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Fences for bottomland farms in the Delta

Louis C. Maisenhelder

J.S. McKnight

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FENCES
For Bottomland Farms In the Delta

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FRANK J. WELCH, Director
STATE COLLEGE MISSISSIPPI

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Fences for Bottomland Farms in the Delta

By L. C. MAISENHELDER and J. S. McKNIGHT[1]

The success of any fence depends on the posts. Their cost and the labor of setting them make up most of the price of the fence. The best way to make the investment in the fence last as long as possible, and to avoid the annoyance and expense of repairs, is to use durable posts. Means of securing such posts and of constructing fences suited to bottomland soils and weather conditions are described in this bulletin.

Sources of Posts

Bottomland farmers who want durable wooden fence posts can secure them in several ways: by getting them from species of trees whose wood is naturally durable; by purchasing posts treated with preservatives; or by treating the wood of local non-durable species to prolong its life. Steel posts are another alternative, but they are more expensive than wooden ones, and in some bottomland soils cattle push them over when the ground is wet.

Cypress, mulberry, eastern red cedar, mountain cedar, osage orange (bois d'arc), and black locust are the principal trees whose heartwood endures well in contact with the ground. All of the cedar and most of the osage orange posts are grown outside the bottomlands. There are a few black locust plantations in the Delta, but most posts of this species are cut in the uplands. Mulberry and cypress, which are native to the bottomlands, were the chief source of posts in the past, but the supply from these species has dwindled.

In all of these species, it is only the dark-colored heartwood that is durable. In judging a post from one of these species, therefore, the prospective buyer should picture it as it will appear after the light-colored outer ring of sapwood has rotted off. Only if it is then large enough will it give the service that should be expected.

Some pine posts treated with preservatives are now being sold in the bottomlands. If treating is properly done, such posts will last 15 years or more. The buyer should get a guarantee that the treatment was made with an effective oil-base preservative. Pentachlorophenol (commonly called penta) and coal-tar creosote are two good preservatives. The posts should have at least 6 pounds per cubic foot of a 5-percent solution of pentachlorophenol or the same weight of at least a 50-50 solution of creosote and fuel oil.

When the supply of posts from mulberry and cypress declined, many bottomland farmers turned to other native species, using them without preservative treatment. In fact, untreated posts are still used more than their durability warrants. Most of them have a life expectancy of between 1 and 5 years; even those from white oak heartwood seldom last beyond 7 years. While the first cost of such posts may be low, the need for frequent replacements makes them costly in the long run.

Many species of bottomland hardwoods, however, will take preservative well. In 1941 about six miles of fence (about 528 posts per mile) was constructed along the boundary of the Delta Experimental Forest, near Stoneville, Mississippi. The posts were native Delta species treated locally by the hot and cold bath method, described later, with a 50-50 mixture of creosote and fuel oil. After nine years of service, a check of 335 sample posts shows

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[1]Delta Branch, Southern Forest Experiment Station Forest Service, U. S. Department of Agriculture in cooperation with Mississippi Agricultural Experiment Station.

that only 26 posts had failed because of decay, and fourteen of these were from species not recommended for treatment. Subsequent study shows that bottomland species will absorb pentachlorphenol as well as they do creosote.

At present there are no commercial treating plants in the Delta, but posts can be treated on the farm by methods described in this bulletin. Home treatment provides for the amounts and sizes of posts needed and assures that the proper type and amount of preservative is used. If farm labor can be used during slack seasons, the posts can be turned out for less than if they had to be purchased. When the posts are cut from trees undesirable for other purposes, post-making is a means of improving the farm woods.

Cutting and Preparing Posts For Treatment

Sapwood of oak, pecan, hickory, sweetgum, honey and water locust, and hackberry generally is the easiest to treat, but most of the common bottomland species treat well. The only exceptions are cottonwood and willow, which take preservative less uniformly and less readily than all the others.

Round posts are best. They are encircled by sapwood, which takes up preservatives more quickly and readily than heartwood does. Split posts may be used if they have only a small volume of heartwood. Service tests on heartwood posts of most bottomland species have shown only partial decay over a period of 9 years, but the penetration of the preservative was not so uniform or deep as in sapwood posts, rotting is futher advanced, and earlier failure seems certain.

About 6½ feet is the minimum length for a good line post for a bottomland fence. Top diameter of line posts should be 3½ to 5 inches. Larger posts waste preservative. Corner, gate, and pull posts should be at least 7½ feet long and 5 inches in top diameter. Braces should be 9 feet long and 3 to 5 inches in diameter at the small end.

Post cutting can either improve or butcher the farm woods. The posts should be cut from the least desirable trees—those damaged by fire, wind, or ice; small trees too misshapen or crowded to grow to lumber logs; or trees of species that are not easily marketable. Weeding and thinning the forest in this manner rapidly improves the value of any woodland. There is always plenty of post material in the average bottomland forest.

Cutting and peeling posts: Posts may be cut at any season. They must be peeled, however, and peeling is easiest between spring and July. Sawing is generally a better means of felling the trees and cutting the posts than chopping is. It is easier to cut the posts to uniform length with a saw and sawed posts usually make a neater looking fence.

The posts can be cut where the tree is felled, limbed, and topped, or the tree can be skidded full length to a central point. Bunching the tree lengths makes post cutting and peeling more efficient, and it saves the trouble of finding and collecting the individual posts for loading or stacking.

