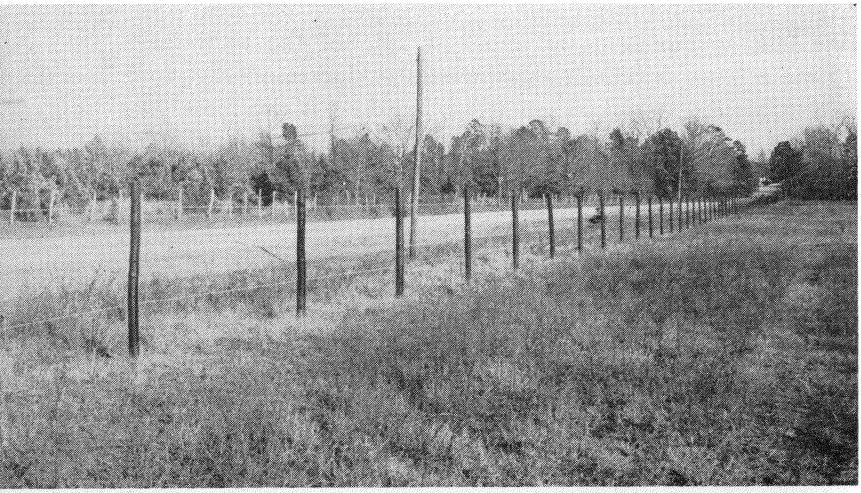
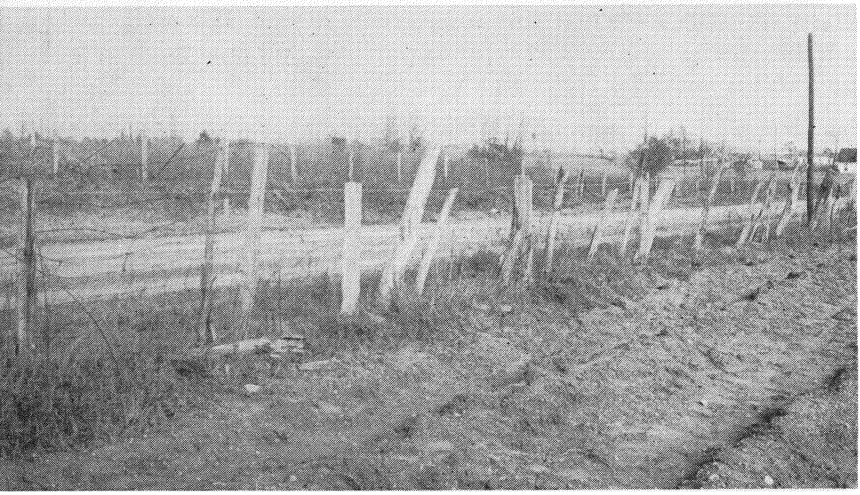
Treated Fence Posts





Circular 541

EXTENSION SERVICE
Shawnee Brown, Director
Oklahoma A. and M. College
Stillwater, Oklahoma

Treated Fence Posts

by
C. L. Clymer
Assistant Extension Forester

Oftentime fencing represents as much as 10% of the total farm value. Each time a fence is rebuilt this investment increases; therefore it is evident that a good initial job of fence building is the most economical. Surveys indicate that a large percentage of fences must be rebuilt every five to eight years.

