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BLEACHING FATS AND OILS

No Drawing.

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This invention relates to an improved method of bleaching fats and oils, including animal and vegetable fats, oils and greases, for the removal therefrom of colored impurities.

The colored impurities of such oils and fats vary widely in their chemical and physical nature and properties, as well as in the amounts in which they are present. Some of them are pigments, such as carotin found in palm oil and butter, some belong to the unsystematic group known as lipoids, and some are resinous and other albuminous.

Various methods of bleaching oils and fats and removing these colored impurities have been proposed, some of them producing excellent results, but most of them being of limited application.

The method of the present invention is of more or less general application for bleaching oils and fats of the groups enumerated, and enables better results to be produced in many cases than with previously known methods. The invention is particularly advantageous for bleaching certain animal and vegetable oils and fats.

According to the method of the present invention, the oil or fat is subjected to the combined action of a bleaching earth and sulfuric acid, the earth and acid being added simultaneously or in immediate succession. The treatment of the oleaginous material with the earth and acid is advantageously effected at an elevated temperature, particularly where the material being bleached is solid or semi-solid at ordinary temperature. Following the bleaching treatment, the oil and sludge are separated, e. g., by settling or filtration, or by a combination of these two operations. The oil may in some cases be subjected to a neutralization treatment, either before or after the settling, or before the filtration. So also, where the oil is settled before filtration, the settled oil may be subjected to further treatment with a small amount of earth before filtration.

The invention includes certain novel steps of the process, as well as the complete process itself. The nature and advantages of the invention, and the novel features thereof, will

more particularly appear from the following more detailed description and from the accompanying claims.

In carrying out the invention, the fat or oil to be treated or bleached is heated to a suitable temperature, is subjected to thorough agitation in a suitable apparatus, a bleaching material such as fuller's earth, and an acid such as sulfuric acid, in suitable amounts, are added thereto with continued agitation until the desired reduction in color is obtained, and the oil is then further treated, as by settling and filtration to free it from the sludge, etc.

The temperature to which the fat or oil is heated before the addition of the bleaching material and acid thereto can be varied, the temperature usually ranging from about 130 to about 220° F., but other temperatures, particularly lower temperatures, may be used. The lower the temperature employed, the longer the period of treatment required.

The treatment can be carried out in different types of apparatus, such as a tank or other vessel, lead-lined or constructed of other acid-resisting material, and with a suitable agitator capable of keeping the oil and bleaching material and chemicals in complete admixture and thorough agitation. When the oil is to be heated in the treating apparatus, the apparatus is equipped with a suitable heating device which may be in the form of a jacket or a closed coil of acid-resisting material, or both a jacket and heating coil can be used.

As suitable bleaching materials may be mentioned fuller's earth, kaolin, bleaching clay, diatomaceous earth (kieselguhr), various augites and hornblendes or other similar bleaching material. The amount of such bleaching earth will vary somewhat with different fats and oils. Usually from about 1% to about 10% of the weight of the fat or oil will suffice. The bleaching material is added while the entire mass is kept in rapid and violent agitation.

The addition of the bleaching material is advantageously followed immediately by the addition of a suitable acid, such as sulfuric acid of proper strength. The amount and strength of the sulfuric acid required varies

with different grades of fats, oils and greases, but ordinarily about 2% to about 8% of 60° Bé. acid is required, while somewhat larger quantities of lower strength acid would be required.

The temperature at which the process is carried out, as well as the amount of bleaching material and acid, can be varied, and will vary with different oils and fats, and may be varied even with the same oil or fat. We consider it advisable in all cases before proceeding to carry out the process on a large scale, to treat a test sample of the oil or fat in the laboratory to determine the best procedure for obtaining the maximum effect and bleaching action. The optimum temperature, as well as the proper amount of the bleaching material and the optimum strength and amount of the acid can readily be determined by simple preliminary tests, and these conditions and amounts can then be employed in large scale operations. It will be evident however that conditions which depart somewhat from the optimum conditions can be used and that certain of the conditions or factors of the process are more or less interdependent, the process requiring, for example, a longer time at a lower temperature.

When the fat or oil has been heated to the proper temperature, and has had the bleaching material and acid added thereto, the immediate and visible effect of the acid is to produce an apparent darkening of the fat or oil, but this is more apparent than real because after a moderate agitation, if a sample is removed and filtered, the color is found to be much lighter. The apparent darkening of the oil or fat is apparently due to flocculation of colloidal particles which are then readily absorbed by the bleaching earth. The coloring matters are absorbed by the bleaching earth more readily and in greater quantity, when the earth treatment is combined with an acid treatment in the manner above described, than when the earth is used alone. Most of the acid is also finally absorbed, so that, at the end of the treating process, the oil remains practically acid-free. When fuller's earth or similar clay is the bleaching earth used, it is evident that a portion of the sulfuric acid may react chemically with components or elements of the clay, so that only a small residue of the original acid used may remain in or on the earth.

