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The Durability of Fence Posts

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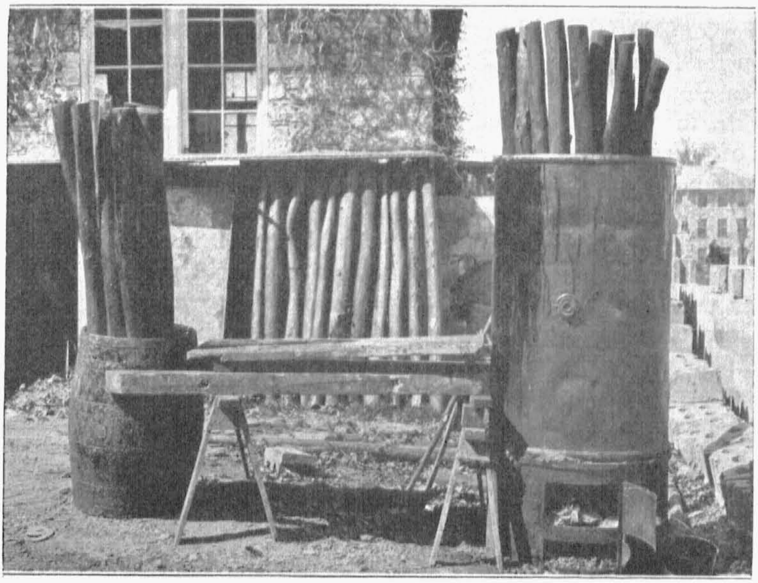

Equipment used in giving posts the double tank treatment.

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The Fence Post Problem

The management of the modern farm requires an increasing amount of fencing and makes necessary the use of hog-tight fence in many places, instead of the three- or four-wire cattle fence of earlier times. The inability of the farmer to hire help makes it necessary for him to do his own chores. This usually means that lanes must be fenced from the farmstead to the different fields to enable the stock to come to one central location for feed and water. The quality of post timber is inferior to that of thirty years ago, and in some localities fence posts are no longer grown but must be shipped into the community. All of these conditions combined, tend to increase the importance of fence and fence post problems on the farm. In a recent survey of 200 farms in northwest Missouri, the annual cost on each farm for fencing was $36.28, making up one of the important items of expense on the farm.

In the solution of the fence problem, data is needed as to the life of different varieties of wood when used for fence posts, the effect of various treatments in extending the serviceable life of these varieties, the cost of such treatment, and cost of posts other than wood.

In the fall of 1913, the forestry department of the University started an experiment to determine the life of different varieties of wood when used as fence posts and to determine the effect of six different treatments on each of these varieties. Since that time some additional kinds of posts have been added to the experiment as well as two different types of treatment.

The varieties used and the serviceable life of each when set without treatment is given in Table 1. This is termed Treatment "A."

Table I.—Results Available on Life of Varieties at End of 18-Year Period

Series A—No Treatment

Variety	Years of Service	Variety	Years of Service
White Cedar	Serviceable at 18 years	Iron Wood	Failed after 3⅔ years
Osage Orange	Serviceable at 18 years	Hickory	Failed after 3⅔ years
Black Locust	Serviceable at 18 years	Red Oak	Failed after 3⅓ years
Catalpa	Serviceable at 18 years	Cotton Wood	Failed after 3⅓ years
Sassafras	Failed af er 14⅓ years	Hack Berry	Failed after 3⅓ years
White Oak	Failed after 12½ years	Sugar Maple	Failed after 3⅓ years
White Walnut	Failed after 11 years	Black Oak	Failed after 3 years
Red Bud	Failed after 10⅓ years	River Birch	Failed after 3 years
Black Walnut	Failed after 9⅓ years	Dog Wood	Failed after 3 years
Honey Locust	Failed after 5⅓ years	Willow	Failed after 2⅓ years
Black Ash	Failed after 7⅓ years	Sycamore	Failed after 2 years
White Elm	Failed after 4 years		

Treament B. Setting in Gravel

Three posts of each of the twenty-seven varieties were set in gravel. The holes were dug in the usual way and the fill around the post made with screened gravel instead of earth, the theory being that the gravel would drain out quickly and the posts would consequently remain dry. The posts in the check plot and in the "set in gravel" plot have failed in eighteen of the varieties to date. The average life of the posts set without treatment was 4.59 years, and of those set in gravel 5.22 years. The setting in gravel increased the serviceable life of the posts .63 years.