Peeling is the most tedious part of post-making, but unless all of the bark is removed down to the solid wood, the post will not take preservative as it should. The bark of some species, as red oak, is very tenacious except in early spring. Particular care must be taken to remove the corky inner layer, which seems to be almost a part of the wood itself. To avoid an increase in the tendency of the bark to stick to the stem, peeling should be done within a day after the tree is cut.

In the spring, when the bark is loose, the posts can be peeled with an ax or bark spud. The old hoe and shovel (figure 1) are home-made bark spuds that are useful when the bark is not tight.

The hooked bark spud can also be used to strip the bark during the spring. When spuds are used, it is sometimes easier to peel the tree trunk before it is cut into post lengths. Generally, the safest and most efficient way of hand peeling, in any season but spring, is with the special 16-inch draw knife. A rack or sawbuck should be constructed to hold the post at waist height as it is being peeled.

Barking machines may be used very profitably where the size of the job warrants the expense. Inexpensive machines of this type cannot, however, be relied on to do a thorough barking job on hardwoods at all seasons. For descriptions of barking machines currently in use, see "Fence Post Barking Machines in the South," by Mark M. Lehrbas. Copies of this bulletin may be had by writing to the Southern Forest Experiment Station, New Orleans.

Peeling may be done either in the woods or at the treating plant. The advantage to peeling in the woods is that the posts will be more likely to be peeled soon after cutting. When cutting is done during the winter, it is usually necessary to peel and stack the posts in the woods until the ground dries out enough to permit hauling.

Stacking posts: The stacking place should be well drained, free from weeds and debris that prevent free circulation of air about the posts, and preferably near the treating plant. Species which require different schedules of preservative treatment must be stacked separately. Stacks may be as high as desirable, but should always be started on a foundation which will place the bottom of the stack at least a foot above the ground. The method of piling illustrated in figure 2 affords enough air space to assure rapid drying and to prevent decay in the middle of the stack.

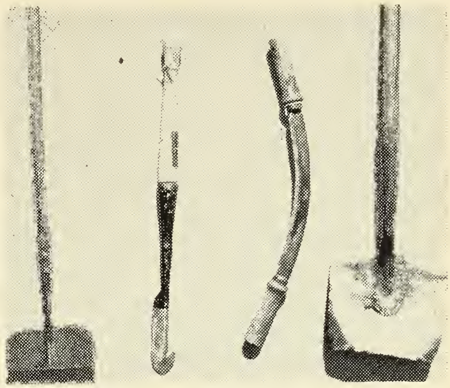

Figure 1. Post peeling tools—old hoe, hooked bark spud, drawknife and old shovel.

Well-stacked posts piled in this manner dry in two or three months of warm, dry weather, but require at least four months during the winter. When sufficiently dried, a post will be much lighter than when green, and usually will be considerably checked or cracked. It is very important that checking be complete before treating. To this end, very large posts (5 inches and larger) should be dried an extra month. Dried posts should be free from rain for at least three days before they are treated with preservative.

Treating Posts With Preservative

Three methods—hot-and-cold bath, cold soaking, and pressure treating—are in common use for getting preservative into fence posts. Pressure treating is a technical, engineering operation that requires an expensive plant best adapted to treating large quantities of posts for the market.

Of the other two methods, cold soaking is the simplest and requires the least initial cash outlay. Well-seasoned posts are piled in a tank of preservative and allowed to soak until they have taken up the required amount of chemical. Cold soaking is the slowest method of treatment but is suitable where requirements for posts are small or are spread over a

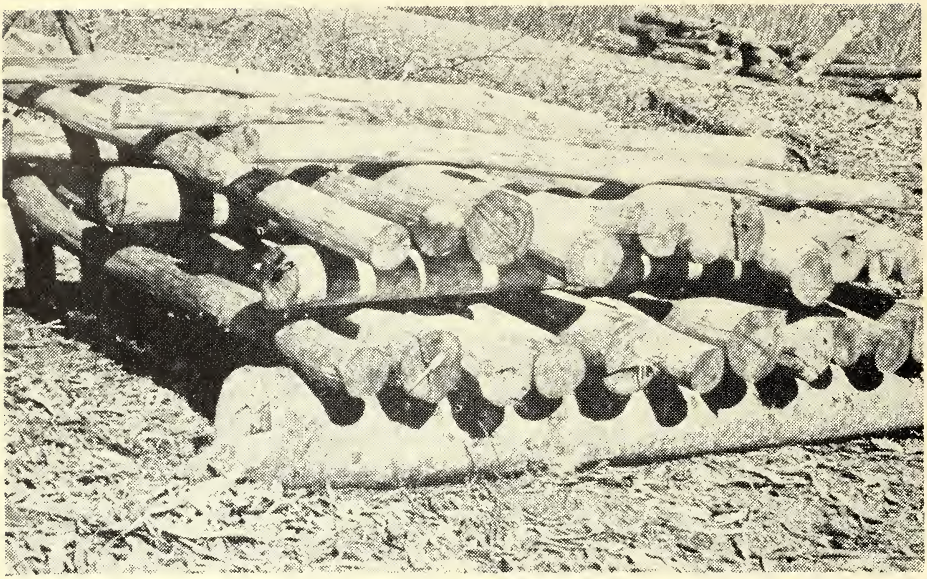

Figure 2. Posts piled in this way get enough air for rapid drying. The pile can be made as high as is convenient.

long period. The method will not be described here, as complete instructions are given in "Treating Fence Posts with Pentachlorophenol-Fuel Oil Solutions Using the Cold-Soaking Method," by D. A. Kulp, published as Circular 141 of the Mississippi Agricultural Experiment Station, State College, Miss.

