, OF WOODCLIFF, NEW JERSEY, ASSIGNORS TO THE BARRETT COMPANY, A CORPORATION OF NEW JERSEY

FLOTATION REAGENT

No Drawing.

Application filed January 29, 1926. Serial No. 84,749.

This invention relates to reagents for use in the separation of valuable minerals from their ores by flotation and to the process of preparing and using this reagent for flotation purposes. It relates more particularly to reagents of this character that are prepared from certain tar distillates or extractions therefrom.

This application is in part a continuation of our application Serial No. 751,696, filed November 22, 1924.

Those crude tars which are commercially known as coal tar, blast furnace tar, lignite tar, wood tar and others, contain acids which are commercially known as phenol, cresols and xylenols. These acids occur in those fractions of the tar distillate which are known as carbolic oil and creosote oil (both of which are sometimes designated as "carbolic oil" or "middle oil"). These acids are quite often separated, from any coal tar distillate in which they occur, by causing them to unite with caustic soda. Those acids to which we refer would, in most cases, be those which are extractable from the above tars or distillates by caustic soda.

By the present invention a very uniform, stable and satisfactory reagent for flotation purposes is produced. In carrying out this invention sulphur is caused to unite with tar acids (phenol, cresols or xylenols) and the resulting reagent may be used in its concentrated form for flotation purposes or may be mixed with coal tar, coal tar oil or other oil and thus used as a flotation agent.

As a specific illustration of practicing this invention, but by which we do not intend to be limited, it may be stated that a very efficient and simple method is to add disulfur-dichloride to either crude or purified tar acids such as phenol, cresols or xylenols. The observed results seem to indicate that sulphur from the disulfur-dichloride replaces hydrogen from the acid and hydrochloric gas is generated and evolved. Some form of phenyl, cresyl and xylenyl sulphides or other sulphur compounds seem to be formed and remain indefinitely combined without serious decomposition of the same or deposition of

sulphur taking place even upon long standing.

Our experiments have proven that, when tar acids are treated with disulphur-dichloride without moderating the heat of reaction, a substitution of sulphur in the benzene ring takes place, resulting in the formation of a dihydroxy-disulfide. In fact we have found that when phenol itself is sulfidized, such as by the treatment thereof with disulfur-dichloride and taking advantage of the heat of reaction developed, dihydroxy-diphenyl-disulfide is produced. This compound has been discovered by us to be an excellent flotation reagent either when used separately as such, or when mixed with oils or tars and thus used as a flotation agent.

Other chlorides of sulphur may also be added to the tar acids to produce this flotation reagent.

When tar acids are to be treated as above, it has been found that about 10 to 50% by volume of the total reacting mass should be disulfur-dichloride or, in other words, 100 parts by volume of tar acids should be treated with about 10 to 100 parts by volume of disulfur-dichloride.

The reagent thus produced may be used as such for flotation purposes by adding the reagent directly to the agitated mineral pulp, or in solution in a dispersing agent, such as tars or oils of various types. Thus shipping and handling costs are reduced to a minimum because it may be necessary to supply the reagent from a remote point, whereas the dispersing agent, such as tars or oils as may be used, may be procured at a place near where the ore is being separated.

The same applies where it may be found desirable to mix the reagent with any kind of oil or tar before it is added to the mineral pulp that is being treated.

As an alternative method of preparing a flotation agent in accordance with our invention, it may be stated that a very efficient and simple method is to add disulfur-dichloride to coal tar oils such as acid bearing creosote or light creosote oil, for example, containing tar acids such as phenols or cresols and the mixture used for mineral

flotation. The observed results seem to indicate that sulfur from the disulfur-dichloride replaces hydrogen from the oil or acid and hydrochloric acid gas is generated and evolved, thus indicating that the reaction which takes place is similar to that occurring when tar acid alone is treated with disulfur-dichloride. When the oils containing tar acid are to be sulfidized by treatment with disulfur-dichloride, the amount to be used will depend very largely upon the percentage of tar acids present in the oil or tar. It will usually require about 1% to 25% of disulfur-dichloride by volume. 25% is about the upper limit for oils containing as high as 25% of tar acids. By testing samples of any particular oil the best proportions for that oil can be ascertained. Some high acid tars are themselves susceptible to this treatment and the treated acids may be combined with tars as well as distillates. In practicing the invention it has been found that widely different grades of oil or tar can be treated so as to obtain a satisfactory product, and that this modification of the invention is not restricted to high grade refined oil.

