

# FLORIDA NAVAL STORES

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FIG. 1. Dipping and loading logs to be hauled to the mill. The man on the horse, called the "Woods Rider," supervises the work in from six to ten crops of cups.

### ACKNOWLEDGEMENT

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## FOREWORD

Originally published by the Florida State Department of Agriculture, this bulletin was reprinted in July, 1933, by the Florida Forest Service. It is now reprinted the second time since the supply is exhausted, and changes have been made to bring it up to date again.

Mr. Lenthall Wyman, formerly director of the Starke Branch of the Southern Forest Experiment Station, was the original author of this bulletin. Mr. Wyman and Mr. C. H. Coulter, associate State forester, former cooperative agent in naval stores work in Florida, were both in close touch with woods work and stilling operations in the naval stores industry. Mr. H. D. Cook, now cooperative agent, representing the Florida Forest Service and the Bureau of Chemistry and Soils, U. S. Department of Agriculture, has aided in the present revision.

During the past seven years, woods work, stilling practices, tree planting, and the protection of turpentine woods from fire have greatly improved. Progressive naval stores operators and timberland owners have been largely responsible for this progress aided to a certain extent by state and Federal agencies.

This revised bulletin incorporates most of the up-to-date methods which operators and landowners are using in both woods work and stilling practices.

JOHN B. GLEN, Vice-Pres.,  
Florida Board of Forestry

## Florida Naval Stores

By

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Published by the Florida Forest Service, in cooperation with The Southern Forest Experiment Station and the Bureau of Chemistry and Soils, U. S. Department of Agriculture.

**T**HE NAVAL STORES treated in this publication are rosin and turpentine produced from crude gum, which is extracted from certain southern pine trees by repeated scarring or chipping and then distilled. These products are known as gum turpentine and rosin. About four-fifths of all the naval stores manufactured in the United States are obtained in this way. The remaining fifth is obtained by steam or destructive distillation and solvent extraction from pine stumps, knots, lightwood, and mill refuse. Naval stores obtained in this way are known as wood turpentine and rosin<sup>1</sup>. Although this difference is observed in the names of the products, the qualities and uses of gum turpentine and rosin and wood turpentine and rosin are very similar. The wood naval stores industry, due to chemical research, advertising, good business practices, and proper packaging, has increased its output and has made inroads in the market of the gum naval stores industry.

The term "naval stores" dates back to the early days of the seventeenth century when wooden sailing vessels used large quantities of tar and pitch obtained from the evergreen forests of Sweden and other northern European countries. Tar and pitch, although manufactured from crude gum at the present time, are of minor importance. Their use and the use of turpentine and rosin in the maritime trade has dwindled to small proportions; yet the name "naval stores" has persisted in the industry.<sup>2</sup>

1. Grosvenor Dawe "Florida, An Advancing State." 1928.
2. "Naval Stores." Trade Information Bulletin No. 454.

Florida's position in naval stores production is an important one. The output of the State is 31 per cent of all the naval stores manufactured in the United States and 21 per cent of the world production.

Longleaf pine (*Pinus palustris*, Miller) and slash pine (*Pinus caribaea*, Morelet) are of paramount importance in the industry in Florida, although other pines are sometimes turpented. Both longleaf and slash pine grow throughout northern and western Florida and as far south as the Everglades. Locally longleaf grows on the sand ridges and drier sites of the flatwoods, and slash pine is found in the ponds and wetter situations. With protection from fire, slash pine is inclined to occupy the drier locations as well.

Longleaf pine<sup>3</sup> may be recognized by its very long needles, which vary from 8 to 15 inches in length, occurring always three in a bundle. The twigs are stout and blunt. Buds, which are locally called "candles," are thick and silvery white when they start growth in the spring. The cones or burs are from 8 to 12 inches long.

Slash pine<sup>4</sup> has shorter leaves, from 8 to 12 inches long, growing in bundles of 2's or 3's. The twigs are slenderer than longleaf twigs. The buds are reddish brown and less stout than the buds of the longleaf pine. Cones are egg-shaped, from 3 to 5 inches long, with prickles on the shiny brown end of the cone scale.

#### THE TURPENTINE CAMP

A representative turpentine camp consists of a fire still, spirit shed and glue pot, rosin yard, blacksmith and cooperage shed, cup cleaning vat, barn, and wagon shed.

The word "quarters" is applied to the group of dwellings that house the manager, woods riders, and laborers.

The typical turpentine camp operates about 10 crops of faces. A "crop" is a timber tract containing enough trees to hang 10,000 cups.

3. U. S. Dept. of Agriculture Farmers Bulletin 1486, Longleaf Pine Primer.

4. U. S. Dept. of Agriculture Farmers Bulletin 1256, Slash Pine.



Fig. 2. 40-year-old Slash Pine stand, Bradford County, Fla. The man in the foreground is indicating a face in its sixth year which has reached the limit of practical working. Narrower chipping would have made possible from 2 to 5 years longer working.

### CHOOSING A LOCATION

In starting a new turpentine operation, the first step is the location of an adequate supply of timber to last for at least 10 years under usual management. The best turpentine timber is rather open and fast growing, with large thrifty crowns. Locations near railroads or highways and where labor is plentiful and easily kept are desirable, although many turpentine operations lack these advantages.