The hot and cold bath method is the most effective of the open-tank methods for treating the large numbers of posts commonly needed on bottomland farms. The posts are first heated in a tank of hot preservative. When most of the air and remaining moisture has been driven from the cells of the wood, the posts are immediately submerged in a tank of cool preservative. The partial vacuum created in the wood cells by the cooling and contraction of the remaining air assists in pulling the preservative into the pores of the wood. From 75 to 95 percent of the absorption takes place in the cold bath.

The hot and cold bath system is rapid and thorough, and can be used on all bottomland species (tests in the Delta show that cottonwood and willow cannot be treated as effectively as other species). The chief disadvantage is that the cash outlay for equipment is greater than for the cold soaking method. The plant can usually best be financed as a cooperative project between farms or as a small scale commercial operation.

Plant design and equipment: A very satisfactory plant for hot-and-cold bath treating was built at Stoneville, Miss. It consists of two 1,200-gallon tanks, each 18 feet long, made by cutting a large boiler in two. The tanks are placed end to end and there is a working platform and guard rail around each. A chain hoist on an overhead trolley enables prompt transfer of posts from the hot to the cold tank. Long tanks are desirable for treating poles, bridge timbers, sills, planks, and other material. If only posts or other short material is to be treated, however, large tanks are unnecessary except as a means of speeding production.

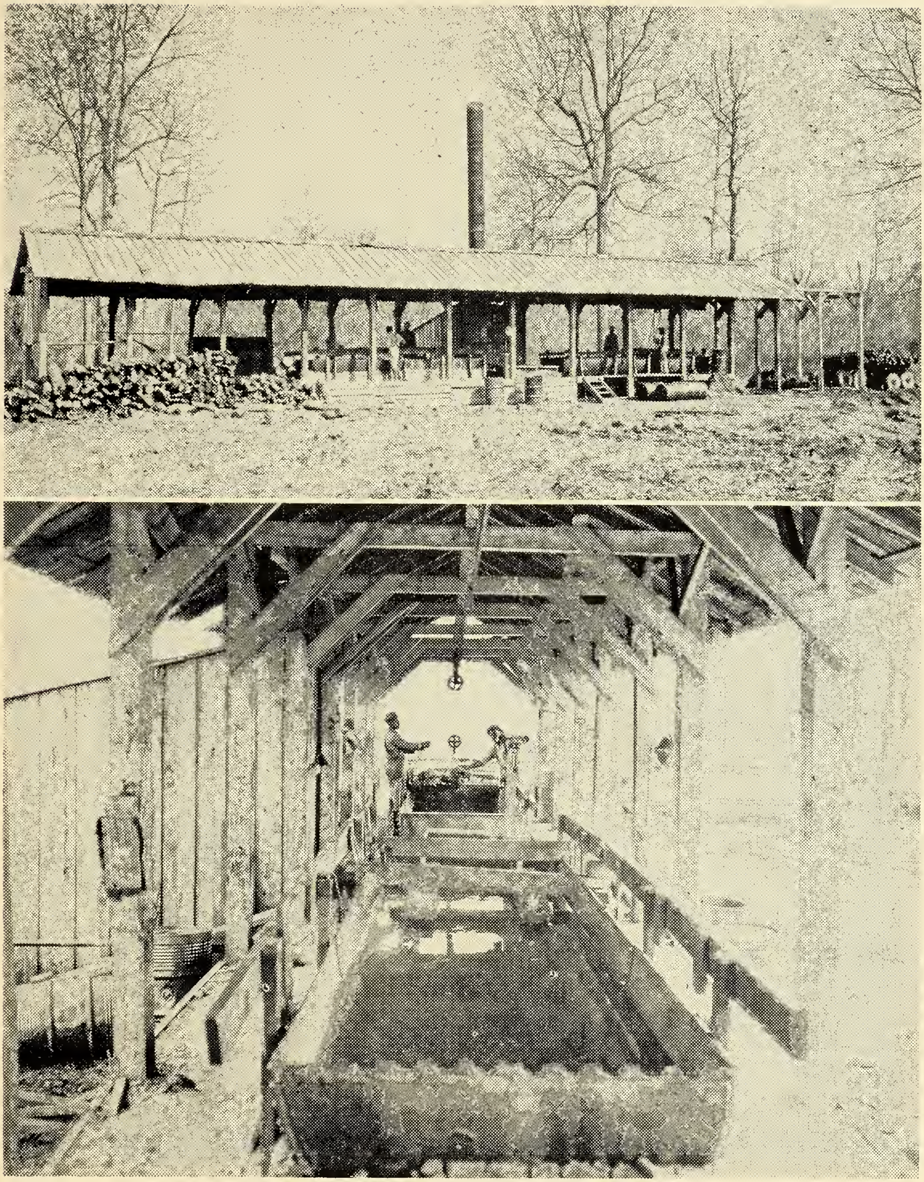

Figure 3. The hot-and-cold bath treating plant at Stoneville. This plant is suitable for use with both creosote and pentachlorophenol. Two laborers with part-time supervision can treat about 300 posts per day. Hot tank is in foreground of lower view,

