Tung Oil as Applied to the Paint Trade in England

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THE use of Tung Oil as a varnish material in England does not go back very far, in fact it has been intelligently used in the United States for a longer period than in my own country; this probably being due to a combination of several factors.

The first factor is mainly psychological, and has its roots in that particular conservatism which at times can be said to characterize English industrial practices. In fact, in this particular instance, where scientific control in the industry is a comparatively recent innovation, the varnish making secrets of the craftsman of the last two centuries were carefully guarded and handed from one craftsman to his son or apprentice. These practices became so deeply rooted that each man had his own particular points of technique and would neither divulge these nor be prepared to receive anything which would alter the already firmly fixed impression of the trade he practiced.

The second factor is an offshoot of the first and showed itself in the following way. The finishes produced from Tung Oil were so much harder and dried so much more rapidly than those produced from Linseed Oil that these were suspected from the outset, since it was held that the harder and quicker a varnish dried, the lower would its durability ultimately be. Durability is perhaps the most important requirement of a paint or varnish to be used in the British Isles, and the life demanded of such materials is rather more than in the United States.

In America it is possible to manufacture varnishes which are satisfactory in different zones of the continent, and so make allowances for the varying climatic conditions, whereas in the British Isles it is practically impossible to do this. Conditions vary quite widely in the short distance of a few hundred miles that a selling organization could hardly cope with different grades for different localities. For example, there are wide differences in the extremely wet conditions of the western coasts of Ireland and Scotland and the sunny conditions of the beautiful southern coast of England, and these again are different from the extremely difficult conditions of the industrial cities of the north, where the atmosphere is rather more corrosive than in the most difficult of your own industrial centers.

These points may give you some idea of the reasons why caution was exercised before Tung Oil became generally adopted, and even today, in some quarters, there is still a feeling that, unless in addition to Tung Oil, a paint or varnish contains a large proportion of Linseed Oil, that it is in danger of premature breakdown.

The third main factor was mainly economic, in that the comparatively low price of Linseed Oil and the high price of Tung Oil (a difference greater than in your own country) made it necessary to limit the quantities of Tung Oil used. This was particularly the case two years ago, when the price of Tung Oil rose to such a level that it was necessary in many cases either to substitute some of the Tung Oil already in varnish formulae with Linseed Oil or to make use of some of the substitutes now available.

While speaking of the Tung Oil substitutes, here again we have been cautious in our adoption of them, and while undoubtedly this has to an extent retarded development of them, it is a practice which has undoubtedly saved many "heartburnings" in the industry. For example, exposure tests have now shown that Oiticica Oil cannot, in the truest sense of the word, be regarded as an alternative to Tung Oil, as it is more rapidly oxidizing, thus giving rise to a sometimes dangerous degree of after embrittlement, and the view is generally held that unless there is an adequate proportion of Tung Oil present as well as the Oiticica Oil, that the durability and general chemical resistance of the varnish is definitely impaired. Some authorities suggest that there should not be more than 30 per cent of Oiticica Oil to 70 per cent Tung Oil in any given varnish, but a considerably higher proportion can be used when dealing with varnishes made from the, so-called, 100 per cent phenolic resins.

In addition to Oiticica Oil experiments have been made with the various processed types of Linseed Oil, such as Blown Oil, etc., many of which may show certain points of advantage, but cannot adequately substitute Tung Oil itself, or in any way approximate its unique properties. Other materials which have also been used are the newer types of polymerised and hydrated castor oils, which have certainly given promising results, although again it is necessary to have an adequate proportion of Tung Oil present. With these castor oils, which are extremely pale and have excellent color retention, great care must be taken to keep the quantity sufficiently low to prevent an objectionable degree of "after tack," due to the slower drying of this particular oil, but it can be said that in spite of certain defects of this nature and the defects associated with its lower chemical resistance, that its durability is sufficiently close to that of Tung Oil for it to be substituted in formulae containing fairly high proportions of other oils.

