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PROTECTION OF ALUMINUM

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6 Claims. (Cl. 23—240)

This invention relates to the treatment of gasoline tanks and, more particularly, to the protection of such tanks, especially gasoline tanks of aluminum or aluminum containing alloys, from corrosion resulting from the action of metal derivatives in the gasoline.

Corrosion is, of course, a widespread phenomenon whose serious consequences in some industrial applications have prompted much study of the problem. The causes of corrosion and the methods of preventing or retarding it vary widely according to the materials and conditions in each case.

During comparatively recent years, aluminum has become a construction material of increasing application, one of its outstanding characteristics from a practical standpoint being its resistance to corrosion under many conditions which other materials do not readily withstand. Aluminum and aluminum alloys have found especially wide application in the construction of aircraft of both the heavier-than-air and the lighter-than-air types because of the desirability of minimizing weight in these structures. Some rather peculiar corrosion difficulties arise when aluminum and aluminum-containing alloys are used for gasoline tanks, as in aircraft. Water-free gasoline appears to have no corrosive effect on an aluminum or aluminum alloy tank, and this is also true of gasolines which contain metallic compounds added to give anti-knock or other desirable properties to the gasoline. However, gasoline which contains a compound of a metal which is electropositive to aluminum will attack an aluminum or aluminum alloy tank if the gasoline contains water. Since aluminum and aluminum containing alloys are being used more and more in the construction of transportation vehicles, such as ships, railroad cars, etc., and particularly heavier- and lighter-than-air craft, the prevention of corrosion in aluminum or aluminum alloy gasoline tanks assumes constantly increasing importance and this is particularly true because of the wider use in gasoline of metal derivatives such as tetraethyl lead, tin tetra ethyl, etc. as anti-knock compounds.

Although these metal compounds are relatively insoluble in water and although it is not readily to be expected that they will undergo any substantial amount of ionization under the conditions involved, it has been found that, when the metals of these compounds are electropositive to aluminum, they are often reduced to the metallic state by electrolytic action, an equivalent amount of aluminum going into solution. Moreover, the dissolving out of the aluminum from the gas tank structure may be so localized as to promote the separation of metallic crystals of aluminum, thereby increasing the amount of corrosion. Furthermore, such electrolytic action apparently accelerates the ordinary corrosion of the aluminum as by the action of various salts in the solution, etc. Although various methods have been suggested for reducing or retarding the amount of corrosion of aluminum under given circumstances, these methods are more or less peculiar to the conditions of each particular case. Therefore, the corrosion of aluminum gasoline tanks in the presence of water and gasoline which contains compounds of metals electropositive to aluminum, presents its own special difficulties and necessitates individual treatment.

Since, as previously indicated, such corrosion ordinarily takes place only in the presence of water, one method of avoiding the difficulty consists in removing water from or preventing its entrance into the gasoline tank as by the use of suitable absorbent materials. This procedure, however, offers certain mechanical difficulties and necessitates constant control to ascertain when the absorbent material is spent and must be replaced. Moreover, it is rather difficult to entirely prevent water from getting into the gasoline system in many instances. This water may be introduced in a number of ways. For example, in lighter-than-air craft, it is sometimes necessary to pump the gasoline from one storage tank to another to maintain the balance of the ship while it is in flight. For instance, in a ship equipped with motors located at different positions along the length of the ship, as, for example, in a ship equipped with two motors near the front and two motors near the stern, if all of the motors are operating at the start of a voyage and during the course of the voyage it becomes necessary or desirable to discontinue the operation of the two motors toward the front or the two motors toward the stern, it is necessary to pump gasoline from tanks in one position of the ship to tanks in another position in order to maintain the desired balance. Such transfer of gasoline is not uncommon during Zeppelin flights and where it is transferred several times during a flight, it may take up considerable water.

It has now been found that the difficulties of attempting to remove or prevent the entrance of water by mechanical devices and absorbents may be avoided and the corrosion of the tank may be prevented by adding a water-soluble chromate such as sodium or potassium dichromate or so-

dium or potassium chromate to the tank, the water soluble chromate dissolving in any water present. The chromate may be added to the tank in crystalline form, in which case it will go into solution as water is added to or collects in the tank or if preferred, a concentrated solution of the chromate in water may be added to the tank and this will be diluted by any water present in or accumulating in the gasoline and will thus protect the tank from corrosion. If the water is not removed from the gasoline, it will be necessary to prevent it from going to the motor and this may be readily accomplished by suitable traps or other devices.

In the so-called "aqua" system of removing gasoline in storage tanks by pumping water into the tanks and thus forcing the gasoline out at the top, corrosion of the tank by the combined action of the water and a metal in the gasoline may be inhibited or prevented by dissolving in the water a chemical such as a water soluble chromate. The chromate may be added to the gasoline tank or to the water. In the former case, it will be dissolved by the water when it is supplied to the tank.

As previously described, the chromate may be introduced as crystals or in other dry form or it may be introduced as a concentrated solution in water. If introduced in dry form, it may be added as loose crystals or placed in a bag or other container or added in any other convenient manner. However, since any water which goes into the system, being heavier than gasoline, will gravitate to the lower portion of the system the chromate should be placed at such point, which in most cases is, preferably, the lowest point in the tank. Any water getting into the tank or system will thus settle and dissolve the chromate whereby it will be made effective. Although the concentration of chromate required to effectively inhibit the corrosion is small, the total amount added will obviously depend upon the particular conditions in any given case, such as the size and construction of the tank, the amount of gasoline, the amount and kind of metal compound contained in the gasoline and the amount of water collecting in the system. Although any water-soluble chromate may be employed, sodium and potassium chromates and dichromates are the preferred materials since they are effective and at the same time readily and economically available.

This application is a continuation-in-part of my co-pending application Serial No. 744,859, filed September 20, 1934.

Although only the preferred forms of the invention have been described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. In a gasoline tank or aluminum-containing construction, water in which a chromate is dissolved and gasoline which has mixed therewith a compound of a metal which is electropositive to aluminum.

2. The method of inhibiting the corrosion of aluminum by the combined action of water and gasoline containing tetra ethyl lead which comprises adding to the water a water-soluble chromate.

3. The method of inhibiting the corrosion, in the presence of moisture, of a tank of aluminum-containing construction which holds gasoline containing tetra ethyl lead which comprises placing in the bottom of the tank a water-soluble chromate.

4. The method of inhibiting the corrosion of aluminum in the presence of water and gasoline containing an organic derivative of a metal electropositive to aluminum which comprises adding to the gasoline a water-soluble chromate.

5. The method of inhibiting the corrosion of aluminum by the combined action of water and gasoline containing an anti-knock compound which is an organic derivative of a metal electropositive to aluminum which comprises adding to the water a small amount of potassium dichromate.

6. In a tank of aluminum-containing construction, gasoline which contains tetra ethyl lead and an aqueous solution of potassium dichromate.

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