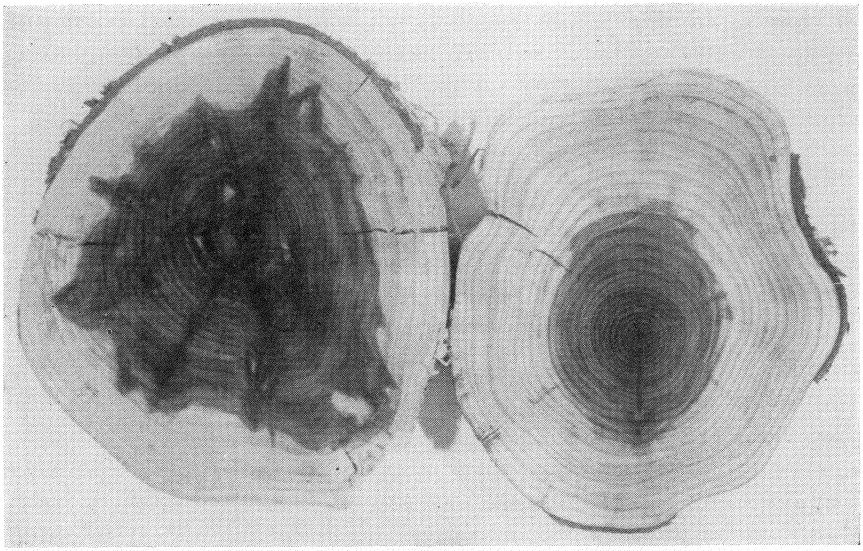
Fence failures in a great many cases are not caused by the present day good galvanized iron wire, but are caused by poor posts used in fence building. For this reason every person should give serious thought to the quality of posts used in making new or rebuilding old fences. Low first cost of building fences using non-durable species or improperly treated posts is invariably a false saving due to the necessity of frequent repairs.

Let us illustrate this fact in figures. If an improperly treated or untreated low durability species post costs 34 cents to purchase and install and lasts six years its actual cost is 5⅔ cents a year. If a well treated or durable species post costs 49 cents to purchase and lasts thirty years, its actual cost is not quite 1⅔ cents a year.

A saving of a few cents per post per year may not seem very important until you count the number of posts in your fence lines. If you own 1500 posts, and the saving between the above mentioned posts amounts to only 4 cents each, that's $60 per year, or $1,800 for the life of the fence. That is 10% interest on $18,000 aside from the fact that only one fence has been built during the period where with the use of poorly treated posts or average native untreated wood posts, five fences would have been built.

CAUSES OF STRUCTURAL FAILURE OF POSTS

Decay is the most common destroyer of fence posts. Decay is not caused by chemical action of the soil or by the fermentation of the sap, but is the result of the action of certain low forms of plant life called fungi. Substances in the wood are used as food by the fungi. As such substances are consumed the wood structure is destroyed and it becomes rotten.



Dark centers are the heartwood and durable portion of these cedar posts. Because of more heartwood, the post on the left would be more durable.

The requirements for growth of fungi are moisture, air, favorable temperature and food. The food is the post, air is always present, and Oklahoma's average annual temperature and rainfall are favorable to fungus growth.

Termites, Lyctus powder-post beetles and other "wood eating" insects are also responsible for much damage to fence posts, especially those of the hardwood species such as oak, hickory, ash, sweet gum, black gum, persimmon, elm, sycamore and others.

DURABILITY OF UNTREATED POSTS

Some species of posts are naturally much more durable than others. However, species alone is not the one determining factor of durability.

With climatic and soil conditions being equal, a post with a high percentage of heartwood will last longer than a post of the same species that is composed largely of sapwood. For the same reason a large post will generally last longer than a small post because the former usually has more heartwood than the latter. Sapwood of any tree, regardless of species, is very low in durability. Any post having a wide band of sapwood surrounding the heartwood should not be considered more durable than a post of smaller diameter, but having as large or larger center of heartwood.

Posts made from trees of slow growth (growth rings close together) are more durable than those made from trees of the same species but

of more rapid growth. In some cases it was observed that posts with closely spaced rings lasted as much as five times as long as those having wide rings, the posts being set in the same fence, coming from the same source and of the same species.

Farmers differ considerably as to whether split or round posts are the more durable. As long as one contains the same amount of heartwood as the other, there is no difference in durability. If splitting decreases the percentage of heartwood, the split post will be less durable; but if the percentage of heartwood is increased by splitting, the post will be more durable than a round post.

There is little difference in length of service of posts that are dried and seasoned before setting and green posts of the same species that are set immediately after cutting. Posts cut in the fall usually dry out more slowly and check less than posts cut in the spring or summer. Rapid seasoning in hot, dry weather will cause the post to check badly, thus exposing the new wood to decay organisms. Posts cut in spring and early summer peel more easily than posts cut in winter.

Although conclusive evidence gathered through experiments on all species is not available, it is generally believed that peeling of all posts will delay initial attack and rate of decay.

