

## UNITED STATES PATENT OFFICE

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## FILTERING

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This invention relates to improvements in filtering and includes a new composite refining and filtering material and an improved process of refining and filtering therewith. The invention relates particularly to improvements in so-called contact filtration and in an improved composite filtering medium for use therein, the filtering medium, and the process, being adapted to decolorize the liquid being filtered as well as to remove suspended matter therefrom.

In contact filtration processes, in which bleaching or decolorizing of the liquid is accomplished, finely divided bleaching clay, or other bleaching agent, such as bone black, charcoal, etc., is admixed with the liquid to be refined or purified, and the liquid and admixed bleaching clay are then subjected to filtration to remove the bleaching clay, and to purify or refine the liquid. The removal of the bleaching agent, and adsorbed or absorbed impurities, is commonly effected by passing the liquid through a filter cloth or fabric which will hold back the bleaching clay while permitting the refined or purified and decolorized liquid to pass therethrough.

In practice, there is a limit to the fineness or mesh of the filtering cloth or fabric, since screens of less than around 100 mesh are expensive and lacking in strength and not well adapted to withstand handling and usage such as scraping of the cloth or fabric to remove deposited materials. On the other hand, the most effective materials for use in contact filtration are those which have a particle size much less than 100 mesh and which would readily pass through a 100 mesh screen.

Accordingly, it is common practice, when using, e. g., finely divided bleaching clay, to precoat the filter screen with a material which will not pass through the openings in the screen so readily, and which will form a bed or coating thereon, such as diatomaceous earth, then to pass the liquid and suspended contact material through the filter so coated. In this way, a layer of the bleaching clay is built up on the filter screen and the liquid is decolorized by contact with the bleaching clay. Sufficient clay must be used to insure intimate contact of the liquid to be decolorized with the clay so that an effective bleaching action can take place. The bleaching clay is extremely active, and only a small amount is required for a great deal of decolorizing or bleaching. Nevertheless, as heretofore used, sufficient bleaching clay must be used to insure the necessary intimacy of contact and to serve not only to accomplish the decolorizing or bleaching of the liquid, but also the removal of suspended material. Thus the full bleaching or decolorizing ability of the bleaching clay has not been made available, partly because of the necessity of supplying sufficient of the bleaching

clay to insure the required intimacy and completeness of contact, and partly because a large part of the clay has been required to remove suspended material. In the treatment of cleaners' naphtha, for example, the bleaching clay has become coated with fatty material and the resulting impervious coating has served to prevent the clay from coming into contact with the naphtha with the result that only a fraction of the bleaching or decolorizing power of the bleaching clay has been made available for bleaching and decolorizing.

The present invention provides an improved composite filtering medium which is an effective decolorizing or bleaching medium, and which serves to bleach or decolorize liquids as effectively as the bleaching clay or other bleaching agent alone, yet which is considerably more economical to use than the bleaching agent.

The composite medium of the present invention is particularly adapted for use in contact filtration processes and enables the full benefit of the bleaching or decolorizing power of e. g. bleaching clay to be made available for decolorizing or bleaching, while at the same time providing for the effective removal of suspended material.

The new composite filtering medium is made up of about equal proportions of finely divided bleaching clay, or other bleaching agent, such as one of the various types of bone blacks, charcoals, etc., and a finely divided absorbent or contact material which serves to effectively remove suspended material from the liquid being treated, and which serves as a surface extender for the bleaching agent. The bleaching agent used in accordance with the present invention is advantageously of a size such that it will pass through a 50 mesh screen and be retained on a 200 mesh screen, and the finely divided contact or absorbent material may be of about the same size, or it may advantageously be more finely divided, e. g., of a size which will pass a 200 or 250 mesh screen, as the more finely divided contact or absorbent material, with its increased surface, is more effective for the removal of suspended and other impurities.

A finely divided contact or absorbent material which is particularly advantageous for use in the new composite medium is pyrophyllite of a size, e. g. that is comparable to the size of the particles of the bleaching clay, or of a smaller size, e. g., that passes through a screen of 200 or 250 mesh.

The bleaching agent, e. g., bleaching clay, and the pyrophyllite are admixed to form a homogeneous mixture, and the proportions are advantageously such that the mixture contains about 50% pyrophyllite and 50% bleaching agent, although the amount of either may vary from

40% to 60% of the mixture more or less. When the proportion of, e. g., bleaching clay used in the mixture is reduced much below 50%, e. g., below about 40%, the bleaching or decolorizing power of the mixture is impaired; but when the proportion of bleaching clay is about 50% or somewhat more, the composite mixture or medium has a bleaching or decolorizing action which is not substantially less than that of the bleaching clay alone. A mixture containing, e. g., 50% of finely divided pyrophyllite and 50% of finely divided bleaching clay has a bleaching or decolorizing action about the same as the bleaching or decolorizing action of the bleaching clay alone, the pyrophyllite serving as an extender, increasing the intimacy of contact of the bleaching clay with the liquid so that its bleaching or decolorizing action is increased, and also serving to remove suspended material so that the tendency of the bleaching clay to adsorb or remove suspended material from the liquid is lessened, so that it is not coated by an impervious coating of suspended or fatty material which would impair its bleaching or decolorizing power. Thus a mixture which may be produced at a little over half the cost of the bleaching clay is as effective as the same amount of bleaching clay.

