

UNITED STATES PATENT OFFICE.

JOHN H. WINGFIELD, OF MONTCLAIR, NEW JERSEY.

PROCESS OF EXTRACTING SUINT FROM AND CLEANING WOOL AND PRODUCTS OBTAINED THEREBY.

SPECIFICATION forming part of Letters Patent No. 548,942, dated October 29, 1895.

Application filed February 1, 1895. Serial No. 536,996. (No specimens.)

To all whom it may concern.

Be it known that I, JOHN H. WINGFIELD, a citizen of the United States of America, residing at Montclair, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Processes of Extracting Suint from and Cleaning Wool and Products Obtained Thereby, of which the following is a specification.

My invention is an improved process for removing suint from wool or like fiber by means of heavy petroleum-oils, of washing out from the wool the solution which remains after the major part has been drawn or thrown off by a centrifugal machine or otherwise removed, and of separating certain constituents of the suint after the solution has been removed from the wool; and my invention further consists in certain valuable products resulting from the improved process. The term "suint" is used to define the mass found on wool in its natural state, resulting from the sweating of the sheep.

In my process I dissolve the crude suint in a warm heavy petroleum-oil having certain properties hereinafter described. The exact quantity of solvent used is unimportant, except that there should be enough of the warm solvent to dissolve thoroughly the constituents of the suint soluble therein at the temperature employed.

In other processes of recovery suint often acquires foreign matters and loses some of its valuable characteristic constituents, and the products obtained are different from and less valuable than the products obtained by my process of treating suint when applied to it as existing on the wool in the grease. Therefore I prefer to obtain the crude suint directly from the wool by applying thereto as a solvent of the suint a warm petroleum-oil having the characteristics and properties hereinafter described. A convenient method of treating the fiber in carrying out my process is to place a quantity of wool in the grease in a suitable vessel, as the basket of an ordinary hydro-extractor, using a sufficient amount of the solvent to completely cover the wool—say about one-half to one gallon of solvent for each pound of wool. The temperature of the solvent when applied to the wool may vary considerably; but I prefer to have it about 135° Fahrenheit. This temperature will not injure

the fiber, and it is desirable to use the solvent as warm as may be without injury to the wool, so as to quicken the operations herein described. After the wool is steeped until the suint is dissolved, which may require from ten to twenty minutes, the solution is drawn off and subjected to the further steps of the process.

I have discovered that the solubility of suint in the petroleum-oils varies not only with the temperature, but with the composition of the solvent used, of which the specific gravity is with commercial oils the most obvious index. Some of these oils deposit from a warm solution in large measure certain constituents of the suint on cooling and retain in solution in large measure other constituents of the suint, and the products obtained by dissolving suint in such oils, and also the products obtained by effecting the separation suggested, are new and valuable. The petroleum-oils in which this deposit of certain constituents of suint is effected on cooling the solution have high boiling-points, and they can be heated sufficiently to accomplish the solution of suint in open vessels with safety. The temperature to which they must be cooled in order to effect the valuable separations which I have indicated is within range of the ordinary temperatures which are usually maintained in woolen mills, which of course vary somewhat with the season, but may be approximately stated as between 65° and 80° Fahrenheit. Therefore a main point of advantage in my process is that it can be carried on conveniently in open vessels in woolen mills without the necessity of heating the solvents to a dangerous point or of cooling them artificially. In practice I usually aim to cool the solution to about 74° Fahrenheit or a little lower.

Both the paraffin or cracked and the uncracked petroleum-oils possess the desired property; but the latter are preferable because they do not stain the wool. These uncracked oils are known to the trade as "neutral" oils, an expression which, however, does not refer to reaction on test-paper.

The solvent properties herein described are found generally in the heavy petroleum-oils, by which I mean oils as heavy as the burning or kerosene oils or heavier—say below 51°

Baumé. The kerosene-oils, however, ranging from about 47° to 51° Baumé, possess these properties in a more limited degree than the heavier oils. The lighter oils, as the naphtha and benzine, do not possess these properties to any degree sufficient for practical use.