Controlled experiments on relative durability based on the heartwood of all the species used for posts in Oklahoma are lacking, but information taken from "Commercial Timbers of the United States," by Brown and Pushin has been used to arrange the following species in order of durability for untreated posts:

Osage orange	Mulberry, red	Hickory
Bald cypress	Oak, post and white	Maple
Red cedar	Sassafras	Oak, red
Mulberry	Coffeetree	Persimmon
Mesquite	Elm, slippery	Sycamore
Black locust	Hackberry	Cottonwood
Walnut, black	Pine	Willow
Catalpa	Elm, other	
Locust, honey	Gum, sweet and black	

These relative durabilities range from fifty years or more for Osage orange to only one or two years for willow. All species listed are not commercially important but are trees cut and used by individuals in various sections of the state.

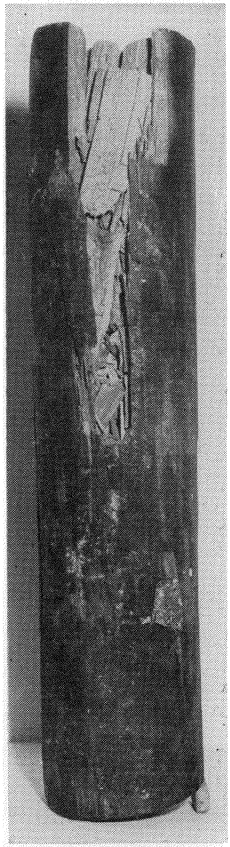
Soil type and moisture content are other factors influencing the length of service of untreated posts. For example, posts set in alkali soil usually last longer than posts of the same species in non-alkali

soil. Posts set in soils that are alternately wet and dry will usually decay faster than posts of the same species set in constantly wet or constantly dry soils.

THE PRESERVATIVES USED IN POSTS

Wood preservatives are chemicals that, when injected into wood, make it unpalatable or uninhabitable to wood-destroying organisms. For protection against decay and most insects, preservatives must be poisonous or toxic. There are some chemicals that are repellent to insects rather than poisonous. For general treatment of posts a preservative must have high toxicity. It must also be chemically stable and permanent so that it will remain in the wood for many years, have good penetrating properties, be safe to handle, harmless to wood and metal, readily available, and reasonably cheap.

There are many materials that are capable of extending the life of wood. Some are more effective than others. All possess disadvantages that limit their use, as well as advantages that make them especially suitable for specific purposes. Almost without exception, these preservatives fall into three general classes: (1) the toxic oils, like creosote, which are relatively insoluble in water and evaporate slowly; (2) the salts that are injected into the wood in the form of water solutions; and (3) preservatives that consist of a small percentage (usually about 5 percent) of a highly toxic chemical in a solvent or mixture of solvents other than water.



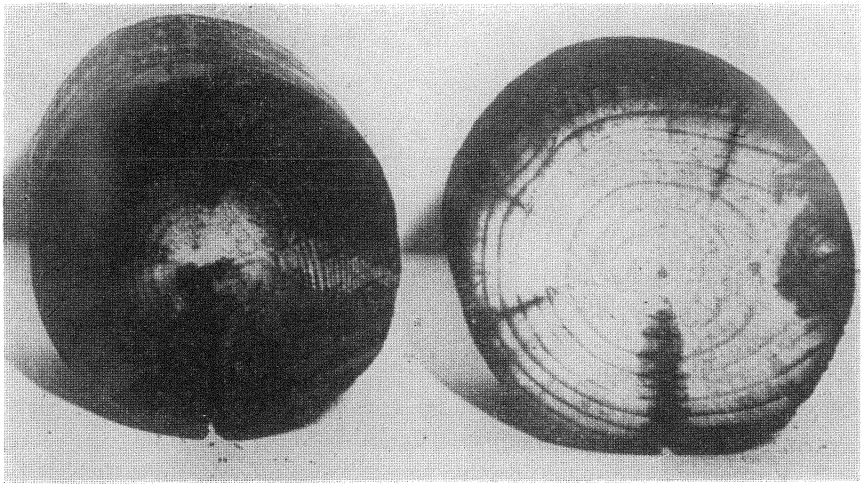
Rot in oil-dipped post, in service only 2½ years.