Treatment C. Charring

It is common practice in some sections to cut fence posts, peel them, and then place the butt ends of the posts in the fire and char them. This practice was carried out on the theory that the fire would kill the spores on the wood and provide a surface that would make it more difficult for infection to get a start when the posts were set. Posts have failed in nineteen varieties in this series, with an average life in the check of 4.2 years, and in the "charred" treatment of 4.53 years, the treatment causing an increase of .33 years in the serviceable life. The additional cost of this treatment was for the labor used in charring the posts and amounted to .6 cents per post.

Treament D. Carbolineum

One brush coat of "Avenarius" Carbolineum, was applied to the posts, covering the post to a height well above ground. The posts were peeled before the carbolineum was applied. The cost of the treatment over the check plot was as follows: Peeling posts, 3.1 cents; Preservative, .5 cents; Labor for treating, .8 cents.

Total cost over that of the check post is 4.4 cents. Eighteen varieties have failed in both the check and carbolineum treatment to date. The average life of the check plot was 4.2 years, and in the carbolineum treatment 6.64 years, an increase of 2.4 years.

Treatment E. Creosote (Two Brush Coats)

Two brush coats of the ordinary creosote used for the tank treatments were applied to the butts of the posts. The first coat was allowed to dry in and then the second applied. Costs were as follows: Peeling, 3.1 cents; Preservative, .9 cents; Labor for treating, .4 cents.

Total cost in addition to check is 4.1 cents.

Twenty varieties have failed to date in this treatment. The average life without treatment is 4.6 years; with two brush coats of creosote 4.9 years. This shows an increase in serviceable life of .3 years.

Treatment F. Creosote (two hour open tank treatment)

The equipment similar to that shown on the cover page, was used for treating posts used in this test. Creosote was placed in the tank and heated until the fumes began to come off. As many posts as possible were placed in the tank and allowed to remain in the hot creosote for one hour. They were removed and plunged into a barrel of cold creosote for a period of one hour. The cost of this treatment was as follows: Peeling, 3.1 cents; Fuel, .6 cents; Preservative, 5.8 cents; Labor for treating, 4 cents; Depreciation of equipment, 4.2 cents.

Total cost over check post is 14 cents. Eighteen varieties can be checked in this treatment. The life of the check posts was 4.09 years, and the life in the two-hour double tank treatment was 9.79 years, showing an increase of 5.7 years.

Treament G. Creosote (five-hour double tank treatment)

This treatment is similar to the two-hour treatment except for the length of time required. Posts were placed in the hot creosote for a period of 2½ hours and in the cold for the same length of time. The cost of the treatment was as follows: Peeling, 3.1 cents; Fuel, 1 cents; Preservative, 11.7; Labor for treating, 7.8 cents; Depreciation of equipment, 8.8 cents.

Total cost above check post is 24.5 cents. Seventeen varieties may be compared to the check in this treatment. The average life of check posts is 4.09 years, and in the five-hour treatment, 11.15 years, showing an increase of 7.6 years in serviceable life.

Treatment H

This treatment was the same as treatment G. with the following exceptions. First, the posts used were allowed only six months to season. Second, the tops of the posts were treated by dipping up hot creosote and pouring over the tops while the butts of the posts were in the hot treatment. This was done two times during the treatment. Third, only five varieties were tested (these were varieties where the tops had rotted before the treated part of the post, in previous tests). The cost of the treatment was as follows: Peeling, 3.1 cents; Fuel, 1.6 cents; Preservative, 3.5 cents; Labor, 3.5 cents; Depreciation on equipment, 1.9 cents.

Total cost above untreated post is .1258. In the five varieties used in this test the average life of check posts was 8.4, and the life of the treated posts was 7.4 years. The negative results secured were probably due to the fact that the wood was not thoroughly seasoned, providing conditions for early decay; also, the posts in the check plot were thoroughly seasoned before use.. In addition to this the preservative did not penetrate the green wood and thus offered less protection. This may be noted from the low cost of creosote in this treatment.