When the crude suint has been dissolved and the solution drawn off from the wool and, if desired, filtered from dirt, if it is then allowed to stand and cool to a temperature such as is ordinarily maintained in woolen mills it breaks up or separates, a large part of the suint subsiding and forming a dark unctuous flocculent slightly translucent mass of a neutral reaction on test-paper. This settles at the bottom of the vessel, while the rest remains in solution. The question whether there will be actual subsidence or not depends, of course, on the relative specific gravities of the solvent and of the several constituents of the suint thrown out of the solution. I use the word "deposit" and its derivatives or words of similar meaning throughout this specification and the claims to indicate that the so-called "deposit" is thrown out of the solution. This process gives results which differ when solvents of different composition are employed, or when the solutions are cooled to different temperatures, or when suint of different qualities or in different quantities relative to the amount of solvent is treated.

Speaking generally and somewhat roughly, it may be stated that the process described results in a substantial separation of what I call the "cholesterine group of constituents of suint," which are in the main deposited from the glycerides, which latter are chiefly held in solution. With the cholesterine group are deposited potash compounds and albuminoids and more or less of glycerides and a dark-brown liquid of bad odor which contains much of the coloring and odoriferous matter of the suint. If the temperature is still further lowered, more of the glycerides come down, and if the oil is cooled to the freezing-point of water the major part of the cholesterine group and the glycerides is deposited. It should be stated, however, that a material though small percentage of the cholesterine group of constituents always remains in solution. While it is not possible to state exactly the composition of the deposit, this is not of great importance, since the product resulting from the process herein described is perhaps quite as valuable in the form of the mixed solution and deposit as in any other form.

By the cholesterine group of constituents I mean cholesterine, ischolesterine, and cholesteryl and ischolesteryl ethers, and other cholesterine and ischolesterine compounds, if any others are present. These are the most valuable constituents of the deposit. The term "glycerides" is used in its ordinary sense of combinations of glycerine with fatty acids. The liquid solution may now be drawn

off from the deposit by decantation or filtration. The product, which consists of a heavy petroleum-oil with certain constituents of the suint in solution, obtained by cooling to ordinary temperatures, is neutral and is valuable as a lubricant, and it is highly useful as a leather-oil. It can also be used several times for the recovery of suint.

The presence of the constituents of suint which remain dissolved in the solvent adds greatly to its value as a lubricant, and also as a wool-oil and as an oil to be applied to leather. The solution forms an emulsion with water and has a much lower cold test—i. e., solidifies at a lower temperature—than the solvent alone. The deposit is useful for the same purposes and for manufacturing into other forms of suint, and the mixture of solution and deposit obtained without decanting or filtering off the solution is highly valuable as a lubricant and for use on leather. Respecting the use on leather, these products are found to have very remarkable penetrating power. They keep the leather soft for a long time.

Neither the solution nor the mixture of solution and deposit just described is to be confounded with the analogous solution or mixture of English degrass and petroleum-oils. Degras has only the crude appearance or semblance of wool-fat and is obtained from scouring-waters by the use of sulphuric acid. This method of preparation causes the loss of many of the valuable constituents of the suint, including, probably, a large portion of the cholesterine group of constituents, and results in the presence of a large amount of free fatty acids, which render both the solution and mixture of degrass and petroleum-oil hurtful both as lubricants and when used on leather. After the bulk of the solution has thus been drawn off from the wool I pursue the further process of cleaning the wool. To accomplish this, the basket of the hydro-extractor in which the wool is placed can be revolved at the rate, say, of about twelve hundred revolutions per minute and part of the residue thus thrown off by centrifugal action, and I then wash or scour off the residue with water or any other suitable agent, and I believe that I am the first to make the discovery that the solution of constituents of suint in a heavy petroleum solvent, such as is described, can be washed out or scoured off by water or some suitable aqueous solution.