The effectiveness of preservative treatment depends on the soundness of the wood, the amount of preservative absorbed and the depth of penetration as well as on the preservative used. The importance of this fact must not be overlooked, whether it applies to commercially treated posts or those treated at home.

Non-Toxic Oils

Petroleum oils of various grades ranging from the heavy crude oils through crank case drainings have been and are continuing to be used as a preservative treatment for posts, both on the farm and on a commercial basis.

The fact that these oils, regardless of grade, when used alone are practically worthless as a pre-



Pressure-treated creosote on the left; oil dipped post on the right.

servative cannot be stressed too emphatically. Such oils are not toxic to fungi or insects and do not increase the durability of posts to any satisfactory degree, even though penetration may be very deep.

Persons purchasing "black" posts should take every precaution to determine what preservative has been used and the method by which it was applied. When examining such posts for quality, the buyer should:

(1) Observe whether or not a distinct odor of creosote is present;

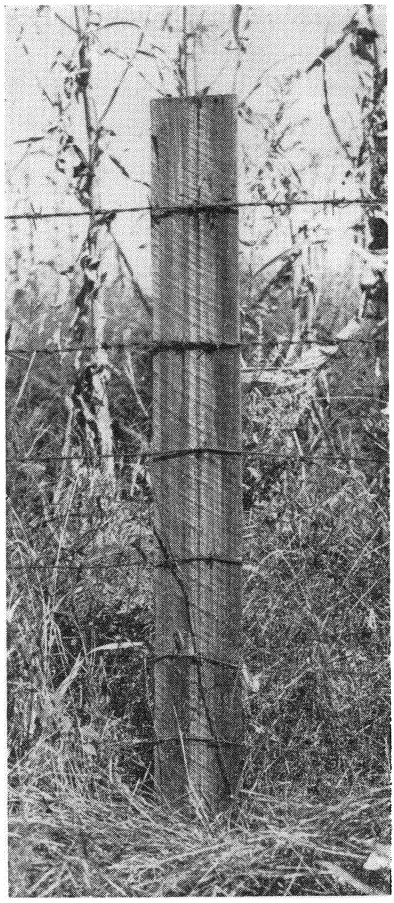
(2) With a pocket knife whittle into the post at a point one-half its length. If shaving or notching exposes white wood the treating method has been inadequate and probably indicates an oil treated post;

(3) Ask the dealer or trucker from which he is considering purchasing black posts for a certificate of treatment or guarantee. Reliable concerns selling a good product will usually provide either one or both such written statements.

If after applying the above mentioned precautions and tests a purchaser is not satisfied, it would be well to purchase a post from the stock pile being considered and saw it in half at a point one-half its length. The dark creosote stain should extend into the post to a depth of 2 or more inches in posts of large diameter or should stain 85 percent of the sapwood of small posts.

Posts treated with petroleum oil only, may not be expected to

last longer than untreated posts. Most such posts treated commercially are of pine, and under average climatic conditions such as occur in Oklahoma may be expected to remain durable for only three years or less.



Half round pressure-treated creosote post. In service 30 years and still sound.

Toxic Oils

Coal or coke-oven-tar creosotes — Coal-tar creosote and coke-oven-tar creosote of the same quality are equally as good when used as fence post preservatives and any statement hereafter contained in this publication referring to coal-tar creosote will apply equally well to coke-oven-tar creosote.

Coal-tar creosote is a black or brownish oil having an odor which should readily distinguish it from any of the petroleum oils. This creosote is the most important and most generally useful post preservative.

Advantages of creosote are: (1) its high toxicity, which makes it extremely poisonous to wood-destroying organisms, (2) its relative insolubility in water and its low rate of evaporation which gives it a great degree of permanence under the most varied use conditions and (3) the ease with which its depth of penetration can be determined. Commercially it is easy to apply, and it is generally available (when purchased in wholesale quantities).