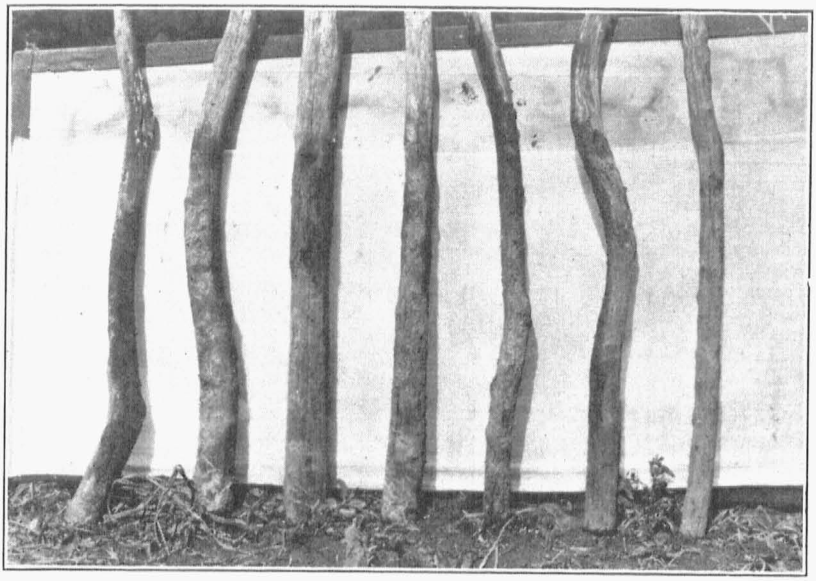

Figure 2.—Osage orange posts removed after eleven years. Reading left to right, the treatments were as follows: Five-hour double tank creosote; two-hour double tank creosote; two paint coats creosote; two paint coats carbolenium; charred; set in gravel; and no treatment. Practically no difference in decay can be noted from the picture.

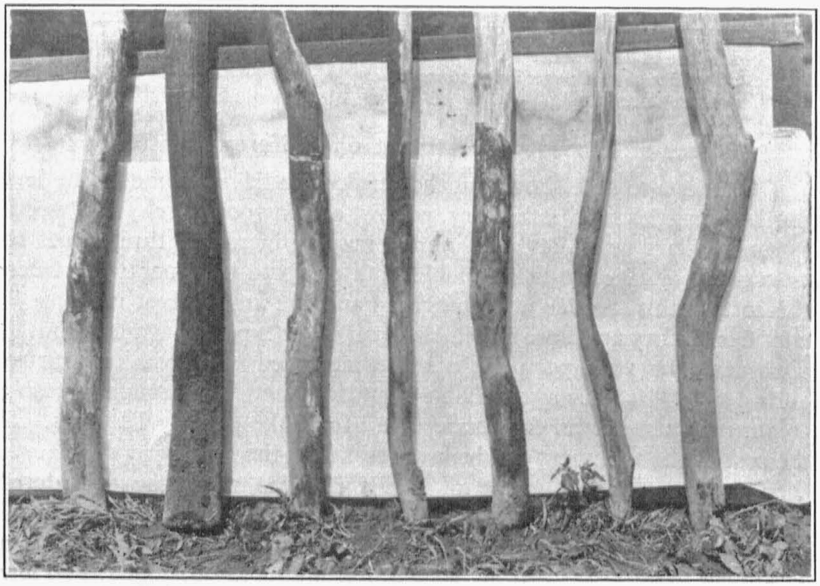

Figure 3.—Catalpa posts after eleven years. Treatments arranged as in Figure No. 2. Little benefit of treatment can be seen in the picture, although some benefit could be seen on close inspection.