### LEASES

The timber is usually leased from the owner for periods of from 3 to 5 years. Prices of leases vary with the size and quality of timber, cost of labor, prices received for turpentine and rosin, distance from shipping point, and a number of other factors. From 2 to 3 cents per face per year for leasing was the average price in 1935-36. This amounts to from \$2000 to \$3000 for 10 crops each year. In 1926, when naval stores prices were high, 7 cents per face per year was not an exceptional price, but in 1935 many leases were made at about 2 cents per face per year.

Large owners frequently lease their timber on a percentage basis. In such cases the operator pays from 15 per cent to 30 per cent of the gross sale value of the turpentine and rosin produced, the payment varying according to the producing capacity of the timber, the grades of rosin, and the various other factors which influence lease values as mentioned above.

While the percentage basis is fair to both owner and operator, it can be used successfully only if the owner supplies the operator with all, or at least a great percentage, of his gum. If several individuals are concerned, it will be found difficult to maintain accurate records.

For the owner of a small block of timber a simpler, though less desirable, form of lease must be used. Leases providing three different bases of payment, based on commercial lease forms in common use but embodying restrictions and specifications which safeguard the timber owner's interests without imposing any hardships on the operator, are given at the end of this bulletin.

There is a tendency on the part of modern operators to acquire title to their timber lands rather than to lease them. This policy is commendable, leading as it does toward a better class of work and a permanent steady industry, since the operators are personally interested in the highest ultimate product from the land on which they are working.

### CUPPING

Before actual cupping begins, it is necessary to select and mark the trees which are to be worked and to indicate the side of each tree on which the face is to be placed. It is good practice to cull trees that are spike-topped or that have poorly developed crowns. Such trees are apt to die or at least to dry-face badly before being chipped for the full working life of the face. Care in locating the face also reduces possible future losses from dry-face caused by severed bark bars or old scars. Waste from ill-fitting gutters and cups and reduced production from narrowed faces may also be avoided to a considerable extent if the location of the face is selected by a competent man.

Progressive operators cup no trees under 9-inch diameter, 4 feet 6 inches above the ground, and work only one face to a tree at a time.

In preparing the tree for hanging cups, the best practice is to smooth off the outside bark, care being taken that no wood is exposed except where knots or buris must be cut in order to seat the cup properly. This facing may be done with a broadaxe or with a hogal (Figure 5). If the hogal is used for facing, it may also be used to cut the first streak.

To set the gutters—if the Herty system is used—a slanting cut or gash is made on each side to a depth of one-half inch into the smoothed surface, the lower ends of the cuts being about 12 inches above the ground (Figure 3). These cuts are made with a broadaxe or a gutter-chisel driven in with a maul. Galvanized iron or zinc gutter strips are inserted into the cuts. These gutter strips are 2½ inches wide and long enough to go the full length of the cut with a slight overhang at the lower end and are bent or crimped lengthwise along the center. With this style of gutter,



Herty Cup Installation

Fig. 3. Good Cupping — bark and Wood Beneath Gutters Supports Tins No Exposure

Bad Cupping—Heavy Slab Cuts Expose Tree to Fire Often Damage Roots

a clay Herty cup holding from one quart to three pints of gum is commonly used. Conical galvanized iron or Birdseye cups suitable for this cupping system are also on the market. The clay cup is hung on one eight penning flooring nail; the conical metal cup rests on one or two nails.

The Ball system of installing tins (Figure 4,) uses a gutter and an apron. The gutter has much the same slant as the Herty gutter, while the apron is horizontal, or parallel to the top of the cup. The apron has no crimp, being flat galvanized iron sheeting 2 inches wide. A flat-bottomed, rectangular-shaped McCoy style cup, resting on one or two nails is used with the Ball installation. Slanting and horizontal axe cuts are used to seat the tins.

Two other systems of installing tins—the one-piece apron and the two-piece apron—are sometimes used with flat-bottomed rectangular McCoy cups. The one-piece apron is concave and is usually installed with a concave broadaxe. The pieces of the two-piece apron overlap at the center and are inserted in two axe



Rectangular Oblong Cup Installation

Fig. 4. Good Cupping — No Wood Exposed Below Tins Supported Underneath by Bark and Wood

Bad Cupping — Wood Shabbled Off Exposing Tree to Fire and Insects Tin Support Inadequate

cuts. The outside corners of the aprons are usually turned up to direct the gum into the cups. With this style of cupping, the first streak can be chipped several inches nearer to the ground than with the Herty or the Ball system.

The work of setting tins and hanging cups may be done as late as March but *should* be done in December and January, because early facing stimulates heavy early season gum flow. The cost of cup installation was about \$9.00 per thousand faces in 1936. Day laborers were paid about 75 cents to \$1.25. Ten dollars per thousand is more nearly right as an average figure to use for tin setting.

## CUPS

A satisfactory cup should not discolor the gum. It should not be easily broken by freezing or rough handling. It should be inexpensive. It should be light in weight. Finally, it should not heat up so as to increase evaporation of volatile material from

the crude gum. Clay, aluminum, and zinc cups do not discolor gum. Galvanized iron and zinc cups withstand rough handling and these and aluminum cups are not easily damaged by freezing. Clay and galvanized iron cups have the lowest initial costs but zinc and aluminum cups have a junking value. Clay cups do not heat up as rapidly as metal cups but are very heavy and hard to handle. Aluminum cups are very light in weight. The difference in rosin grades that may be made from gum collected in clean or in rusty cups is usually great enough to warrant discarding old rusty equipment and replacing with either new galvanized iron cups or cups made of clay, zinc, or aluminum. Many other cup materials, such as glass, wood, paper, and veneer, are being tested at the Naval Stores Station, Olustee, Florida, but thus far, none has proved practical.