Tung Oil is very widely used when it is polymerised together with Linseed Oil, to make what we call in England, Enamel Oils, the most usual ratios being 30 per cent of Tung Oil (or lower) to 70 per cent of Linseed Oil. If larger quantities than 30 per cent of Tung Oil are used, the Tung Oil seems to become unable to form a simple polymer with all the Tung Oil present, the excess Tung Oil polymerizing more rapidly to a point where it may even reach a jell stage, remaining in solution with the lightly bodied Linseed Oil, so forming a mixture of questionable durability and general stability.

Varnishes made with these particular oils are usually cooked by what is known as the German or European method, in which the oils

are bodied to a medium consistency as a separate operation, preparatory to the actual making of the varnish, which then consists of dissolving the resins employed in the thickened oil. Varnishes made on these lines, although possibly containing relatively large amounts of Tung Oil, nevertheless have a low quantity of mineral spirit, usually about 30 per cent to 35 per cent, and it is claimed by Fonrobert that they show a better finish, greater hardness and in some cases higher durability than similar varnishes made by the American method, but in my experience this is by no means always the case, and although the German method is still popular in England, the American method is also in great use, particularly now there is great popularity for varnishes made from the unmodified phenolic resins.

It was not until the phenolic resins of this type became widely used that Tung Oil was substantially used in any form other than with Linseed Oil, but the advent of these resins has rendered it possible to make varnishes of outstanding durability, with, for all practical purposes, no other oil present than Tung Oil. With varnishes of this type we have found in England that the old fear that excessive use of Tung Oil would result in rapid embrittlement of the film need no longer be a source of worry, in fact such varnishes, although extremely hard, seem to remain sufficiently elastic to ensure a long life and in addition have high gloss retention and amazing water and chemical resistance, the latter two items rendering them especially useful in the humid atmosphere which is present in varying degrees throughout the British Isles, and also in the highly acid atmosphere of the industrial cities.

As is the case in the United States, uncertainty as to the political situation in China has led to many attempts being made at producing Tung Oil within the British Empire and plantations have been developed in various parts of Africa, Australia, India, New Zealand, Palestine, Burma, just to mention a few parts of the British Empire where promising results are being obtained. These tests, which have been carried out under the guidance of Dr. L. A. Jordan of the Research Association of British Paint and Varnish Manufacturers, have, in the main, been very promising, and it does not seem to be the wild dream that it was ten years ago, that at some time our Tung Oil supplies may be grown on our own plantations and no longer dependent on the ever changing political situation in the Far East.

Only the week before I left England the situation had arisen that, due to the fighting at Shanghai, no further shipments of Tung Oil had arrived and so far as I am aware there was no oil to be had in London at any price. Unfortunately, no British Empire Tung Oil is yet available in commercial quantities, and we were forced into the position, as you are in this country, of substituting it with other oils and reinforcing with phenolic resins, etc., in order to keep up our trade in the lines where Tung Oil has hitherto been widely used.

The samples of Empire produced Tung Oil which I have received have all been of excellent quality, the color being an extremely pale yellow and the odor very slight and different from the strong "ham-like" smell of the Hankow oils. The physical and chemical properties of the oils have been excellent and in certain cases, when laboratory samples of varnish have been made, the time taken to reach a satisfactory stage of polymerization has been slightly less than is the case with an average Chinese oil, although not to the point where this might cause any difficulties.

I know that in the United States you have been working with the same end in view and have been carrying out many experiments on your own plantations, and I know that you must feel as we do the desirability of satisfactorily concluding the experimental stage and reaching a sound commercial basis, because, although it is almost certain that neither the United States or Great Britain can ever render themselves wholly independent of the Chinese market, the production of a reasonable percentage of Tung Oil will at least affect a commercial balance and give a measure of independence in this regard to both countries.

Spring Meeting Notice

The Governing Board has approved the date and place of the Spring Meeting of the Society. This meeting is to be held in New Orleans. The dates are May 12th and 13th. It is not too early to lay your plans to attend.

Members should be thinking about the program. Those who have papers to present are urged to inform President Sheely at the earliest possible date. His address is Armour & Company, 1355 W. 31st Street, Chicago.

Put these dates on your calendar now—May 12th and 13—New Orleans.