There is, as yet, no better preservative than coal-tar creosote for treating fence posts. When solutions containing not less than 50% creosote and the remaining percentage a low cost petroleum oil of the heavy, high-boiling and high-viscosity type are used and the proper treatment applied to obtain good penetration a durable post will be produced. Durability will increase as the percentage of creosote in the solution is increased.

It is usually cheaper to purchase pressure treated creosote posts than to treat them with creosote on the farm. The price of creosote in

small quantities is comparatively high; and, when properly treated at home, posts retain rather large quantities of the preservative. Surplus creosote in commercially treated posts is reclaimed through application of vacuum.

Water-gas-tar creosote and carbolineums.—Water-gas-tar creosote is a petroleum product and not a coal product and it is somewhat different from the coal product. It is generally not so toxic nor so effective as coal-tar creosote but it is known to be a good preservative. Wood that is deeply penetrated with it will have satisfactory resistance to decay.

Carbolineums (anthracene oils) are coal-tar distillates of higher specific gravity and higher boiling range than ordinary coal-tar creosote, but their general properties and preservative effectiveness are similar to those of coal-tar creosote. These oils are usually sold under trade names. This group of preservatives is used to advantage in open-tank treatments that involve heating, since loss of the oil through evaporation is likely to be less than with low-boiling oils.

Pentachlorophenol

Pentachlorophenol, often spoken of as "Penta", is a chemical moderately soluble in oils, but only slightly soluble in water. It does not evaporate readily, and is easily handled.

Cleanliness, paintability, color, odor, and combustibility of posts treated with pentachlorophenol are dependent upon the properties of petroleum oil used as a solvent. Pentachlorophenol irritates the skin of workers, but with careful handling and the use of protective clothing it is possible to avoid harmful effects.

Pentachlorophenol is usually applied to posts as a 5 percent solution in a suitable light fuel oil. The preservative solution penetrates better and is more uniformly distributed throughout the wood than in the case of heavier oil preservatives; however, the petroleum oil used in the solutions varies from the diesel-oil type to the heavier types ordinarily used in creosoting processes.

Pentachlorophenol may be purchased in solution sold under trade names. For economy, ease with which it may be applied and its rather high toxicity and permanence, pentachlorophenol petroleum solutions are well adapted to farm treatment of posts.

Durability of pentachlorophenol treated posts has not been conclusively established, since posts treated with this compound have not been observed over a long enough period to draw any definite conclusions;

but from all indications brought forth in research conducted over a period of 16 years it appears that pentachlorophenol, when properly applied, may produce a post which will compare favorably with creosote treated posts.

Water-Borne Preservatives

Wood preservatives such as zinc chloride, copper sulfate, chromated zinc chloride and many other salts are injected into the wood as water solutions.

The chief advantages which encourage the use of such preservatives are: (1) low cost, (2) simple methods of application, (3) posts are left comparatively clean, and (4) many such salts are available locally.

Disadvantages inherent to many and in some cases all of this type preservative are: (1) water-borne preservatives are subject to leaching and therefore will not perform so satisfactorily as creosote or pentachlorophenol under wet conditions, (2) they are all more or less poisonous to human beings and to domestic and wild animals, and (3) some are corrosive to iron.

Copper Sulfate.—Copper sulfate has been used as a wood preservative for centuries and fulfills most of the requirements of good preservative, except that it is corrosive to metals. Wire coming in contact with posts well treated with this chemical often corrode and rust out in a comparatively short time.

Copper sulfate, commonly known as blue vitriol, blue copperas, or bluestone, is available at most farmers' supply houses in crystalline or powder form. Three-quarters of a pound of copper sulfate in one-half gallon of water will treat one cubic foot of wood. The above concentrate is considered the minimum for safe treatment, and to provide an additional margin of safety it is advisable to increase the copper sulfate to one pound per one half gallon of water.

Copper sulfate usually discolors wood. A small quantity imparts a light greenish-blue shade with the color becoming more intense as the quantity of chemical increases. Large amounts make it dark olive green.

Zinc Chloride.—Zinc chloride, sometimes called butter of zinc, has come into more common use than copper sulfate. It is only slightly corrosive to galvanized iron and does not usually discolor wood.