Herty clay cups cost from \$200 to \$250 per crop; oblong galvanized cups cost from \$300 to \$400 per crop; oblong aluminum, and zinc about \$500 per crop.

### CHIPPING THE TREES

The first "streak" should be put on the trees at the time the cups are hung at least by the early part of January. Streaks are cut with hacks, which come in several sizes, the most widely used being number 0's and some number 00's. The hacks are mounted on 15-to-24-inch wooden stocks or handles with weights of about 5 pounds on the end. Considerable skill is needed to use a hack properly; but a fair chipper can chip from 1500 to 1800 faces per day, or from 7000 to 9000 faces per week. Once a week, from about the first of March until November, a new streak is placed on every tree just above the one last made.

The best practice calls for a streak cut from one-fourth to one-third of an inch high and five-eighths inch deep in slash pine and from one-third to four-tenths of an inch high and three-fourths of an inch deep in longleaf pine. The depth should be adjusted to suit the timber if the maximum yield consistent with keeping the trees vigorous is to be obtained. Large crowned, open-grown long-leaf may be chipped three-fourths of an inch



Fig. 5. Tools used in chipping trees.  
1. Broad ax; 2. Pringle ax; 3. Maul; 4. Hog; 5. Back; 6. Puller; 7. Push down scraper;  
8. Full down scraper; 9. Gutting puller; 10. Dip-puddle.



Fig. 6. Deep chipping causes dry face. The wood above deep streaking becomes unproductive and yields little or no gum. Trees are often killed by too heavy working.



Fig. 7. Longleaf gum hardens forming scrape. Streaks on this tree are regular and even, 3-8 of an inch each in height.



Fig. 8. Gathering Scrape. The scrape box is leaned up against the tree to catch flakes of scrape. A dull iron which does not remove the wood is preferable.

deep; but crowded, small-crowned trees should have a shallower streak. Many operators also have a streak put on every 3 or 4 weeks during the winter in order to clear out the gum-soaked wood and give employment to their labor during the slack season. Chippers were paid from 60c to \$1.00 for chipping a thousand faces in 1936. Average wages in the past were probably from \$1.00 to \$1.50 per thousand.

Smooth, even chipping at regular intervals, done with a sharp tool by a chipper who knows his job, is a very important factor in getting good production. Increases up to 15 per cent are shown from the use of sharp tools compared to dull tools.

#### DIPPING AND COLLECTING THE GUM

Cups fill up on from 3 to 5 streaks, the number depending on the season, the height of the face above the cup, and the size and nature of the tree. When most of the cups are full they are "dipped." Frequent dipping keeps down the loss from clogged tins or too full cups and helps to prevent discoloration of the gum. The dipper empties the gum from each cup into a wooden or galvanized metal dip bucket the size of a nail keg, which he carries from tree to tree. This bucket holds, from 35 to 50 pounds of "dip," as the crude gum is called when gathered from the cups. The gum is next put into 50-gallon barrels stationed at convenient places in the crop. These are later collected and hauled to the still. From 6 to 12 dippings are made during a turpentine season. Experienced dippers can dip from 2 to 4 barrels a day. They were paid from 50 to 75 cents per barrel for this work in 1936; but, at average wages in the past, they received about \$1.00 per barrel. It takes from 275 to 300 cups of gum to fill a barrel.

#### REMOVING SCRAPE

During the course of the season some of the gum hardens on the face, forming what is known as "scrape." This constitutes from 5 to 10 per cent of the total yield of slash pine trees and from 20 to 30 per cent of longleaf yields. At the end of the sea-



Fig. 8. Pulling high faces. Even though cup has been raised, evaporation of turpentine and lowered rosin grades result from gum running down the long face. A Birdseye metal cup is in use.

son scrape is gathered and packed down in loose stave rosin barrels to be carried to the still.

Many modern operators are now removing scrape throughout the season along with the dip. This practice results in saving of scrape often lost on the ground and reduces the amount of sand and trash collected. Saving in labor cost is effected and better grades of rosin are produced. Scraping has cost about \$1.25 per 300-pound barrel on the average, but for 1935 the cost was only from 60 to 90 cents per barrel.

#### RAISING THE CUPS

Every year or two, tins are pulled and raised close to the top of the face. It is good practice to discard rusty tins and use new ones. The tins are raised in order to shorten the distance from streak to cup and thus avoid gum wastage, evaporation, and lowering of grades due to excessive scrape formation and the consequent oxidation. Raised tins are seated by means of cuts in the face made with broadaxes or gutter chisels. This is bad practice as it encourages wind breakage or splitting.

A better method is to make a shallow streak with a hack near the top of the old face, and nail the tins under the shelf formed by the cut. The most satisfactory tack found so far is a rustless coated heavy hide tack with a count of 190 per pound. The cups are raised so as to fit closely under the tins.

The frequency with which tins are raised depends upon prices of the higher rosin grades. It is more important to raise tins when prices are high than when they are low, and when there is a marked difference in the value of grades. Longleaf pines, which build up scrape rapidly, will repay the cost of raising better than slash pines, which build scrape slowly.

#### BOILING AND CLEANING CUPS

In order to remove dirt and caked gum from the cups they are "bunched" at intervals and boiled and cleaned out. The cost of collecting the cups, cleaning, and rehangng in the woods limits



Fig. 10. Chipping at the left; canvas cover keeps bark and chips out of the dip. At right, collecting  
Gum to be hauled to the still.

the frequency of cleaning, which is done to make high grade rosin. Some operators clean their cups only when rehangng on virgin faces.