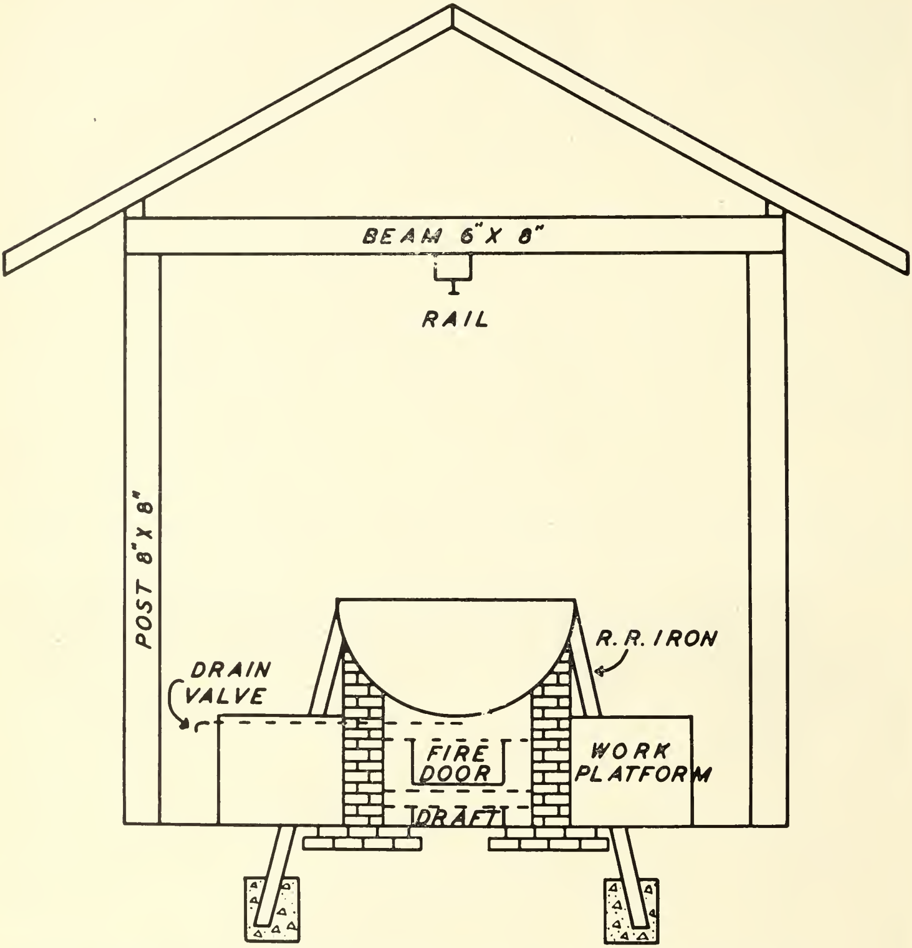

Figure 4. Diagram of hot tank installation for hot and cold bath treatment.

Figures 3 and 4 show the chief features of the plant, which is adapted to the use of both creosote and pentachlorophenol. A Dutch oven runs the length of the hot tank—the fire door is at one end and the chimney at the other. A fire just inside the door heats the entire tank evenly. Dry and green wood are used in combination to get a steady heat. Natural gas or butane could also be used. An exposed flame, however, causes serious risk from fire, and the safest method would be to heat the tank with steam coils from a boiler at some distance from the plant.

Pure creosote was used in the hot tank for safety and to reduce evaporation, the cold tank solution was made up of equal volumes of number 2 Diesel fuel and creosote. In any plant, tanks must be covered to keep rainwater out of the preservative and as a safety measure for people and animals. Water causes hot creosote to froth and boil over, thus creating a fire hazard.

Before the posts are submerged, they should be chained into bundles for ease in handling. A bundling rack similar to the one shown in Figure 5 greatly facilitates chaining, which must be done securely as the oily posts become very slippery. A heavy wooden frame hinged to the tanks is used to force the bundles of posts completely under the solution (Figure 6).

Tank schedules: Next to seeing that the posts are dry and completely free of bark, the most important phase of treating is the length of time the posts are kept in the hot and cold tanks. The following recommendations are made after considerable investigation and experience at Stoneville. The schedules assume that preservative in the hot tank will be kept at an even 220°F; the temperature should be checked frequently with a thermometer.

Different species vary a little in the time they require but when creosote solutions are used the species may be placed in the three general groups shown in table 1. The schedules in this table are designed to produce an absorption of 6 to 8 pounds of a 50-50 solution of creosote and fuel oil per cubic foot of wood in line posts averaging 3 to 5 inches in diameter at the small end. For larger posts, the hot tank schedule should be increased by 45 minutes.

Pentachlorophenol requires slightly longer times than creosote. The schedules in table 2 gave satisfactory absorption at the Delta Branch plant though service tests have not yet been in long enough to be conclusive. The schedule is for "4-1" concentrate as delivered from a chemical supply house. For the hot tank, every drum of pentachlorophenol was