From the above description, it will readily be seen that the practice of this invention is not confined to highly refined tar acids or to tar acids of any particular class, except that they should be monohydric phenols. Impure tar acids or mixtures thereof may similarly be treated. It has been found that there is some little difference in results when sulfidized phenol, cresols or xyenols are used or when a mixture of tar acids which have been sulfidized are used. However, this does not vary the broad principle of applicants' invention which is the discovery of a valuable flotation reagent or series of reagents, regardless of the method of their production.

Some of the advantages of our invention are that the product can be made more uniform than was possible by processes heretofore known; the product is much more stable than those heretofore known and the results obtained by using this product for flotation purposes are better and more uniform than are possible with prior known products.

In describing and claiming this invention the various terms used are intended as follows: "Coal tar" includes those tars that are commercially known as coal tar, water gas tar, oil gas tar, blast furnace tar, lignite tar and tars from the distillation of wood; "coal tar oil" includes any fraction or mixture of fractions of the distillate from "coal tar" taken off during the distillation thereof to pitch: and by "tar acids" (or "acids") are meant the monohydric phenols or those tar acids commercially known as phenol, cresols and xyenols which occur in what is commercially known as the crude carbolic oil and/or creosote oil fractions from the distillation of such tars as commercial coal tar, blast fur-

nace tar, lignite tar and wood tar. In other words the "tar acids" used in our invention are those which are removed by caustic soda extraction from tar distillates produced in distilling any tar to pitch.

We claim:

1. The process which comprises treating coal tar oil containing tar acid with disulfur-dichloride, using about 10 to 40 parts of disulfur-dichloride by volume to 100 parts of tar acid.

2. The process which comprises treating coal tar oil containing tar acid with disulfur-dichloride, using about 15 parts of disulfur-dichloride by volume to 100 parts of tar acid.

3. The process which comprises treating coal tar containing tar acid with disulfur-dichloride, using about 15 parts of disulfur-dichloride by volume to 100 parts of tar acid.

4. The process which comprises treating coal tar containing tar acid with disulfur-dichloride, using about 10 to 40 parts of disulfur-dichloride by volume to 100 parts of tar acid.

5. A composition of matter comprising the reaction product obtainable by reacting, while hot, a coal tar acid and disulfur-dichloride.

6. A composition of matter comprising the reaction product of disulfur-dichloride with a mixture of phenols obtainable by the extraction of a coal tar distillate with sodium hydroxide solution.

7. A composition of matter comprising the reaction product obtainable by reacting, while hot, phenol and disulfur-dichloride.

8. A composition of matter comprising the reaction product obtainable by reacting, while hot, a cresol and disulfur-dichloride.

9. A composition of matter comprising the reaction product obtainable by reacting, while hot, a xyleneol and disulfur-dichloride.

10. The process which comprises treating a coal tar acid with disulfur-dichloride.

11. The process which comprises reacting a hot mixture of a coal tar acid and disulfur-dichloride.

12. The process which comprises reacting disulfur-dichloride with a mixture of phenols obtainable by the extraction of a coal tar distillate with sodium hydroxide solution.

13. The process which comprises reacting a hot mixture of disulfur-dichloride with a mixture of phenols obtainable by the extraction of a coal tar distillate with sodium hydroxide solution.

14. A composition of matter comprising coal tar and a compound obtainable by the reaction of a coal tar acid and disulfur-dichloride.

15. A composition of matter comprising coal tar and the reaction product of disulfur dichloride with a mixture of phenols ob-

tainable by the extraction of coal tar distillate with sodium hydroxide solution.

16. A composition of matter comprising dihydroxy-diphenyl-disulfide and coal tar.

5 17. A composition of matter comprising dihydroxy-diphenyl-disulfide and coal tar oil.

In testimony whereof we affix our signatures.

10 FREDERICK G. MOSES.
EDWARD J. CANAVAN.

15

20

25

30

35

40

45

50

55

60

65