Zinc chloride will prevent the breeding of bark beetles, and damage by sawyer ants, termites and wood destroying fungi. It will not prevent pinhole damage by ambrosia beetles. Pinholes may not struc-

urally weaken the wood but the holes permit the infiltration of moisture, increasing the possibilities for leaching.

Zinc chloride salt is available to most farmers' supply houses in the form of a white granular salt which must be stored in tightly sealed containers to be kept dry. A solution of one pound of the salt to one-half gallon of water will give adequate protection to one cubic foot of wood.

Chromated Zinc Chloride.—Chromated zinc chloride is a gray crystalline mixture of zinc chloride and sodium dichromate that must be kept in tightly sealed containers for dry storage. Like zinc chloride, chromated zinc chloride is slightly corrosive to metal but does not discolor wood.

The chief advantage of this combination is that the salts are more resistant to leaching than zinc chloride used alone and also act as a fire retardant. A solution of one pound of the salt in one-half gallon of water is a satisfactory minimum treatment for one cubic foot of wood.

Other Salts.—There are many other salts which have been or are being used for post preservation; but in most cases the high price of the chemical makes their use prohibitive, or there are other disadvantages which limit their use.

Such salts as sodium arsenite, mercuric chloride, ammonium biflouride and many others are extremely poisonous and without special instructions should not be used for home treatment of posts.

Proprietary Salt Preservatives

Proprietary salt preservatives are those made and sold by manufacturers who have the sole right to make and sell them; thus all such preservatives are protected by patents and are in most instances sold under trade names. For this reason the following preservatives will be referred to by trade name.

Cost of treating posts with these salts compare favorably with those already discussed and concentration of solutions should conform with recommendations and directions supplied by the manufacturers and distributors.

Wolman Salt (Tanalith).—The estimated average life of posts pressure treated with Tanalith is 14 years. Solutions of this salt should be of such concentration that not less than one-third pound of the salt remains in each cubic foot of wood. This treatment does not stain the wood.

Celcure (acid cupric chromate).—The estimated average life of posts

treated with this preservative appears to be approximately 15 years. However, no conclusive durability tests have been completed. Tests on posts exposed to decay and termite attack indicate that wood well impregnated with Clecure can give good service. These tests were made on posts containing about one pound of preservative per cubic foot.

Zinc Meta Arsenite (ZMA).—This chemical treatment has been used for the past twenty years with fair results, but recently its use has been declining. As a result of service tests it has been listed as providing considerable protection. It seems that its greatest use at the present is for treatment of lumber.

Chemonite (ammoniacal copper arsenite.)—Chemonite has been in commercial use for about 14 years. After it is distributed in the wood, the ammonia evaporates leaving insoluble copper arsenite which stains the wood green. Service records in Chemonite-treated structures show that this preservative provides good protection against decay and termites. Minimum retention of one-third pound of the preservative salt per cubic foot of wood is necessary for adequate protection.

Osmose (Osmosar or Osmosalts).—Any one of the three names are often used to indicate the same preservative; however, the specific trade name of the chemical is Osmosar.

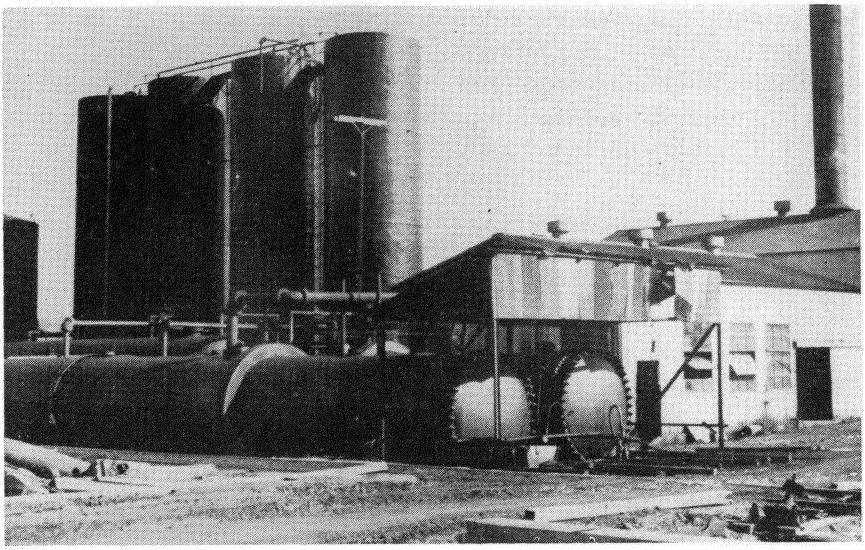
The Osmose process used for treating posts is coming into more general use, both on a commercial and on the farm basis. Like other proprietary preservatives the chemical mixture is protected by patent.