#### SUPERVISION—THE WOODS RIDER

All of the woods work, including chipping and dipping, is supervised by a "woods rider" whose duty it is to see that the various jobs are done carefully and thoroughly. He sees that dip barrels and scrape barrels are distributed when needed, keeps account of piece work, and directs such jobs as facing, raking, et cetera. He lays out the boundary limits of the various working units, which are called drifts, and acts as field manager. In small operations, the still owner does the woods riding himself.

#### FIRE PROTECTION

Each winter when the gathering of scrape is finished and most of the straw or leaf fall is over, some form of fire protection must be used to prevent the burning of the highly inflammable turpentine faces with an accompanying loss of cups and tins.

The old method of raking and burning is still common practice. The grass, straw, chips, and brush are hoed away from turpented trees for a distance of  $2\frac{1}{2}$  or 3 feet. The cost of this work depends on the ground cover, averaging around \$4.00 per thousand trees (in 1935), but it is higher where there is heavy grass and underbrush. As soon as the trees are raked the whole tract is burned, generally at a time when the ground is damp and at a time when the operator counts on the fire's doing the least damage to turpented trees.

Even with great care in the use of fire, some faces are burned and cups and tins are destroyed. From 5 to 20 per cent of the faces may be burned even after raking. Young growth needed for restocking the "blank spaces" and for future working is destroyed or damaged by the fire. The blackening and charring of the bark above freshly hung cups and the scorching of



Fig. 11. Before and after burning. Burning has damaged cup and tin and scorched the face. Scorching leaves the tree open to damage by the turpentine borer and may result in a blow down two or three years later.



FIG. 12. THE FLORIDA FOREST SERVICE PLOW CONSTRUCTING AN EIGHT-FOOT FIRE LINE IN ONE TRIP. During the years 1933 and 1934, the Forest Service, CCC camps, and landowners plowed or reworked a grand total of 13,465 miles of fire lines or an average of 7.1 miles per section of land.

even high pulling faces lower the grades of rosin, with a consequent reduction in the sale price. Fires are often allowed to escape and burn uncontrolled over adjacent land notwithstanding a State law which prohibits this and provides for a fine, or imprisonment, as well as liability for damages through civil court action.

Over 126 turpentine operators in Florida are cooperating with the State Forester in protecting 1,036,530 acres of turpentine woods from fire. Fire lines are plowed, guards and organized crews are equipped for fire fighting, and lookout towers are erected. Telephone lines connect the "eyes of the service" with the fire-fighting crews for speedy suppression of fires. This procedure eliminates raking costs. Operators report increased gum yields of from 10 to 20 per cent from timber which has been protected from 2 to 4 years.

The cost of breaking up a section of land into 40, and 160-acre blocks by 8-foot fire breaks, with Florida Forest Service equipment, amounts to \$20.00, and \$10.00, respectively. Since the State and Federal Governments share half the costs when signed up for protection, the landowner and operator are re-

quired to pay only \$10.00, and \$5.00 per section, depending upon the size of the blocks.

Raking and burning at \$40.00 per section (10,000 faces on 640 acres or about 15 faces per acre) costs the owner and operator much more than fire lines and fire control. Lowered production, poorer rosin grades, and the killing of young growth represent a further financial loss.

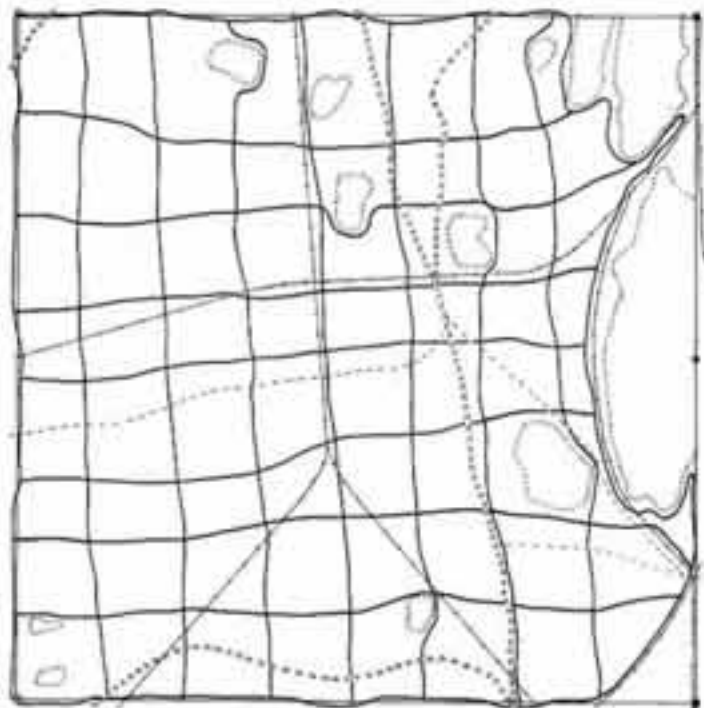
The increasing number of operators cooperating with the Florida Forest Service in fire control indicates that the value of organized protection is definitely recognized. Interested landowners or producers should get in touch with the nearest district forester, whose address is given on the back page of this bulletin.









Fig. 13. "THE EYES OF THE SERVICE." During the fire season, lookouts man the 50 observation towers and locate fires when they are small. Telephone connections to organized crews aid the Florida Forest Service and landowners in suppressing the fires before much damage is done.