The properties of the bleaching agent and of the pyrophyllite are such that when admixed in suitable proportions a homogeneous mixture is obtained which may be shipped in a dry state without objectionable separation or segregation, and which may be admixed with a liquid to be refined or purified and decolorized with intimate contact of the bleaching agent and pyrophyllite with the liquid, and with removal of suspended material and effective decolorizing.

The pyrophyllite particles alone, while they serve effectively to remove suspended material from the liquid, do not have any substantial bleaching or decolorizing action, and the bleaching or decolorizing by the composite medium of the present invention is accomplished by the bleaching agent, which is rendered more effective for the purpose by admixture with the pyrophyllite than if used alone.

In place of the finely divided pyrophyllite other suitable contact or absorbent materials in a finely divided state may be admixed with the bleaching agent to produce contact filtration media which are effective for the purification or refining of liquids, and effective for the decolorizing or bleaching of them. Among the finely divided contact or absorbent materials which may be used are talc, amorphous silica, fired clay, acid-treated clay, spent or calcined fuller's earth, etc. All of these materials serve as surface extenders for the bleaching agent, and serve to remove suspended material from the liquid being treated, so that the bleaching agent is made more effective for bleaching, and its bleaching properties are not impaired by the adsorption or absorption or removal of suspended material.

The new composite filtering medium described above, that is, the composite medium consisting of a mixture of a finely divided contact or absorbent material and finely divided bleaching agent, e. g., bleaching clay, may be used as a bleaching and purifying powder by being admixed with a liquid to be refined or purified, the liquid and admixed filtering medium then being passed through a filter precoated with a suitable precoating material, such as diatomaceous earth, in accordance with common practice. The composite filtering material thus may be used

in the usual way for the use of bleaching filtering media but with the advantages resulting from the use of the composite material having the bleaching agent in association with and admixed with the surface extender, which serves to remove suspended material from the liquid and to make the bleaching property of the bleaching clay more effective. The composite medium can thus be added in a dry state to the liquid to be refined or filtered, and intimately admixed therewith to permit absorption or adsorption of impurities, etc. and to permit the effective decolorizing or bleaching of the liquid; and the liquid and admixed filtering agent can then be passed through a filter suitably precoated.

However, in many cases it is advantageous to carry out the filtering operation without the precoating of the screen or filter, and to include in the filtering medium along with the bleaching agent and contact or absorbent material a suitable porous or fibrous material which will serve to coat the filter, or to form aggregates with the finely divided material which will coat the filter screen, so that when the liquid and admixed filtering material is passed through a filter screen, the screen becomes suitably coated and effectively removes the filtering and bleaching material.

In my copending application Serial No. 89,257 filed July 6, 1936, I have described a new process of filtration, and a new composite filtration agent, which comprises a mixture of a suitable fibrous or porous material in relatively finely divided form, such as asbestos, with a finely divided contact or absorbent material, such as finely divided pyrophyllite. The composite medium there described may effectively be used in contact filtration with the fibrous or porous particles forming aggregates with the finely divided pyrophyllite or other contact or absorbent material such that when the liquid and admixed medium is passed through a filter screen, the filtering material forms a bed on the screen and the finely divided contact or absorbent material is held on the screen and does not pass through, even though the size of the finely divided material is such that it would freely pass through the screen except for the presence of the fibrous or porous material.

The composite bleaching and filtering medium of the present invention may be similarly admixed with a suitable fibrous or porous material so that it is unnecessary to precoat the filter screen with diatomaceous earth or the like before passing the liquid and admixed medium there-through. Asbestos fibres, particularly finely divided asbestos fibres, e. g., such as will pass through a 14 mesh screen and be retained on a 100 mesh screen, are particularly advantageous. Asbestos fibres commonly known as "floats," which are generally a waste product, may be used with advantage. Other finely divided fibrous materials, such as mineral wool, glass wool, rock wool, or vegetable fibrous or porous materials, such as cotton linters, wood flour or pulp, either treated or untreated, paper pulp, etc., may also be used. The use of such materials in admixture with the bleaching agent and finely divided contact or absorbent material is advantageous, in that it eliminates the necessity of precoating the filter screen with a material which will prevent the bleaching agent and contact material from passing therethrough. Where a coarser fibrous or porous material is used in admixture with the composite medium, it may be used in

amounts ranging from about 6 to about 12 or 15%, the use of about 10% being advantageous.