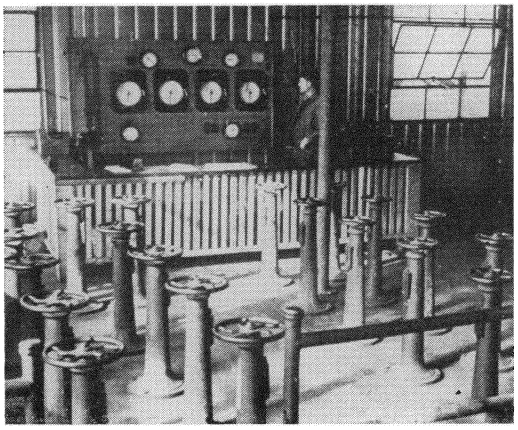
The manufacturer of Osmosalts claims a durability for posts treated with this preservative of three to five times that of untreated posts, which probably is a conservative estimate. On the basis of this claim, southern pine posts would be durable for 9 to 19 years.

Minimum requirements of one-fourth pound of Osmalts per cubic foot of wood is necessary for adequate protection. A 4-inch post six feet long contains slightly more than one-half cubic foot of wood; therefore, one pound of the preservative will treat a little over seven posts of this size.

METHODS OF TREATING POSTS USING TOXIC OILS

Seasoning.—Posts to be treated by the following processes must be seasoned to take treatment satisfactorily. Such seasoning will take from two to six months of air drying depending on size, species and climatic conditions. When posts begin to crack and check they are usually dry enough for treatment. Posts must have all bark peeled from them and must not have moisture on them in any form at the time of treatment. Peeling of posts is usually easier at the time they are cut.





Control rooms, storage tanks and pressure cylinders are necessary for controlled pressure treatment of posts. Plants of this type guarantee their posts.

Commercial Pressure Treatment.—The most effective fence post treatment known is pressure treatment using coal-tar creosote or mixtures of coal-tar creosote with other oils. Pentachlorophenol and some of the salt preservatives are also applied by pressure treatment.

Pressure plants, almost without exception, apply preservatives in accordance with specifications recommended by the Government or the American Wood Preservers Association. In some localities it is possible to purchase pressure treated posts from local dealers or local pressure treating plants, or to purchase such posts cooperatively in carload lots. In localities where pressure plants exist, it is often possible to have posts cut from farm woodlots custom treated.

Hot-and-Cold Bath Treatment.—Next to pressure-creosoting in effectiveness is the hot-and-cold bath, open-tank treatment using coal-tar creosote or creosote and oil mixtures. In this treatment the posts are heated in the preservative oil for a few hours and are then submerged in

cold preservative oil for a few hours, or they are given the hot bath and then allowed to remain several hours or overnight in the cooling preservative.

This treatment is not cheap and it is not a treatment that can be effectively applied without proper equipment, considerable hard, dirty work, and some intelligent observations. If the proper mixture of creosote and oil is applied and the penetration of the preservative is deep enough to insure good durable posts, treating by the hot-and-cold-bath method is often more costly than to purchase pressure treated creosote posts.

Species which may be difficult to treat by this method are listed under the cold soaking method.

Cold Soaking Method.—This method is used in treating posts with pentachlorophenol solutions. The equipment required for treatment by the cold-soaking method consists mainly of a leak-proof tank of sufficient size to accommodate the completely submerged material for the full time of treatment.

The posts are submerged in the preservative solution and allowed to soak until the desired quantity of the preservative has been absorbed and good penetrations are obtained. Round pine posts and other easily treated wood are usually well penetrated within 48 hours.