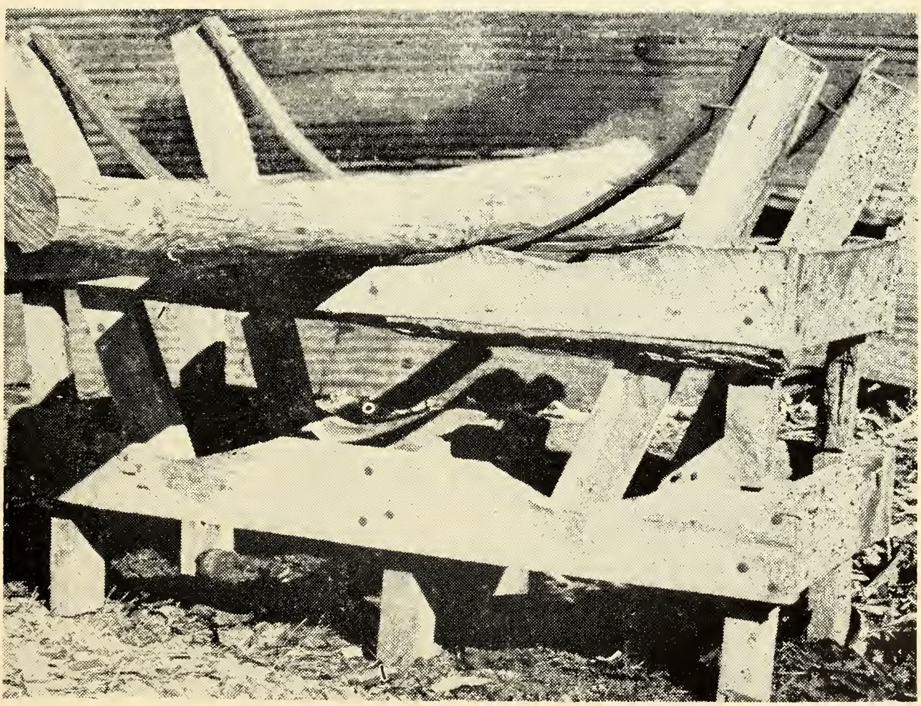

Figure 5. Post-bundling rack. The two bowed irons on which the posts are laid conform to the curve of the bottom of the treating tanks.

Figure 6. Heavy wooden frames, hinged to the sides of the tanks, are dropped on the bundles of posts to keep them submerged in the preservative.

diluted with four drums of oil with a high flash point (a high flash point is safest with an open flame, and also avoids excessive evaporation). In the cold tank, each drum of pentachlorophenol was diluted with four drums of number 2 Diesel fuel oil. When any pentachlorophenol is purchased, the seller should recommend the exact type and amount of oil to be used as a diluent.

With both pentachlorophenol and creosote, particular care should be taken to see that the cold tank schedules are followed closely. The hot tank schedule can be increased somewhat without seriously affecting the treatment, but it should not be decreased.

However, because of inevitable variations in the temperature of the cold tank, and in the dryness, size and heartwood content of the posts, it is wise to check the actual effect of the recommended schedule. Too much absorption increases the cost unnecessarily, while absorption

Table 1. Recommended hot and cold bath schedule for treating with creosote solution.

Species group	Hot bath	Cold bath
	Minutes	
1— Soft elm, Honey locust, Oaks, Sweet gum, Hackberry	90	15
2— Maple, Willow, Cottonwood, Cypress	90	20
3— Pecans, Persimmon, Ash, Rock elm	105	60

Table 2. Recommended hot and cold bath schedule for treating with 5-percent pentachlorophenol solution.

Species group	Hot bath	Cold bath
	Minutes	
1— Soft elm, Hackberry, Oaks, Sweet gum	90	25
2— Pecans, Ash, Persimmon, Rock elm	120	60

of less than 5 pounds per cubic foot may reduce the life of the post.

The easiest way to check absorption is to determine the weight of a bundle of posts before and after treating, and then compute the weight of the solution absorbed per cubic foot of wood. Wood volume in posts of various sizes is given in table 3.

With either chemical, the problem with species in the first group will likely be to hold the absorption to 6 to 8 pounds; it may turn out that the recommended cold bath schedules for these species should be reduced. With species in the last group the problem will be to get the necessary minimum absorption. For equally good treatments, large posts will naturally take up somewhat less preservative per cubic foot of wood than small ones.

When the posts have been in the hot tank for the required time, they should be submerged in the cold tank as rapidly as possible, lest the pores refill with air instead of preservative. When the posts come out of the cold tank they should be suspended over the tank until excess solution has drained off. They are ready to use as soon as they are dry enough to handle. If they are not to be used soon, they should be stored under some sort of cover.

Cost of Treating Posts

The figures in table 4 were obtained in 1950 from the treatment at the Stoneville plant of about 2,000 bitter pecan, oak, sweetgum, and white elm posts. All posts were round. They averaged about 3.5 inches in diameter at the small end, and the average absorption of preservative was 6 3/4 pounds per cubic foot of wood. Treating was done by labor supplied by a farmer. The operation was very efficient and little reduction in the cost per post seems possible except through lower wage rates, and by purchase of the preservative in large amounts.

The cost of building a hot-and-cold bath treating plant will vary with the number of refinements that are included. Unless much of the material is already on hand, the simplest design will cost about $2,000, if farm labor is used for its construction. Tanks for storing wholesale quantities of preservative would add to the initial investment.

Fence Construction

The following pages touch on important points in fence construction that are frequently neglected. Fence builders who plan to apply for PMA benefits should procure a copy of the latest official specifications.

Setting the posts: Holes may be dug by hand, or more rapidly, with a mechanical digger attached to a farm tractor. They should be two feet deep for 6½-foot line posts and three feet deep for 7½-foot pull and corner posts.

Line posts should be set 10 feet apart from center to center, brace posts should be 8 feet from each corner post or pull post (Figure 7). The posts can be kept at uniform heights above the ground by checking with a 4½ foot stick as they are set. If the posts are set in the winter, tamping the soil used to fill the holes is unnecessary unless the site is very well drained. The dirt should be piled up above the normal ground level, however, to allow for settling. Posts set in dry seasons should be tamped. Pull posts should be set every 250 feet for woven wire fences and every 800 feet for barbed wire fences.

