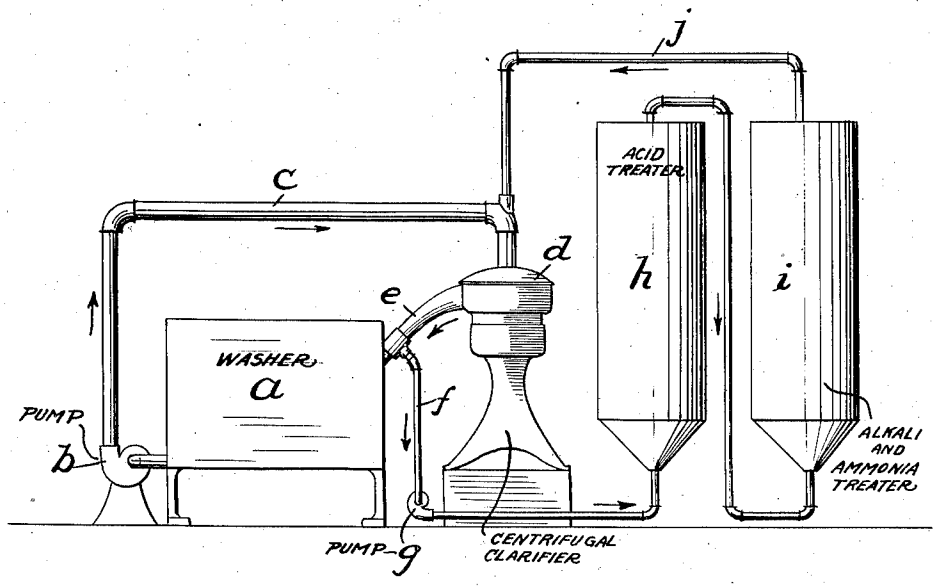
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PROCESS OF RESTORING THE QUALITY OF USED GASOLINE

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PROCESS OF RESTORING THE QUALITY OF USED GASOLINE

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My invention comprises an improvement in processes for reconditioning used dry cleaner's solvent. Liquids used for this purpose are usually petroleum products, such as gasoline, cleaner's naphtha and Stoddard solvent, although there are sometimes used other solvents such as carbon tetrachloride and trichlorethylene. Where, hereinafter, the word "gasoline" is used, it is intended to include all of such solvents.

When fabrics are washed in gasoline, there are two classes of material taken up by the gasoline. The first of these is solid dirt, which is taken into suspension. This may be easily removed by mechanical means; a much used process of partially maintaining the quality of gasoline consisting of drawing a large stream of dirty gasoline from the bottom of the washer, centrifuging it, and returning the clarified gasoline to the top of the washer.

The second class of materials taken up by the gasoline includes coloring and other matters which are soluble in the gasoline. These materials collect gradually in the gasoline and eventually give it a dark brown color that makes it unfit for washing white and light colored goods. They also impart a disagreeable odor that is difficult to remove.

One known (but little used) process for removing dissolved impurities from gasoline is to agitate the gasoline in small batches with a mineral acid, preferably concentrated sulfuric acid, which changes the dissolved impurities to insoluble, sludge-like compounds so much heavier than the gasoline that they may be, to a large extent, settled out by gravity. There is, however, danger that some of the acid and sludges may remain in suspension in the gasoline, and some of them are slightly soluble in it, so washing with water, or a neutralizing agitation with an alkaline solution, is required. Examples of many usable neutralizing solutions of the class of those that have been used in gasoline decolorizing processes are sodium carbonate, potassium carbonate, sodium hydroxide and potassium hydroxide. The word "alkali", when hereinafter used, is intended to include all solutions of this type. Such alkalies are characterized by the fact that they are substantially insoluble in gasoline.

In order to insure contact of such a neutralizing solution with every particle of acid or sludge in the gasoline, the agitation must be very thorough. Severe agitation, however, frequently forms an emulsion of the alkaline solution and the gasoline that is very difficult, if not impossible, to separate.

In my invention I utilize, as a neutralizing agent, aqua ammonia, which differs from the neutralizing solutions of the other class in that it is appreciably soluble in gasoline, or the gasoline is capable of absorbing a certain amount of gaseous ammonia. In place of ammonia, I may use any water soluble alkali that is appreciably soluble in gasoline and that performs the functions of ammonia in my process.

The advantage of using ammonia is that, in order to act as a neutralizing agent for the acids and sludges carried in the gasoline from the acid treatment, the degree of agitation required is so mild that emulsification is avoided. With only mild agitation, some of the ammonia will pass into solution in the gasoline and the ammonia is effective, at least to a substantial degree, to neutralize both acid bodies that are dissolved in the gasoline and acid bodies that are insoluble therein.

In order to secure entirely satisfactory results, the ammonia should be used in association with one or more of the alkalies hereinbefore mentioned. Even with such alkalies, agitation, so mild as to avoid emulsification, will neutralize a considerable part of the acids and sludges carried in the gasoline from the acid treatment. If ammonia be added to such an alkali, some of it will pass into solution in the gasoline and will neutralize the remaining products of the acid treatment. The ammonia also apparently acts as a carrier of alkalinity from the alkali to the acid bodies in the gasoline, for as long as the alkali solution is of good strength, there is little loss of ammonia.

Because the separation of the neutralizing solution and with it the products of the reaction from the gasoline depends on differ-

ence in density, it is desirable to increase the density of the solution. This may be accomplished by adding to the solution one or more inert salts, such as ammonium, potassium, or sodium chlorides or sulphates.