SUMMARY SHOWING THE EFFECT OF DIFFERENT PRESERVATIVE TREATMENTS ON DIFFERENT VARIETIES OF FENCE POSTS—RESULTS GIVEN IN YEARS

Variety	No Treatment	Set in Gravel	Butts Charred	Hot Carbolineum	Hot Creosote	2 hour Tank Creosote	5 hour Tank Creosote
WhiteCedar	*	----	*	*	*	*	*
White Walnut	11	11⅔	8⅔	----	10⅓	13	14⅔
Black Walnut	9⅓	7⅔	7⅓	12⅓	10	----	----
Hickory	3⅔	'	3⅔	9⅔	4⅔	9⅓	12
Willow	2⅓	2⅔	2⅓	4	2⅔	9⅓	13
Cottonwood	3⅓	3⅓	2⅔	4	3⅓	8⅓	8
River Birch	3	4⅔	3⅓	'	'	8	9⅔
Iron Wood	3⅔	3⅔	3	9⅔	3⅔	12	13⅔
White Oak	----	7	7	----	8	---	----
Red Oak	3⅓	6⅓	7	9⅓	4	11	15⅓
Black Oak	3	4⅓	3⅓	7	8½	13	12
Slippery Elm	6	'	'	----	'	8½	'
White Elm	4	3⅔	3⅓	9⅔	4	11	8
Hock Berry	3⅓	'	2	4⅔	3	6⅔	11
Osage Orange	*	*	*	*	*	*	*
Sassafras	----	----	----	6⅔	----	----	----
Sycamore	2	2	6⅓	4	2	9⅓	8
Red Bud	10⅓	7⅓	----	9⅓	7⅓	14⅓	14⅓
Ky. Coffee Tree	6⅓	9	8⅔	11	14½	----	----
Honey Locust	5⅓	11⅓	6	----	9	----	13⅓
Black Locust	----	----	----	----	----	----	*
Sugar Tree	3⅓	3	3⅓	3⅔	3⅔	5	7
Bass Wood	2⅓	2	2⅓	2⅔	2	4⅔	8⅓
Dog Wood	3	3⅓	3⅓	6⅓	3⅔	9⅓	13⅓
Persimmon	2⅔	3	2⅓	3⅓	3⅓	8⅔	8
Black Ash	4⅓	4⅔	4⅔	6	4	14	----
Catalpa	----	----	----	----	*	*	*

*No failure in 18 years.
---- Only part of test posts have failed.
' No posts at beginning.

Effect of Creosote Treatment on Different Varieties

Our tests to date show that the serviceable life of some of the less durable varieties such as hickory, willow, cottonwood, birch, iron wood, sycamore, bass wood, and persimmon may be increased three times or even more by the five-hour double tank creosote treatment, but when the cost of this treatment is computed and the annual cost per post is considered, they are more expensive than other types of available posts. Two cents per year, per post, is sometimes used as a basis of figuring annual cost. If this is a reliable standard then a thorough creosote treatment must extend the serviceable life of the post by 12 years. If the cost of the treatment can be lowered below the figures in these tests, then the treatment of some of these varieties might be considered economical.

The following varieties show sufficiently increased service from treatment to make the process economical unless the first cost is so low that use without treatment is more economical. In most communities this is not the case.