### INTENSIVE FIRE LINE SYSTEM IN TURPENTINE WOODS

One Section



#### LEGEND

-  SQUARE REPRESENTS 10 ACRES IN AREA
-  DOUBLE FURROW PLOWED FIRE LINE 1 TO 2 FEET WIDE
-  OLD PHOSPHATE MINE PIT.
-  GOOD WOODS ROAD.
-  DIM WOODS ROAD.
-  OLD TRAM ROAD.

Drawn by  
*[Signature]*

Fig. 14.

## DISTILLATION

### The Still

The still is a copper kettle surrounded by brick construction over a fire box. The top is covered by a removable cap, or lid, which is taken off while the still is being charged and is replaced when the cooking commences. The permanent cap, with a removable lid on the charging hole, is superior to the old removable cap as some turpentine is saved and the arrangement is safer concerning fire. The connecting copper pipe, or "arm," from the cap leads to a long spiral copper worm in a water tank, or tub. The worm tail-pipe empties into a separator barrel which collects the condensed "spirits of turpentine" and water. Many progressive turpentine operators are running the separated turpentine through dehydrators which removes the dissolved water and saves losses from "turns" and wastage of turpentine.

Within the last seven years over 90 stills in Florida have been erected according to the approved plan of the Bureau of Chemistry and Soils, United States Department of Agriculture. Still settings of this type effect a great saving in wood, afford the best possible insurance against fire, hold up twice as long as the average setting and greatly reduce scorching on the sides of the kettle, thus raising the rosin about two grades above those made with old style settings.

In place of rule-of-thumb methods and inadequate materials used in old style settings, the "Government Style Setting," as it is known to the industry, is scientifically constructed of durable materials. Adequate draft and proper distribution of heat around the sides of the kettle result in a saving of wood used for distillation. Fire brick, asbestos mortar, and asbestos sheeting, and the special outside chimney and wing wall materially reduce the insurance premium and nearly double the life of the still setting.



Fig. 15. This modern plant, near Gainesville, Florida, has one of the government style still settings and approved Bureau type shed, which takes the lowest possible insurance rate. Approximately 90 government style still settings have been built but this shed represents recent modern developments. Note the protective tin roof over the wing walls.

### Stilling

From eight to ten 50-gallon barrels of dip or from 10 to 14 barrels of scrape are emptied into the copper kettle along with water. A fire is built under the still and the charge is heated. As soon as the hardened gum has melted, it is good practice to skim off chips and trash before cooking.

If the gum has not reached a high temperature no material loss of turpentine will occur because distillation starts at about 212 degrees Fahrenheit.

Turpentine vapor and steam are conducted through the cap and arm to the condensing coil and run out into the separator barrel. The water, being heavier than the spirits, goes to the bottom of the barrel and is drawn off. The spirits stay on top and are run over into a second barrel; from this they are dipped into glued oak barrels or run into storage tanks. By covering the separator barrel and spirit tub, from 2 to 5 gallons of turpen-

tine per charge is saved, the amount depending on the temperature of the spirits. The covers prevent evaporation of spirits into the air. A dehydrator—a cask filled with coarse salt and provided with a settling place in the bottom for low-wine—is used in the place of the spirit tub. As mentioned previously, the dehydrator removes practically all traces of water from the turpentine. Water free turpentine reduces waste, losses, and prevents damage to shipping containers.

Usually the distillate consists of 50 per cent spirits and 50 per cent water at the beginning. As the original water in the gum get low—as first shown by a proportion of 55 per cent spirits and 45 per cent water in a glass or 10-ounce wide-mouthed graduated bottle—more water is constantly added to the charge to replace that boiled over and to keep down the temperature in the kettle. After about two hours of distilling, when the spirits are only 10 per cent and the water is 90 per cent of the distillate, the charge is nearly cooked. A little more spirits are allowed to come over if no discoloration appears. When only 5 per cent of the distillate is spirits, the water is turned off and the water that remains in the rosin is allowed to cook out.

#### Turning Out

When the temperature reaches the turning-out point (315 to 330 degrees Fahrenheit) the still is uncapped. As soon as the majority of the foam is off and the charge "goes nearly flat," the tail gate is opened and the hot rosin is drawn off through the strainers into the rosin vat. The stiller controls the water and fire to obtain the proper temperature for "turning out." The temperature range for "turning out" the charge is between 315 and 330 degrees Fahrenheit. After turning out, it is good practice to cool down the kettle and, before adding more gum, wash the dirt and chips off the crown of the still with six or more 10-quart buckets of water. This will prevent burning or charring, and consequent lowering of rosin grade of the next charge. This cooling water should remain in the still.



Fig. 16. Permanent cap and arm leading to worm in cooling tub. This plant has the approved removable charging lid and also the U shaped water intake, both of which save turpentine. Note the sand boxes for precaution against fire.



Fig. 17. This up-to-date plant has a covered separator, covered dehydrator, and a recording thermometer. The hinged glass lid permits the stiller to look at the tail-pipe and to check the spirits in the 10-ounce glass. The dehydrator is fitted with a flexible pipe which helps reduce wastage of turpentine. This layout saves an average of 2.2 gallons per charge as shown by tests run at the Naval Stores Station.