Some species are difficult to treat and it may be desirable to use some other preservative treatment for them. These species are as follows: green ash, butternut, catalpa, hackberry, maple, sweetgum, willow, cottonwood, cedar, black jack oak, and birch.

Using Water-Borne Preservatives

Seasoning.—Nearly all treatments using water-borne salts involve the use of green or thoroughly wet posts rather than dry posts. Cells of the wood must be full of partly filled with water before the physical action which carries the salts into the wood cells will operate satisfactorily.

Tire Tube End-Flow Treatment.—Round, fresh-cut sapwood posts with the bark left on can be treated satisfactorily with water soluble preservatives. A section of tire tube is attached to the elevated large end of the post to hold the preservative solution. By its own pressure, the solution flows in at the elevated end of the fresh cut post and pushes the sap out of the lower end. Treatment is completed in from 6 to 24 hours. To increase service life it is necessary to peel bark from thick bark species only.

Sap-Stream Method.—Freshly cut trees, with the leaves and branches still on, may be treated by standing them in a container into which the

required amount of preservative has been placed. The preservative will then be drawn into the sapwood by the evaporation of moisture from the leaves. Best results will be obtained if trees are treated immediately after being cut from the stump. Any of the water borne preservatives may be used in this process.

Barrel or Trough Method.—This method consists simply of standing or submerging the posts in the preservative solution and allowing them to remain over a long enough period of time to assure penetration. The period of treatment will vary from a few days to two or three weeks, depending on the species of trees used and the state of dryness of the wood.

Osmose Method.—This method of treatment is usually considered as the means by which the proprietary salts of the same trade name are applied. The method of application of the Osmosalts as recommended by the manufacturers of the product is rather simple. Freshly cut peeled posts may be either dipped into the solution or a paste mixed from the preservative may be brushed on the posts. Posts having the salts applied by either method are then stacked and covered with an air-tight covering for at least 30 days. Penetration is accomplished by the natural physical law of osmotic pressure from which the trade name was taken.

Spraying, Charring and Brush Treatments.—None of these treatments is considered satisfactory in extending the durability of posts with possibly only one exception. Brush application of the Osmosalts is mentioned as a possibility for applying this proprietary preservative.

Detailed information on preservatives and methods of application may be obtained through the County Agent or by writing the Forest Products Laboratory, Madison 5, Wisconsin, or to the United States Department of Agriculture, Washington 25, D. C.

ACKNOWLEDGEMENT

The following have contributed material and criticisms to this publication: Donald E. Stauffer and Albert Engstrom, Division of Forestry; Glen R. Durrell, Forestry Department of Oklahoma A. and M. College; Harry P. Rigdon, Extension Service of Oklahoma A. and M.; Albert C. Morley, formerly Extension Service; and authors of numerous publications from which research data was taken. Thanks to each.

We Guarantee

1) *that our posts are produced from sound, live, straight-bodied yellow pine timber;*

2) *that they are processed in our new, modern plant using hot solutions over 200 degrees and pressure of approximately 180 pounds. (The posts are cooked and treated for several hours under careful technical supervision.)*

3) *that we use No. 1 A. W. P. A. oil in 50% solution with petroleum oil—the right economy-serviceability mixture;*

4) *that our posts will give from 20 to 30 years service.*

We will furnish a certificate of treatment on each shipment, if requested.

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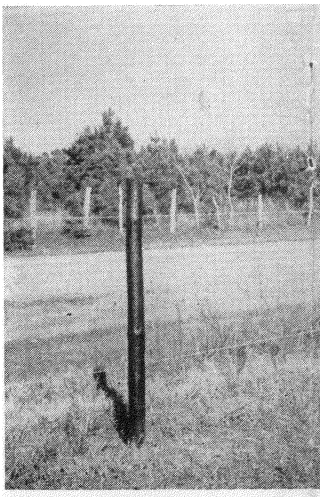

Cooperative Extension work in Agriculture and Home Economics, Extension Service, Oklahoma A. and M. College and Department of Agriculture Cooperating, Act of Congress of May 8 and June 30, 1914.