The rate of addition of coloring matter to dry cleaner's solvent is so slow that substantially complete removal of the color from only a small portion of the gasoline in the stream flowing through the clarifier will maintain good quality in the entire volume of gasoline.

In the accompanying drawing, which diagrammatically illustrates a dry cleaning plant using my process, *a* is a washing machine, *b* a pump, *c* a pipe to a centrifugal clarifier *d*, and *e* a return pipe from the clarifier to the washer. *f* is a relatively small branch pipe leading through a pump *g* to any suitable treater *h*, which may be of the type shown in an application for patent filed by Alan E. Flowers, Serial No. 117,685, dated June 22, 1926, charged with sulfuric acid. In series with treater *h* is a similar treater *i* charged with an alkali and ammonia. *j* is a return pipe from treater *i* to the inlet to the centrifuge.

In operation, dirty gasoline is drawn from the washer *a* and pumped into the clarifier *d*, wherein the solid dirt is removed and from which a major portion of the gasoline returns through the pipe *e* to the washer. A small portion of the gasoline is taken off through the pipe *f* and pumped through the treater *h*, in the lower part of which it is mixed with acid and in the upper part separated from most of the acid and products of treatment. From the top of the treater *h*, the gasoline flows to the bottom of the treater *i* wherein it is mildly agitated with a solution containing an alkali and ammonia, from which it separates in the upper part of the treater and then flows through the pipe *j* to the inlet to the centrifuge *d* where it joins the main stream.

If any minute quantities of alkali, ammonia or reaction products escape from the treaters, they are, because much heavier than gasoline, caught and retained in the centrifuge, thereby insuring their being kept out of the washer.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid bodies, and then, without violent agitation treating the gasoline with ammonia to neutralize acid bodies.

2. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid products that are in part soluble in the gasoline, and then, without violent agitation treating the gasoline with ammonia to neutralize dissolved acid products.

3. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid bodies, and then, without violent agitation treating the gasoline with an alkali insoluble in gasoline and with ammonia to neutralize acid bodies.

4. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid bodies, and then treating the gasoline with an alkali which is insoluble in gasoline while avoiding agitation sufficient to form a tight emulsion and thereby neutralizing the acid bodies in part and also treating the gasoline with ammonia to thereby effect neutralization of the remaining acid bodies.

5. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid bodies, some of which are insoluble, and others of which are dissolved, in the gasoline, and then, without violent agitation neutralizing the acid bodies by adding to the gasoline an alkali that is insoluble in gasoline and ammonia that in part is dissolved in the gasoline.

6. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid bodies, some of which are insoluble, and others of which are dissolved, in the gasoline, and then, while avoiding agitation sufficient to form a comparatively tight emulsion, treating the acid-treated gasoline with an alkali adapted to neutralize undissolved acid bodies and with ammonia, the latter being adapted to

effect neutralization of dissolved acid bodies.

7. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid bodies, some of which are insoluble, and others of which are dissolved, in the gasoline, and then, while avoiding agitation sufficient to form a comparatively tight emulsion, treating the acid-treated gasoline with an alkali adapted to neuralize part of the acid bodies and with ammonia, the latter acting as a carrier between said alkali and the acid bodies and in conjunction with said alkali effecting the neutralization of other acid bodies.

8. The process of reconditioning used gasoline containing mechanically removable solid impurities and other dissolved or suspended impurities not mechanically removable, which comprises mechanically removing solid impurities, treating the gasoline with a mineral acid to change the other impurities to acid bodies, and then treating the gasoline with ammonia and with another alkali that is insoluble in the gasoline and that, without agitation sufficient to form a comparatively tight emulsion, is alone incapable of effecting the desired degree of neutralization of acid bodies but is capable of effecting partial neutralization thereof, and in the said treatment with ammonia and the other alkali, avoiding agitation sufficient to form a comparatively tight emulsion, the ammonia acting to complete said neutralization, whereby substantially all the acid products are neutralized while the formation of a comparatively tight emulsion is avoided.

9. In a continuous process of washing with gasoline, the process of maintaining the gasoline of good quality which comprises establishing a flowing circuit of gasoline from and back to the locus of washing, centrifuging gasoline flowing in the circuit, by-passing gasoline flowing in the circuit, and subjecting the by-passed gasoline to the action of a mineral acid and then, without violent agitation, to the action of ammonia, and returning the by-passed gasoline to the circuit.

10. In a continuous process of washing with gasoline, the process of maintaining the gasoline of good quality which comprises establishing a flowing circuit of gasoline from and back to the locus of washing, centrifuging gasoline flowing in the circuit, by-passing gasoline flowing in the circuit, and subjecting the by-passed gasoline to the action of a mineral acid and then, without violent agitation, to the action of ammonia and another alkali insoluble in gasoline, and returning the by-passed gasoline to the circuit.

11. In a continuous process of washing with gasoline, the process of maintaining the gasoline of good quality which comprises establishing a flowing circuit of gasoline from and back to the locus of washing, centrifuging gasoline flowing in the circuit, by-passing gasoline flowing in the circuit, subjecting the by-passed gasoline first to the action of a mineral acid to change impurities to acid bodies some of which are insoluble, and others of which are dissolved, in the gasoline, and then, while avoiding agitation sufficient to form a comparatively tight emulsion, subjecting the by-passed gasoline to the action of an alkali adapted to neutralize part of the acid bodies and of ammonia adapted to effect neutralization of another part of acid bodies, and returning the by-passed gasoline to the circuit.

In testimony of which invention, I have hereunto set my hand, at Poughkeepsie, N. Y., on this 14th day of May, 1927.

FORD H. McBERTY.