UNITED STATES PATENT OFFICE.

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DISTILLATION PROCESS.

1,372,465. Specification of Letters Patent. Patented Mar. 22, 1921.

No Drawing. Application filed March 9, 1920. Serial No. 364,388.

To all whom it may concern:

Be it known that I, ELBRIDGE WEBSTER STEVENS, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Distillation Processes, of which the following is a specification.

This invention relates to distillation processes; and it comprises a method of utilizing alcohol in the production of motor fuels wherein such alcohol is redistilled in the presence of hydrocarbons (benzol or petroleum oils) and fusel oil for the purpose of improving the blending of such alcohol and hydrocarbon and for the removal of the water contained in such alcohol; all as more fully hereinafter set forth and as claimed.

In the manufacture of composite motor fuels it is desirable to use ordinary alcohol (ethyl alcohol or grain alcohol) as one component and a hydrocarbon as another component. Difficulties arise however in the mixing of these bodies. Ordinarily alcohol as it comes into commerce as a result of the fermentation and distillation of molasses, sugars, etc., is not readily miscible with most of the hydrocarbon oils desirable for use in this connection. With most petroleum oils it hardly mixes at all in the absence of some third body adapted to dissolve both (or to dissolve in both) acting as a co-solvent. With pure benzol it is more miscible, but the low grade tar oils containing benzol which are desirable for fuel purposes do not mix as readily. In part, this difficulty in mixing arises from the presence of water in the alcohol. Ordinary methods of distillation do not remove all the water from alcohol-water mixtures; and commercial alcohol (except the special grade known as absolute alcohol) usually contains from 5 to 8 per cent. of water. Apart from the matter of mixing difficulties, the presence of this water is, of course, undesirable in a fuel.

The reason that water can not be completely removed from alcohol by fractional distillation is the fact that alcohol containing no water has a slightly higher boiling point than alcohol containing a little water and the latter is consequently the product delivered by the still. If however alcohol of the strength which is delivered by ordinary distillation be redistilled in the presence of various hydrocarbons, distilling conditions change and the bulk of the water contained in the alcohol can be removed as a separate fraction. This is done in the present invention.

I have found that in the presence of a little fusel oil the distillatory separations become much sharper; this being particularly the case where petroleum hydrocarbons, such as kerosene, gasolene, etc., are used. The quantity required for this purpose is quite small; 0.25 to 1 per cent. of fusel oil being amply sufficient as a rule. Part of this fusel oil goes with the final dry alcoholic material used for motor purposes while the remaining part remains in other products of distillation. As these other products of distillation go back into the operation this portion of the fusel oil is reused. The portion which goes into the final alcoholic material used for motor fuel purposes is useful since it acts as a blending agent.

In a typical embodiment of the present invention a mixture of about 40 parts (39.25) of commercial water-containing alcohol of 92 to 94 per cent. strength, 0.25 parts of commercial fusel oil and 60 parts of benzol (gasolene or kerosene or tar oils may be used instead) is distilled in any ordinary apparatus having means for fractionation. The mixture begins to distil at a low temperature which rises to about 64° C. and remains at this point for some time. The condensate during this period amounts to about 40 per cent. and is mainly hydrocarbon oil (benzol or gasolene) and alcohol containing more water than the original alcohol used. These form two layers, which, on standing, separate from each other. The hydrocarbon oil goes back into the process for reuse. The alcohol is redistilled to bring it back to its original strength. After a time the distillation temperature of the mixture suddenly rises above 64° and finally goes to about 78° C. During this period a second fraction of the condensed distillate forms which amounts to about 30 per cent. and is composed of alcohol containing some water and of hydrocarbon in two layers. The separated layer of watery alcohol is redistilled to get the alcohol; this alcohol and the hydrocarbon going back into the process. Finally at and above 78° C., there is a dis-

tillation of the remaining 30 per cent. and the formation of a third condensate of alcohol and hydrocarbon practically free of water. This condensate is used for making compound motor fuels. One typical condensate made in the manner just described on analysis gave 89.5 per cent. alcohol, 10 per cent. benzol and but 0.38 per cent. water. With this proportion of benzol the alcohol is denatured, and it is rendered substantially non-hygroscopic on exposure to the air. The material blends readily with petroleum hydrocarbons, partly because of the absence of water and partly because of the presence of benzol. In making a motor fuel it may be so blended with any suitable petroleum distillate giving a permanent non-hygroscopic mixture; say in the proportion of 25 parts of this material to 75 parts of the petroleum distillate.

For motor purposes the fuel composed of alcohol treated as just described and admixed with a petroleum oil may be improved by a further admixture of say 5 per cent. of ether to give quickened ignition and 5 per cent. of toluol to prevent loss of ether on keeping.

Where low-grade or unrectified alcohols containing substantial quantities of fusel oil can be obtained no further addition of fusel oil may be needed. This of course however depends upon the amount of fusel oil present. Where fusel oil is added it may be any of the commercial grades.

What I claim is:—

The process of fitting commercial water-containing alcohol for use in making composite motor fuels which comprises redistilling such alcohol with a hydrocarbon oil and fusel oil and segregating a fraction substantially free of water and consisting mainly of alcohol.

In testimony whereof I affix my signature hereto.

ELBRIDGE W. STEVENS.