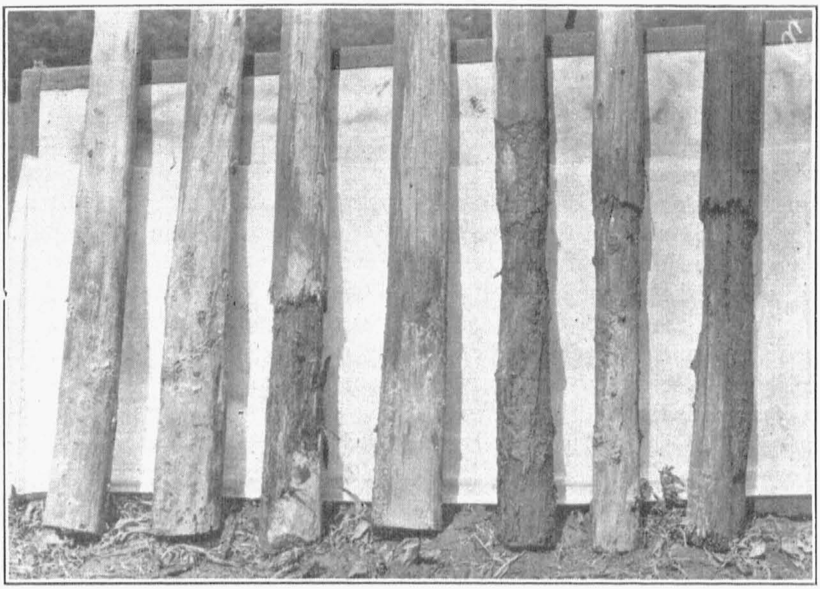

Figure 4.—White cedar posts after eleven years. Notice the effectiveness of the creosote double tank treatments and of the carbolineum on this variety.

The varieties responding satisfactorily to treatment with creosote are: white cedar, white oak, red oak, and black ash. Tests have not been running long enough to determine the effectiveness on Osage orange, black locust, and catalpa, although the two latter varieties show some slight benefits from treatment.

The Steeping Process of Wood Preserving

During the summer of 1927, 166 posts were treated by the steeping process, using zinc chloride, five per cent solution, as one treatment; and sodium fluoride, three per cent solution, for the other. In order to prevent stock from licking the treated posts and to prevent some leaching out of the preservative, the posts were given a brush coat of discarded crank case oil, and to one set of posts a coating of creosote paint was applied. Eleven different varieties of wood are included in the test. To date two failures out of 50 posts are shown in the zinc chloride treatment and 21 failures out of 50 posts in the sodium fluoride treatment. The cost of treatment per post with zinc chloride was as follows: Peeling, 3.1 cents; Chemical, 2.6 cents; Labor, 4 cents; Depreciation on equipment, .6 cents.

Total cost over check post is 10.3 cents. For the sodium fluoride all items of cost are the same except for the chemical which amounts to .0129, making a total cost per post for the treatment of 9 cents.

Growing Fence Posts on the Farm

When the post plot was started in 1913 to determine the serviceable life of fence posts another experiment had been started four years previous to determine the feasibility of growing a supply of posts to meet the needs of the farm. A plot containing one acre was planted with catalpa trees. The trees were planted with rows spaced 5 feet apart north and south, and four feet apart east and west. An inspection in 1931 showed that there were 1474 posts available in the plot. One hundred ninety-four trees would cut two posts. The following sizes could be secured: 9—8″; 185—6″; and 1280—4″, measured at the butt of the post. This plot was located on top of a hill on rather poor land and was given practically no care. On low land, it seems easily possible that an acre would produce 2000 usable posts in a twenty year period. A 160 acre farm planned for a four-year rotation required 1925 posts placed twelve feet apart. The failures in this variety of wood in the post plot have been 25 per cent to date and the remaining posts seem to be good for several years of service. Therefore, it would seem that one acre of bottom land soil planted as this grove was and well taken care of would furnish line posts for a 160-acre farm.

Concrete Posts

One hundred forty concrete posts made by classes in concrete construction were set in a fence line between pastures on a farm near Columbia. The workmanship on these posts was equal to that found on the average farm. The mix varied from 1-3 where sand was used, to 1-2-3, where separate aggregates were available. The posts were made 6 feet long with 3½ inches minimum top diameter and 4½ inches minimum base diameter. They were reenforced with three or four, one-fourth inch deformed steel reenforcing rods. Three failures have been recorded in eight years and these were due to an accident which would have destroyed any type of post.

The average cost of concrete posts was as follows:

.77 cubic feet pebbles @ $1.50 per yard—4¼	cents
.52 cubic feet sand @ 2.00 per yard—3⅞	cents
.26 cubic feet cement @ .75 per yard–19½	cents
3 pieces of ¼″ reenforcing steel 6′ long–12	cents
Depreciation on equipment 1½	cents
Labor @ 25c 3⅛	cents
Total Cost 44¼	cents

Steel Posts

The heavier grades of steel posts are proving to be satisfactory in field line fences. Eight angle iron posts were set in the experimental plot in 1913. None of these have failed to date, but they do not have the stiffness needed in a farm fence. The T cross section post gives a better use of steel for resisting shocks from all directions. This type of post is proving to be very satisfactory for use in line fences.