After the basket of the hydro-extractor has been revolved and the greater part of the solvent thrown off the wool may be cleaned of the solution in several ways, the method preferably depending partly upon how completely the wool is to be cleaned of the solution and also on considerations of convenience and economy. One way is to subject the wool to the action of a light petroleum solvent ranging from 65° to 80° Baumé, a sufficient quantity being used to completely subject the wool to the action of the light solvent. After the

wool has been steeped in the light petroleum for a sufficient time to dissolve the solution of heavy oil and suint on the wool the basket of the hydro-extractor is again revolved and the wool dried as completely as feasible. The residue of the light petroleum can then be removed by water, preferably warm. This can be done by turning a jet of water on the wool while the basket is revolving. After the suggested removal of the light petroleum-oil the wool will usually be subjected to the process of scouring. Throughout the entire treatment the water is usually kept at a temperature of from 75° to 100° Fahrenheit. Low temperatures are more favorable to maintaining the integrity of the fiber; but the temperature should be kept high enough to maintain the suint in solution.

The residue of the solution of soluble constituents of suint in the heavy petroleum-oil has the property of making an excellent emulsion with warm or cold water, and especially with warm or cold alkaline aqueous solutions. The detergent and soluble or miscible properties of the heavy-oil solutions of constituents of suint are decidedly better than those of the oils alone. Therefore, as alternative to the light hydrocarbon process, after throwing off as much of the solution as possible by the use of the hydro-extractor, as above explained, instead of proceeding then to apply a light hydrocarbon I rinse the wool in warm water of a moderate temperature, preferably somewhat below 100° Fahrenheit. This rinsing will be assisted by centrifugal action; but this is not necessary, nor do I in practice use it. If there is a good deal of dirt present, it may be necessary to use an aqueous alkaline solution instead of water, or, first, an aqueous alkaline solution, and then an aqueous soapy solution. Rinsing with water or an aqueous alkaline solution renders the wool clean enough for manufacturing purposes generally. The solutions which I obtain of the soluble constituents of suint in the heavy petroleum-oils being excellent wool-oils, by which is meant a lubricant applied to wool that is to be carded and spun or otherwise manufactured, it is not usually necessary to clean them off entirely. If, however, it is for any reason desirable that the wool be white at this stage, it should be subjected to the process of scouring after being rinsed with the water or an aqueous alkaline solution. This alternative method of rinsing off the heavy petroleum from the wool with water or aqueous solution I claim in another application filed by me September 27, 1895, Serial No. 563,440, and in another application, filed by me July 24, 1895, Serial No. 557,028, I have described and claimed a process which I deem to have advantages over the process described in the said application, Serial No. 563,440, for whereas in that application I look to the removal of the solution from the wool as effectually as may be convenient before the scouring, in my other said application, Serial No.

557,028, I leave a portion of the solution thereon, having discovered that the portion so left forms an excellent detergent with the scouring liquid to remove the dirt.

The foregoing discoveries—namely, the feasibility of freeing wool from suint and obtaining its essential constituents in marketable form, either mixed with the solvent or as separated from it by merely cooling the solution in place of having recourse to evaporation of the solvent, and the feasibility of removing the heavy petroleum-oils from wool by a method which is kindly and leaves the wool in thoroughly workable condition—render possible the employment of heavy and high-boiling petroleum-oil for removing suint from wool or like fiber and makes practical the production of very desirable and superior products in a simple and inexpensive manner, effecting a great saving of plant by dispensing with the costly apparatus required for distillation and avoiding the dangers from fire and explosion incident thereto or to the employment of low-boiling petroleum-oils, besides saving the waste which invariably occurs when the low-boiling oils are employed.