### Handling Rosin

In preparing the rosin, three strainers are used: the top strainer of coarse mesh (No. 4) to catch chips, bark, leaves, and large trash; the second or middle strainer, of fine mesh (No. 30 or No. 40) to catch smaller particles of bark, dirt, and small trash; the lower strainer, with a coarse mesh (No. 4) lined with cotton batting, to filter out the remaining particles. From the vat, after the strainers are lifted off, the rosin is ladled or is run by gravity into rosin barrels in which it is allowed to cool for from 48 to 72 hours. The barrels are then rolled to the storage yard for inspection, heading, and shipment. Rosin barrels hold 420 pounds of rosin on the average. The barrel itself weighs from 80 to 100 pounds, the staves and heading being manufactured from green pine blocks. In a cooper shed the staves and heading materials are made up into barrels as needed. A few operators are shipping rosin in galvanized iron barrels, but this is not yet common practice. The buyers of rosin in metal barrels



Fig. 18. Cooper's winch made from salvaged gears gives the cooper ten times the power that the old wheel provided. Durable tight barrels can be made with this set-up. Space under the main still shed is utilized for this cooper shop.

are favored by reduced freight charges. Thick green wood staves poorly put together mean a decided loss to the purchaser and a hardship to the industry. Seasoned staves put together properly with an up-to-date cooper's winch will reduce substitution and provide a market for worked out trees.

### Costs

At the present time coopers and deck hands at the still receive from 75 cents to \$1.25 per day. Stillers are usually paid by the charge. The cost of stilling in 1936 averaged about \$6.00 per unit, a unit consisting of one barrel of turpentine and 1,400 pounds (3 1-3 barrels) of rosin. This cost includes barrels, labor, and materials. In 1929, the stilling costs were about \$9.00 per unit.

### STORAGE AND GRADING

The turpentine is usually stored in 50-gallon oak casks which are glued on the inside to make them tight. Metal barrels are occasionally used for shipping turpentine, especially for inland

trade. Large operators usually store in metal tanks of from 11,000 to 14,000 gallons capacity and ship in tank cars.

Before being shipped from Florida, every barrel of rosin must be graded by a State inspector. The recognized grades of rosin and the proportion of the total crop in each grade are given in Table 1. The grades are based on color, starting with the palest grades at the top.

**TABLE 1'**  
Rosin Prices<sup>a</sup> and Proportion of Total  
Receipts by Grades.

Grade	Closing Quotations, Savannah, 1935			Percentage of Total receipts at Savannah and at Jacksonville <sup>b</sup>
	April 22	August 19	Dec. 10	
X	\$6.20	\$4.70	\$5.60	4.3
WW	6.10	4.70	5.60	
WG	5.25	4.50	5.00	
N	4.90	4.40	4.60	7.7
M	4.45	4.00	4.50	11.8
K	4.40	3.95	4.40	15.6
I	4.40	3.92½	4.32½	17.8
H	4.40	3.92½	4.25	17.0
G	4.35	3.90	4.25	9.4
F	4.30	3.90	4.22½	5.5
E	3.85	3.75	4.15	3.4
D	3.75	3.70	4.10	3.0
B	3.40	3.60	4.05	

1. Weekly Naval Stores Review 1935-36

2. Rosin is packed and shipped in "round" barrels of 500 pounds gross or 420 pounds net weight, but quotations are always given in barrels of 280 pounds.

3. Average for the years 1928-1930 inclusive.

In 1935-36, the difference in price of rosin increases from B grade to X grade, an average of \$1.81 for the three quotations listed above. The price increases in the top grades are greater than those in the lower grades. The variation in the spread of

prices on the above three quotations is from \$1.10 to \$2.80. The kind of cups and tins, woods methods, class of timber, and stilling practices all reflect in the grade of rosin produced.

First class operators using clay, aluminum, or new galvanized cups, rustfree or rustless tins, doing careful work, excluding all avoidable trash from the gum, dipping frequently, raising cups at least every other year and stilling carefully, may get 90 per cent or more of their rosin in the pale grades. Poor work, on the contrary, will often result in 95 per cent of medium and low grades. On a 10-crop place, 40 barrels of spirits to the crop, the rosin yield would be about 1,333 "round" barrels (420 lbs. net weight). The difference in returns per "round" barrel between pale grades and medium grades might very well be about \$1.50, making the aggregate difference in returns amount to more than \$2,000 annually. This is the reward for good woods and stilling practices.

#### MARKETING

Marketing generally is done through a "factorage house," or firm which provides the operator with the needed financial support and sells his product on a commission basis. For this selling service a charge of 2½ per cent of the net returns is made. The cost of insurance, storage, et cetera, is also charged. Some operators sell direct to the wholesaler.

#### YIELD

The yields to be expected vary greatly with such factors as soil type, weather, quality of timber, size of trees, height of faces, and working practice. In general, we may say that the highest gum yields may be expected under the following conditions<sup>c</sup>.

1. From flatwoods land free from hardpan. Though not a great deal is known of the yields to be expected from different soils, we do have some knowledge of this subject, and authentic instances are known in which sand hill pine has produced much less gum than has been obtained from flatwoods timber. Hardpan land, which frequently results in slow timber growth and short trees, usually makes poor turpentine timber.

<sup>c</sup> U. S. Department Agriculture Bulletin No. 298.



Fig. 19. Boiling and cleaning cups. Usually every year or two during the winter, cups are taken off the trees and boiled to remove dirt and hardened gum.

2. From timber in the south central part of the turpentine pine belt. Timber in North Carolina, South Carolina, and southern Florida yields less than timber in the region between these localities.

3. With warm, dry weather, provided adequate soil moisture is available. Experiments conducted at the Southern Forest Experiment Station have shown a very close relationship between temperature and gum yield.