For protection against lightning, every twentieth post should be grounded by

Table 3. Volume of round fence posts

Average diameter inside bark at mid-point (inches)	Length in feet					
	6	6 1/2	7	7 1/2	8	10
			Cubic feet			
2.0	.13	.14	.15	.16	.17	.22
2.5	.20	.22	.24	.26	.27	.34
3.0	.29	.32	.34	.37	.39	.49
3.5	.40	.43	.47	.50	.53	.67
4.0	.52	.57	.61	.65	.70	.87
4.5	.66	.72	.77	.83	.88	1.10
5.0	.82	.89	.95	1.02	1.09	1.36
5.5	.99	1.07	1.16	1.24	1.32	1.65
6.0	1.18	1.28	1.37	1.47	1.57	1.96
6.5	1.38	1.50	1.61	1.73	1.84	2.30
7.0	1.60	1.74	1.87	2.00	2.14	2.67
7.5	1.84	1.99	2.15	2.30	2.45	3.07
8.0	2.09	2.27	2.44	2.62	2.79	3.49
8.5	2.36	2.56	2.76	2.96	3.15	3.94
9.0	2.65	2.87	3.09	3.31	3.53	4.42
9.5	2.95	3.20	3.45	3.69	3.94	4.92
10.0	3.27	3.55	3.82	4.09	4.36	5.45

Table 4. Cost of fence posts and preservation, 1950

Operation	Quantity	Cost
		Dollars
Stumpage, harvesting, peeling and hauling to plant[1]	2,000 posts	240.00
10-1 pentachlorophenol	100 gallons	220.00
Diesel fuel solvent	810 gallons	109.00
Heavy oil (hot tank solvent)	180 gallons	48.60
Firewood (stumpage)	4 cords	6.00
Labor (except harvesting posts)[2]		142.00
Treating plant rental		30.00
Total		795.60

Cost per post—39.8 cents

[1] This operation actually cost the farmer only 9c per post instead of 12c since he had his own timber and made no charge for hauling to the plant.

[2] The labor charge was at the 1950 prevailing hourly rate for plantation labor in the Mississippi Delta.

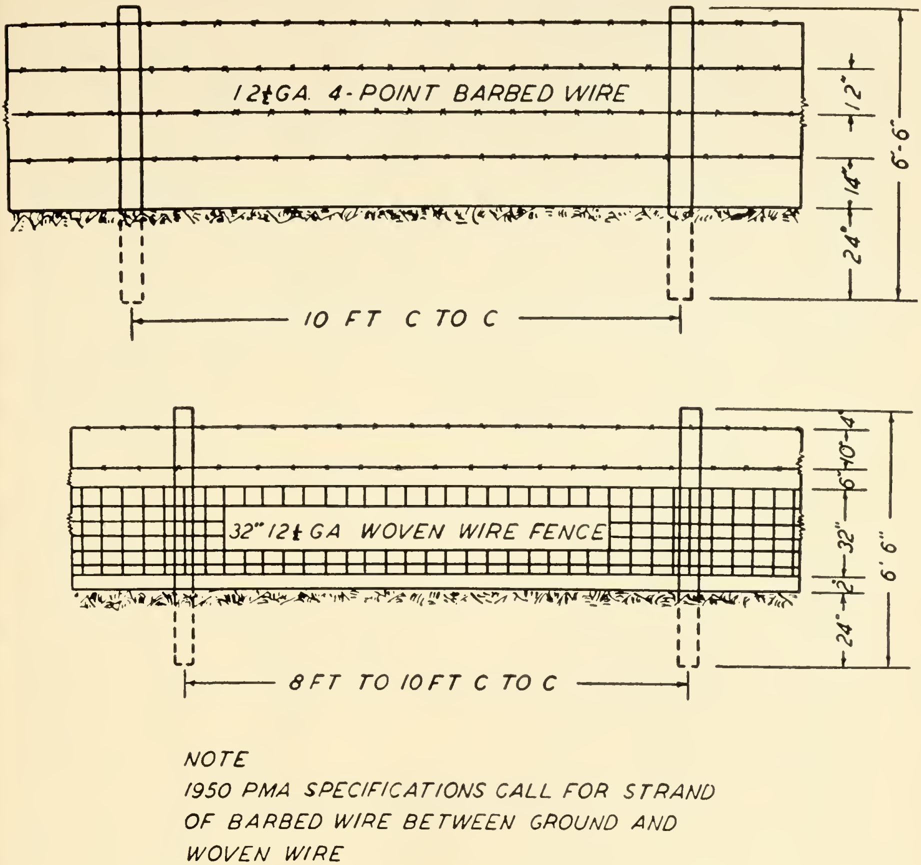

Figure 7. Cattle and hog proof fences.

stapling a piece of No. 9 wire from the top to the bottom, between the fence wire and the post. At least three complete turns should be taken under the bottom of the post.

Bracing. Although wood is satisfactory, corner posts and their bracing are often made of iron pipe or railroad steel set in concrete. Though costly, this is a very desirable practice.

If wood corner posts are used, they should be set on concrete and braced in two directions. Figures 8 and 10 show two methods of bracing corner posts. These corner posts should be notched to take the end of the brace, and each brace should be fastened to the post with two 40-penny nails. In addition, a wire brace should be run from the base of the corner post to the top of each adjacent brace post. The wire brace should consist of four strands of No. 9 galvanized wire, with two strands passing on each side of the wood brace and all strands twisted together to form a taut tie and brace. Pull posts and posts at the end of fences (as at slough or drainage ditch crossings) should be braced to the adjacent post in the same way.