In the handling of various liquids which are to be subjected to contact filtration it is frequently necessary to pump the liquid, and the presence of coarse particles of abrasive material would be objectionable. The presence in the composite medium of the present invention of a proportion of a suitable fibrous or porous material such as asbestos or the like, is unobjectionable, as such materials have no objectionable abrasive action and the liquid and admixed medium can be readily pumped, e. g., with a centrifugal pump.

The new composite material, whether containing a fibrous or porous material or not, can be advantageously used in refining or purifying and bleaching various liquids. For example, the new composite medium is advantageous for use in the purifying and bleaching of cleaners' naphtha. When such naphtha is used for cleaning clothes it requires refining or purification before it can be used over again. The admixture of a small amount of the new composite medium with the impure cleaners' naphtha and the filtering of the admixed naphtha and medium through a pressure filter results in the effective removal of suspended and other impurities and the effective bleaching of the naphtha, giving a purified cleaners' naphtha which can be used over again. The new composition has the further advantage that it can be added to the cleaners' naphtha before or during the cleaning of clothes therewith, so that it is present in the naphtha during the cleaning operation, and it is readily removed from the clothes with the naphtha so that naphtha can be subjected to filtration in a continuous manner and the purified naphtha can then be returned for use, e. g., in rinsing the clothes, recirculating the same naphtha through the clothes with the purification and bleaching of the naphtha by the use of the new composite medium and with removal of this material from the naphtha together with suspended and other impurities as a part of the cycle.

The use of the new composite medium of the present invention in such a manner enables the stock of cleaners' naphtha required by a cleaner to be considerably cut, with substantial saving in cost. By using the composite medium, the stock is made continuously available to the cleaner, as the stock is bleached as it is used and is purified as it is used, the absorbent or contact material serving to purify and clarify the naphtha, and to take out suspended matter, while the bleaching agent, e. g., bleaching clay decolorizes or bleaches it, the naphtha thus being purified and bleached or decolorized in a more or less continuous manner, the naphtha being treated as it is used.

With the use of this composite medium, the filters may either be precoated with a suitable material, such as diatomaceous earth, or a suitable fibrous or porous material may be admixed with the filtering medium, so that the filtering medium itself serves to coat the filter. Where a fibrous or porous material is admixed with a composite medium, it is desirable to pump clean liquid, such as clean cleaners' naphtha, with admixed filtering medium through the filter to precoat it, so that when impure naphtha is pumped

through the filter, all of the naphtha is purified and decolorized.

By the use of the new composite filtering medium, the cost of cleaning the filters used is considerably decreased, as the impure naphtha from many more batches of clothes may be filtered without cleaning the filter screens than has heretofore been possible. Also, by the use of the new composite medium, the purification and bleaching of the naphtha is so much more effective that the distillation cost of the naphtha, that is, the cost of distilling impure naphtha after it has been used a number of hours to make it pure so that it can be used for cleaning again, may be cut by as much as 75%.

The composite filtering medium of the present invention may be used with advantage for other liquids than cleaners' naphtha, particularly for liquids in which a decolorizing or bleaching action, as well as the removal of suspended and other impurities is desired.

I claim:

1. A new filtering medium adapted to purify and decolorize liquids by contact filtration comprising a mixture containing at least about 40% of a bleaching agent from the class consisting of activated clay, bone black and charcoal intimately admixed with and associated with at least about 40% of a finely divided contact material from the class consisting of pyrophyllite, talc, amorphous silica, fired clay, acid-treated clay and fuller's earth.

2. A new filtering medium adapted to purify and decolorize liquids by contact filtration comprising from 40 to 60% of finely divided activated clay and from 60 to 40% of finely divided pyrophyllite intimately admixed and associated therewith.

3. A new filtering material adapted to purify and decolorize liquids by contact filtration comprising an intimate mixture containing at least about 35% of a bleaching agent from the class consisting of activated clay, bone black and charcoal, at least about 35% of a finely divided contact material from the class consisting of pyrophyllite, talc, amorphous silica, fired clay, acid-treated clay and fuller's earth, and from 6 to 15% of a fibrous material.

4. A new filtering material adapted for purifying and decolorizing liquids containing from about 35 to 55% of finely divided activated clay, from about 55% to 35% of finely divided pyrophyllite, and about 10% of finely divided asbestos.

5. The process of refining or purifying and decolorizing a liquid which comprises admixing with such liquid a small amount of a filtering medium containing substantial amounts of activated clay and finely divided pyrophyllite, and passing the liquid and admixed filtering medium through a screen whereby the medium and suspended or other impurities are removed, and the liquid is purified or refined and decolorized.

6. A new filtering medium adapted to purify and decolorize liquids by contact filtration comprising a mixture containing at least about 40% of activated clay intimately mixed with and associated with at least about 40% of finely divided pyrophyllite.

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