The solvents which possess the herein-described properties are not useful in equal degree in carrying out this process. The American petroleum is preferable to the Russian petroleum, because it is comparatively free from the aromatic group of hydrocarbons which impart a disagreeable odor to the oil, and, as above stated, among the petroleum-oils the uncracked oils are preferable to the cracked oils, because they do not stain the wool. It may also be stated that oils as heavy as about 29° Baumé or heavier are not desirable to be used in cleaning wool, except with a view to the product, irrespective of the condition in which the wool fiber itself is left after cleaning, and the value of the products, if kerosene-oils are used, is not so great as when heavier oils are used, nor do they wash out so readily as the oils of specific gravity between 30° and 38° Baumé.

All specific gravities herein specified are assumed to be determined at a temperature of about 60° Fahrenheit. The table of specific gravities and degrees Baumé in *Cairn's Quantitative Chemical Analysis* (Henry Holt & Co., New York, 1890) is followed.

Having now particularly described and ascertained the nature of my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The process of removing suint from wool, which consists in subjecting the wool to the action of a warm petroleum oil not lighter than 51° Baumé, which forms a solution of the suint, in which, if it is cooled, there is effected a separation of the constituents of the suint by the deposition of certain constituents and the retention of others in solution, substantially as described.

2. The process of removing suint from wool, which consists in subjecting the wool to the

action of a warm petroleum oil of specific gravity 30° to 38° Baumé, which forms a solution of the suint, in which, if it is cooled, there is effected a separation of the constituents of the suint by the deposition of certain constituents and the retention of others in solution, substantially as described.

3. The process which consists in subjecting suint to the action of a warm petroleum oil not lighter than 51° Baumé, which forms a solution of the suint, and depositing certain constituents of the suint from the solution by cooling it, substantially as described.

4. The process which consists in subjecting suint to the action of a warm petroleum oil of specific gravity 30° to 38° Baumé, which forms a solution of the suint, and depositing certain constituents of the suint from the solution by cooling it, substantially as described.

5. As a new composition of matter, the liquid product consisting of a petroleum oil not lighter than 51° Baumé, in which are dissolved such constituents of suint as are held in solution therein at ordinary atmospheric temperatures, substantially as described.

6. As a new composition of matter, the liquid product consisting of a petroleum oil, of specific gravity 30° to 38° Baumé, in which are dissolved such constituents of suint as are held in solution therein at ordinary atmospheric temperatures, substantially as described.

7. As a new composition of matter, the unctuous, flocculent deposit having a neutral reaction, substantially such as is obtained by subjecting suint to the action of a warm petroleum oil not lighter than 51° Baumé, which forms a solution of the suint, in which, if it is cool, there is effected a separation of the constituents of the suint by the deposition of certain constituents and the retention of others

in solution, and cooling the solution, substantially as described.

8. As a new composition of matter, the unctuous, flocculent deposit having a neutral reaction, substantially such as is obtained by subjecting suint to the action of a warm heavy petroleum oil of specific gravity 30° to 38° Baumé, which forms a solution of the suint, in which, if it is cool, there is effected a separation of the constituents of the suint by the deposition of certain constituents and the retention of the others in solution, and cooling the solution, substantially as described.

9. As a new composition of matter, the mixture of suint and petroleum oil not lighter than 51° Baumé, substantially as described.

10. As a new composition of matter, the mixture of suint and heavy petroleum oil of specific gravity of 30° to 38° Baumé, substantially as described.

11. The process of cleaning wool which contains suint, consisting in dissolving the suint in a petroleum oil solvent, not lighter than 51° Baumé, separating the bulk of the solution from the wool, and removing the residue with a light petroleum oil, and removing the light petroleum oil, substantially as described.

12. The process of cleaning wool, consisting in dissolving the suint in a petroleum oil of 30° to 38° Baumé, separating the bulk of the solution from the wool, and removing the residue with a light petroleum oil, and removing the light petroleum oil, substantially as described.

Signed by me, in New York city, this 31st day of January, 1895.

JOHN H. WINGFIELD.

Witnesses:

THOMAS EWING, Jr.,
SAMUEL W. BALCH.