On uneven ground, the wire tends to pull up posts set in hollows. Pull-outs can

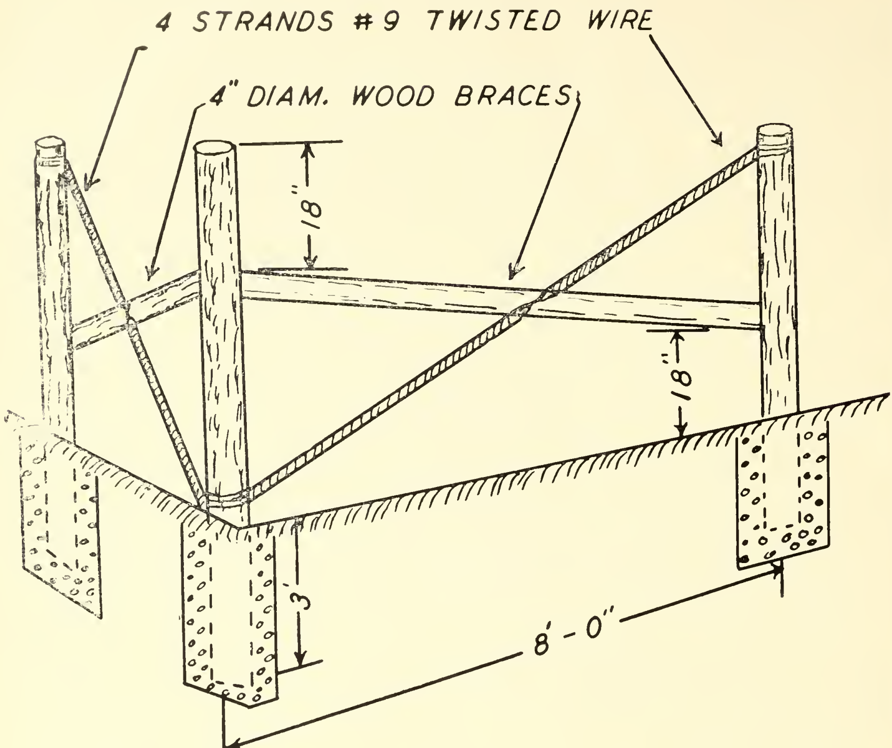

Figure 8. A method of bracing for fence corners.

be prevented by nailing a piece of 2 x 4 material, 2 feet long, at right angles to the length of the post and a few inches from the lower end. The cross-pieces should be treated with preservative. Figure 9 shows several ways of fencing streams and ditches that cross the fence line.

Untreated wood exposed in notching posts and cutting braces to fit should be thoroughly daubed with a concentrated solution of the preservative before the braces are finally put in place. Any holes bored in gate posts should likewise be filled with a concentrated preservative.

Stringing the wire. All wire should be fastened to the post on the side from which the stock is likely to come. With some of the harder species of wood, notably osage orange, it may be necessary to wire the fencing to the post, for it is often impossible to drive staples into the dry wood. Stapling in pecan and oak, species likely to be widely used for posts, is rather difficult but can be done. Other post species recommended for treatment take staples about as easily as pine. Stapling should be done with 1-1/8 inch galvanized staples. Five staples per post are sufficient for 32-inch woven wire, and eight per post will hold 47-inch wire.

When the wire is unrolled, the bottom strand should be next to the post, to make stretching easier. If a tractor is available, stretching woven wire is greatly facilitated, but care must be taken not to exert strain enough to displace corner or pull posts. Barbed wire should never be stretched with a tractor, because there is great danger that the wire will break