After the bleaching earth and acid are added, the thorough and rapid agitation is continued for a suitable length of time, usually from one-half hour to four hours. The lower the temperature employed, the longer the period of agitation required. The progress of the bleaching action can be followed by taking samples periodically, during the agitation, and testing these samples for reduction of color, by removing them from the agitator tank, filtering them through filter

paper, on which it is advisable to use a little kieselguhr or other mechanical filtration medium, in order to ascertain the maximum color reduction, which can be determined by comparison with standard samples by colorimetric readings or any well-known laboratory method.

When the desired reduction in color is obtained, the agitation is discontinued and the contents of the tank are allowed to settle for a sufficient length of time, for example, over night, although in many cases from one to two hours is sufficient. Mechanical methods of separation, such as the use of centrifugal machines, may also be employed. In the ordinary process of settling by standing, the oily mass separates into two distinct layers, consisting of more or less clear bleached oil or fat and a bottom layer of earthy sludge, which contains practically all of the acid added, absorbed by the bleaching earth, and with a certain proportion of fat or oil entangled therewith.

After separation, for example by settling or centrifuging, the oily layer is removed to a separate tank, and, if well settled and relatively clear, is filtered. The filtering of this oily layer can be facilitated and improved by the addition of a small amount of fuller's earth, diatomaceous earth or analogous filtering material, to the oil and then filtering it through an ordinary filter press.

If the oily layer is imperfectly settled, it is either filtered as a whole or heated with a small amount of a neutralizing agent, such as finely divided calcium carbonate (powdered limestone, marble, chalk, etc.) or other neutralizing substance. The amount of neutralizing agent added may advantageously be just sufficient or slightly in excess of that required in order to remove any trace of acid still remaining in the oil or fat or on particles of bleaching earth which have not settled; and this neutralizing treatment is then followed by further treatment and agitation with a small amount, e. g., about one-half of one per cent, to about three per cent, of filtering material, such as fuller's earth, diatomaceous earth (kieselguhr) or other analogous filtering material, and the entire mass is then filtered through a suitable filter press.

We find it advantageous in the process of the present invention, for obtaining the best results and the brightest and clearest fat or oil, to coat the cloth or septa of the filter press with a thin film or layer of diatomaceous earth (kieselguhr) or other similar filtering material. It is not usually necessary to use a specially designed or acid-proof press for the filtering operation, since the amount of acid left in the oil after the treatment, and particularly where the oily layer is treated with a neutralizing agent, is usually negligible.

The oil or fat should be maintained at

an elevated temperature, for example, around 150° F. during the filtration, although this temperature is capable of some variation.

5 Where the treated oil is settled in the treating tank, the acid sludge remaining in this tank after the oily layer has been drawn off may be filtered directly through an acid resisting filter press. Instead of filtering
10 this acid sludge directly in this way, it may be first treated with a neutralizing agent of the character mentioned above, for example, powdered calcium carbonate (such as finely ground limestone, marble, chalk, etc.); and
15 then subjected to filtration. The metal filter cloth or septa may be advantageously coated with a layer of diatomaceous earth or analogous filtering material before filtration. In case the fatty or oily material resulting from
20 this filtration contains water or water and acid, it is allowed to settle, the acid-water or water is withdrawn, and the remaining fat treated with about one-half of one per cent to three per cent of diatomaceous earth or
25 bleaching earth, agitated and then filtered at a temperature of about 150° F. through a filter press whose cloth has been previously coated with diatomaceous earth as outlined above.

30 Instead of first separating the sludge from the fat or oil under treatment, by settling or centrifuging or otherwise, the entire mixture of oil and fat with earth and acid may be pumped directly through a suitable filter
35 press. By proceeding in this way, the two-stage handling of the treated material is avoided.

We have obtained best results with the process of the present invention by the addition of the bleaching earth first and the acid immediately afterwards, and we consider such procedure particularly advantageous and to be recommended. It is possible however to run the acid and earth into the oil
45 or fat at the same time. The order of adding the bleaching materials and acids can also be reversed, by introducing the acid first and following this with the fuller's earth addition, but in this case the bleaching action appears to be less satisfactory than when the earth is added first and followed by the addition of acid.