4. From trees with long, wide, and full crowns.

5. From large timber. The amount of gum derived from a tree varies directly with the size of the tree; and any tree under 10 inches in diameter, 4 feet 6 inches above the ground, is of doubtful value as a money maker except when naval stores prices are high.

6. From unscorched trees on unburned land. Severe scorching, resulting in heavy defoliation, is apt to deplete yields seriously for a year following the fire. Trees growing on consistently burned land probably yield less than trees on unburned soil.<sup>6</sup>

7. From chipping one-fourth to one-half inch high. The narrower the chipping, the greater the number of working years and, therefore, the greater the ultimate yield from the tree.

8. From moderately deep chipping, one-half to three-fourths of an inch, depending on tree vitality. Depth should be adjusted to suit the timber and exceptionally vigorous trees will stand a little deeper work. Deep chipping increases dry-face and in a few years may greatly reduce the yield and the number of cups per crop.

9. From moderately narrow faces and well-maintained life-bars. Faces measuring in width about one-third of the bark circumference are good for sustained high yield.

10. From working one face per tree at a time. If 2 faces are placed on a tree and worked at the same time, the yield from the

<sup>6</sup> Alabama Forest News, Vol. 6, Sept., 1932.

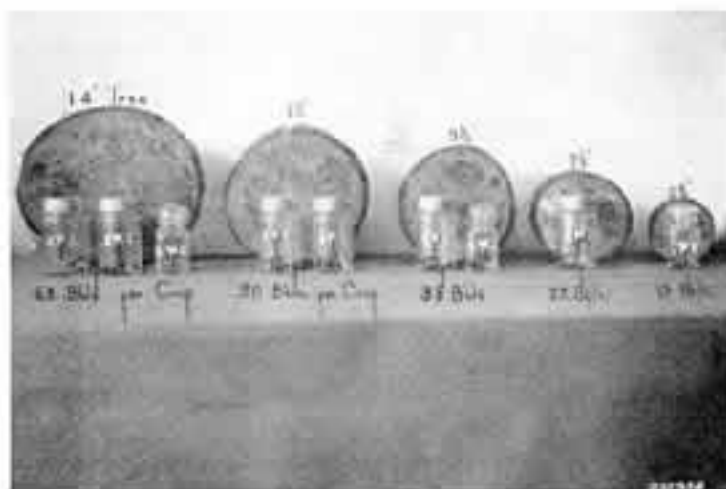


Fig. 20. Yield of turpentine per crop for different sizes of trees. Note that a crop of 7½ inch trees yields only half as much turpentine and resin as a crop of 12 inch trees.

2 faces is not over 70 per cent of the yield which could have been obtained from those 2 faces worked one at a time.

11. From the practice of nailing rather than driving tins. Driving tins results in insect attack, dry-face, and windthrown or blowdown, all conducive to reduced yields.

12. From cutting 3 or 4 winter streaks at intervals of from 3 to 4 weeks.

13. From even, regular streaks cut with a sharp tool. Missed streaks result in lowered yields.

In Florida the average yield per crop is 35<sup>7</sup> barrels of turpentine. The average for the whole south is 42<sup>7</sup> barrels. This Florida figure is reduced due to smaller, poorer yielding timber in western Florida. For every barrel of turpentine there are man-

7. Actual production figure determined by the Southern Forest Survey staff for the year 1933-34.



Fig. 21. Repeated fires prevent restocking and sometimes burn down large trees as shown above. In this case the roots were burned out.



Fig. 22. Chipping a two-faced tree. Double chipping is bad practice except when the trees are to be cut for sawmill lumber. Note the well-maintained life bar. The cup cover should be used to exclude the trash.



Fig. 23. Working small trees is unprofitable, and the majority of such trees will be worthless when the first cupping is completed. Holding off working until at least 9 inches in diameter (at 4 feet 6 inches above ground) assures two or more faces per tree and much higher yields.

ufactured, approximately, 3 1-3 round barrels (500 lbs. gross each) of rosin, the combination of 1 barrel of turpentine and 3 1-3 barrels of rosin being called a unit. The Southern Forest Experiment Station at Olustee operated some slash pine timber 40 years old, averaging 250 cups to the acre. The trees have yielded 43.6 units per crop each year for 5 years of working, which is the equivalent of 1.09 units per acre per year or 5.45 units in 5 years. Average production with a crop on 500 acres yields only 1/10 unit per acre.

The yield per tree for a season varies with diameter and the various factors mentioned on Pages 36 to 39. Yields from slash and longleaf pine trees, worked one face per tree, at a number of points in Alabama, Georgia, and Florida, were combined to form the basis of the following table:

TABLE II.

Turpentine Yields per Crop under Poor, Medium, and Good Conditions.

Diameter of tree 4½ feet above ground	Slash			Longleaf		
	Yield for 32-Streak Season.					
	Poor Site	Medium Site	Good Site	Poor Site	Medium Site	Good Site
Inches	bbls.	bbls.	bbls.	bbls.	bbls.	bbls.
6	16	19	24	18	21	24
7	22	26	32	22	26	31
8	27	33	39	27	32	37
9	33	40	47	32	38	44
10	39	46	54	37	43	51
11	46	53	62	42	49	58
12	52	61	69	47	56	65

The figures in Table II represent something approaching the range of yields for timber of the sizes given, being a composite of a large number of yield records from many points. A crowded stand of slow-growing timber on a poor site will fall in the poor class, whereas very vigorous, heavy-topped trees will fall in the good class. Heavily overcupped crops will not give these averages nor will heavy back-cupping operations.