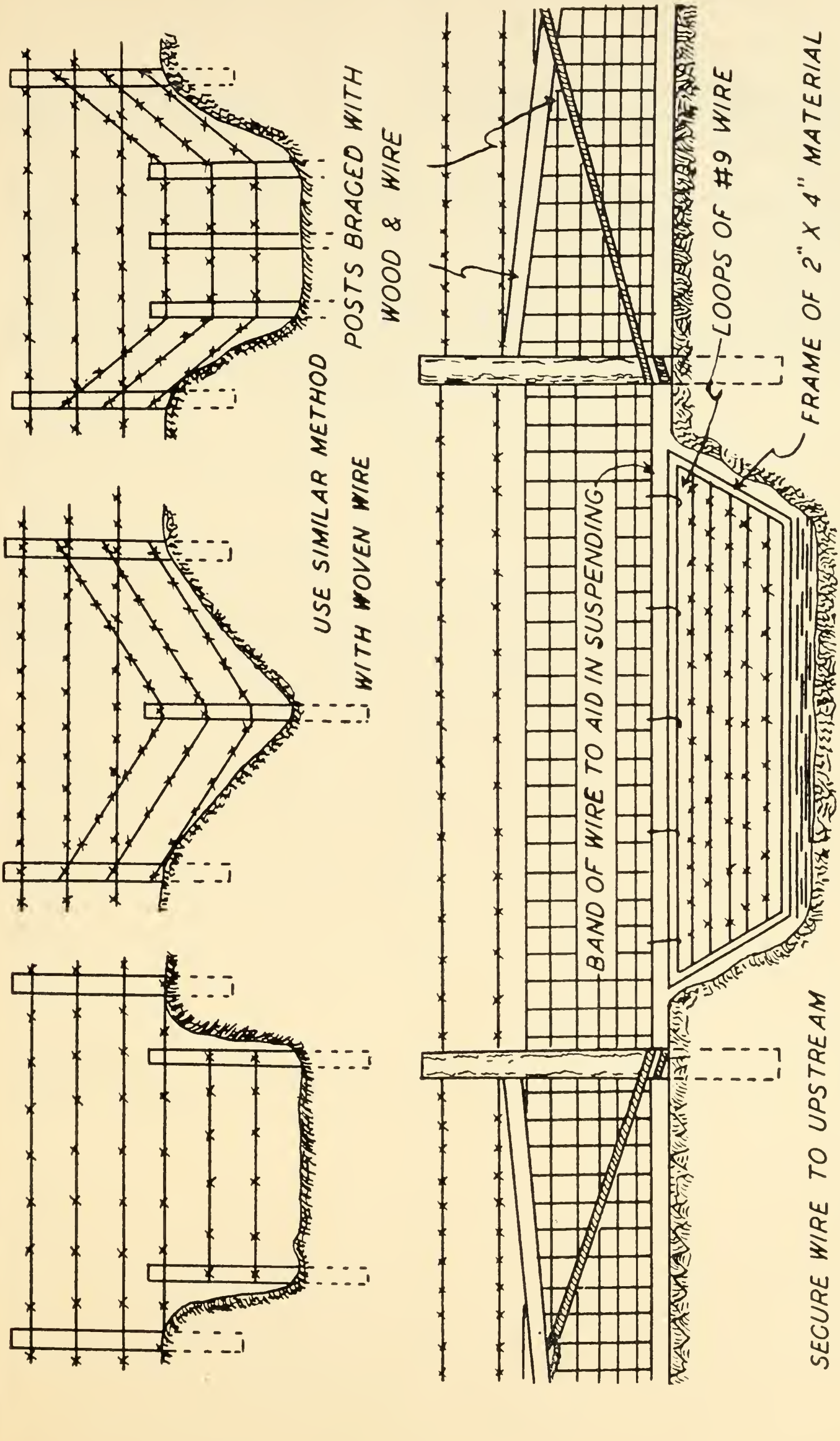

Figure 9. Methods of fencing unusual depressions along fence line.

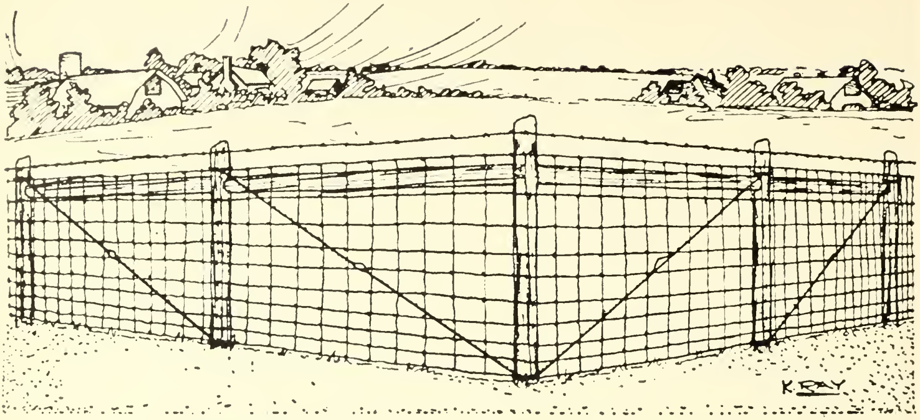

Figure 10. Another method of bracing corner posts.

and injure the tractor driver or other men working near the fence.

Usually it is best to avoid stretching wire when the ground is wet and soft. At such times the posts, unless they have been set for some time, are easily pulled out of plumb or yanked out of the ground.

Estimated Fencing Costs

The figures in table 5 are given only as a close estimation of the cost of constructing a fence in the Yazoo-Mississippi River Delta. They will generally apply in most large bottomland areas.

Table 5. Materials and costs per mile of fence[1]

Item	Using hand digger		Using tractor digger	
	Amount	Value	Amount	Value
		Dollars		Dollars
FOUR-STRAND BARBED WIRE				
Wire (12½ gauge)	16 rolls	136.00	16 rolls	136.00
Posts (treated)	528 posts	264.00	528 posts	264.00
Staples	24 lbs.	2.40	24 lbs.	2.40
Labor				
Digging holes	112.6 hrs.	39.41	16.4 hrs.	8.20
Other	51.2 hrs.	17.92	51.2 hrs.	17.92
Tractor				
Hauling	2.5 hrs.	1.75	2.5 hrs.	1.75
Trailer	2.5 hrs.	.16	2.5 hrs.	.16
Digging	----	—	8.8 hrs.	6.16
Total Cost		461.64		436.59
32" WOVEN WIRE				
Woven wire (12½ gauge)	16 rolls	260.00	16 rolls	260.00
Barbed wire (12½ gauge)	8 rolls	68.00	8 rolls	68.00
Posts (treated)	528 posts	264.00	528 posts	264.00
Staples	34 lbs.	3.40	34 lbs.	3.40
Labor				
Digging holes	112.6 hrs.	39.41	16.4 hrs.	8.20
Other	109.6 hrs.	38.36	109.6 hrs.	38.36
Tractor				
Hauling	2.9 hrs.	2.03	2.9 hrs.	2.03
Trailer	2.9 hrs.	.19	2.9 hrs.	.19
Digging	----	—	8.8 hrs.	6.16
Total cost		675.39		650.34

[1] Adapted from "Possible Land Use Alternatives, Yazoo-Mississippi Delta." Delta Council, Stoneville, Mississippi, 1949. Cost of fence posts has been changed from 35 cents per post to 50 cents per post, which is a conservative estimate of the average market price in 1950.