In the case of certain fats and oils we find it advantageous to repeat the treatment a
55 second time, using a much smaller quantity of acid in the second treatment than in the first. According to this method, after the oil or grease is heated to a suitable temperature in the agitator tank, one-half of the calculated amount of bleaching earth and all the calculated amount of acid (as determined by small scale experiments) are added, and the mixture agitated in the usual way. The sludge is then settled out and the
60 supernatant oil pumped off. This oil is then

treated with the remaining half quantity of earth and a small amount of acid. After the usual agitation, the entire mass is then filtered. While describing this variation of our process it is not our intention to describe
70 all the conceivable modifications through which our process might be run.

The invention will be further illustrated by the following specific examples, but it will be understood that the invention is illustrated thereby, and is not limited thereto.
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Example I.—Brown grease

The brown grease is pumped in molten condition to an acid-proof agitator tank. The agitator is started and while the melted fat is in active motion, 6% of its weight of fuller's earth is added. Immediately thereafter, or even before the last of the fuller's earth has been added, 2% of the weight of the oil, of 60° Bé. sulfuric acid is run in. Rapid and thorough agitation is continued for one and one-half hours, or until test samples removed from the agitator tank and filtered through filter paper show that maximum bleaching effect has been obtained. The agitator is then stopped and the sludge allowed to settle over night while maintained in the molten state.
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On the following morning, the supernatant
85 oily liquid, which may contain in suspension a small quantity of colloidal particles, including particles of bleaching earth, is pumped to another heated tank in which it is treated with a sufficient quantity of finely ground calcium carbonate to neutralize any acid that may be held in suspension, and also with a small quantity of diatomaceous earth as an aid to filtration. The liquid grease is then pumped through an ordinary filter press, the cloths of which have been coated with diatomaceous earth in order to insure a bright, clear final product.
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The sludge remaining at the bottom of the original bleaching tank is agitated, mixed with a sufficient quantity of finely divided calcium carbonate to substantially neutralize the acid held in solution or suspension therein and pumped through an acid-proof filter press, the septa of which may be constructed
95 of phosphor-bronze wire screening or an equivalent acid-resisting metal, and which are coated with a small amount of diatomaceous earth.
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The filtrate from the sludge may be combined with the principal product or used separately. The loss is about the same as in the ordinary process of bleaching by means of fuller's earth. A clear bright product is obtained.
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Example II.—Prime tallow

The tallow is melted, and pumped to an acid-proof agitator tank, where it is maintained at a temperature of about 150° F.
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With the agitator in rapid motion, 4% by weight of fuller's earth and 4% by weight of 40% sulfuric acid are added. The agitation is continued vigorously for one hour, the agitator is stopped and the product settle for two hours. The supernatant oil is filtered and the sludge treated and filtered separately as described in the first example, or the entire mixture may be filtered directly through a filter press after neutralizing by the addition of a suitable neutralizing agent, such as ground calcium carbonate.

ing material and subjecting the same to filtration.

In testimony whereof we affix our signatures.

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Example III.—Palm oil

The palm oil is introduced into the agitator tank and heated to and maintained at a temperature of about 200° F. during the bleaching process. Seven per cent by weight of fuller's earth and 10% by weight of 34° sulfuric acid are added. Rapid and thorough agitation is maintained for one-half hour, after which the product is settled for two hours, whereupon the supernatant oil is filtered and the sludge neutralized and treated as described in the preceding examples, or the entire mixture is filtered, after neutralization with finely divided calcium carbonate, through a press whose septa are coated with diatomaceous earth or equivalent filtering medium.

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It will thus be seen that the present invention provides an improved method of bleaching oils and fats in which the oil and fat is treated while heated to a suitable temperature with a bleaching material and acid which act conjointly upon the oil or fat, and that this action is continued with vigorous agitation of the mixture until the desired bleaching has been obtained.

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It will further be seen that the treated oil can be separated from the earthy sludge by various methods of procedure which give a clear, bright oil product.

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We claim:

1. The process of bleaching animal and vegetable oils and fats which comprises adding thereto a bleaching earth and sulfuric acid, the earth being added at least as soon in point of time as the acid so that the oils and fats are exposed to the action of the acid only in the presence of the earth, agitating the mixture, settling the sludge formed and filtering the supernatant oil through a layer of diatomaceous earth.

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2. The process of bleaching animal and vegetable oils and fats which comprises adding thereto a bleaching earth and sulfuric acid, the earth being added at least as soon in point of time as the acid so that the oils and fats are exposed to the action of the acid only in the presence of the earth, agitation the mixture permitting the sludge formed to settle from the treated oil or fat, adding to the treated oil or fat a small amount of filter-

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