### PLANTING PINES FOR FUTURE CROPS

Including the winter of 1935-36, a total of over 6,000,000 seedlings, largely slash pine, had been planted in Florida. Turpentine operators have seen the value of planting pine on old field land and woods land not properly restocking and have been responsible for planting at least 3,000,000 of these seedlings.

A 12 ft. by 12 ft. spacing, which uses about 300 trees per acre, costs the owner-operator about \$1.50 per acre for trees, express, and labor to set out the seedlings at this spacing.

At Springhill, Florida, some six years ago, slash pine seedlings were planted at 12 ft. by 12 ft. and at that time were between a foot and 18 inches in height. The same seedlings now average between 18 and 22 feet high and from 3 to 5 inches in diameter (measured 4½ feet above the ground). This thrifty stand, protected from fire, shows every promise of being cupping size in 8 more years. (See Figure 24.)

Many operators feel that actual cost of operation will be much cheaper with from 60 to 100 trees per acre and the high yield possible from properly spaced unburned stands.

### THINNING YOUNG TIMBER

A very important feature of forest management, once a good stand of timber is established and protected from fire, is the proper thinning from time to time to produce the type of trees desired. Opinions vary as to when and to how great an extent stands should be thinned, but most authorities agree that thinning should be done gradually if the cost is not prohibitive so that stands should suffer as little as possible from either overcrowding or from being too open. It is important not to delay thinning too long, otherwise the crowns may become so reduced that they will not respond rapidly to the open spacing created by the removal of adjacent trees.

Thinning pine stands is already in practice commercially. This improves the growth of the stand which is left and should be done during the winter months. Two thinnings are desirable. First, when the saplings are between 12 to 18 ft. in height and, second, when the stand is around 6 in. in diameter (measured at

4½ ft. above the ground). The first thinning is usually conducted at a loss, but the second thinning should show a return sufficient to cover the cost and perhaps make a small profit, provided there is a market for pulpwood. For the first thinning, a spacing of 300 trees per acre, or 12 ft. x 12 ft. apart, is considered desirable. The second thinning should reduce the stand to about 15 ft. x 15 ft., or 200 trees per acre. When these trees have reached 9 in. in diameter, it is advisable to work every other tree for turpentine and cut it for pulpwood as soon as it is worked out. This last operation will probably complete the final thinning of the stand.

The selection of trees of the final crop should have straight boles, clear of large limbs for at least one-third of their height, the tops should be unbroken and free from forks and from other evidences of injury. The crown should be full and thrifty, showing a good rate of growth as indicated by the height growth made in the last few growing seasons. From 80 to 100 trees per acre should be left as a final crop.

#### FINANCIAL RETURNS

The financial returns from turpentinizing work fluctuate very widely and this is the most discouraging feature of the industry. The best figures on returns are those computed by Carson Naval Stores Co. of Savannah, based on daily sales of large quantities of naval stores on the open market. The figures in Table III represent the value of the naval stores products at the still ready for shipment. Processing and timber operating costs, leases, depreciation, taxes, et cetera, must be deducted, of course, in determining profits or losses.

Growing more and better trees on fewer acres to secure the lowest unit cost and the maximum premium prices is the salvation of the naval stores industry. 20 cups per acre bring in the timber owner 55 cents per acre profit, 40 cups per acre realize \$2.07 per acre profit, and 60 cups per acre will earn \$3.51 per acre profit. In the latter case, cost of operation is reduced, overhead and taxes saved, and the land is put to work producing from 60 to 75 per cent of what it is capable of producing in place of the present 10 to 15 per cent production.

TABLE III<sup>1</sup>

Value of Naval Stores Products at Still Ready for Shipment, 1926 to 1936

Season	Avg. selling price net bbl. spirits turp. (50 gallons)	Avg. selling price net bbl. rosin (500 lbs. gross. 420 lbs. net).	Avg. selling price net per unit of one bbl. spirits turp. and 3 1-2 bbls. rosin.
1935-36	\$20.70	\$ 6.85	\$ 43.53
1934-35	21.59	7.03	45.02
1933-34	19.67	5.65	38.50
1932-33	17.65	3.90	30.65
1931-32	17.43	5.19	34.73
1930-31	18.33	7.69	43.96
1929-30	22.45	11.98	62.38
1928-29	23.37	12.95	66.54
1927-28	24.51	13.29	68.81
1926-27	39.32	19.97	105.89

1. Gamble's Naval Stores Review.

2. The ten-year average net cash return per unit is \$54.00.

To finance a 10-crop place an operator needs, roughly, \$25,000. Of this amount he must usually count on furnishing half, the rest to be obtained from his factorage house. The factor takes the place of the banker in the turpentine industry. He may protect his own interests at times by taking a part in the handling of an operation which is suffering from poor management. The factor is more than a financial agent, however. Not only does he furnish money for starting the work in turpentinizing, paying for leases, and so forth, but also he is a wholesale dealer in naval stores supplies, tools, groceries, dry goods, and other articles needed in a commissary for the help in the woods and around the still. Besides these functions, he acts as commission merchant, handling the sale of all turpentine and rosin made on the operation, and he frequently acts as a financial or business adviser to the turpentine man.

TABLE IV

SUMMARY OF PRODUCING COST PER CROP IN 1935 ON AN AVERAGE 10-CROP OPERATION IN FLORIDA FOR 30, 40, AND 50-UNIT YIELDS, WITH SALE VALUES AND PROFITS

	Cost per Crop		
	30 Units	40 Units	50 Units
<b>Costs—Independent of Yield—</b>			
Hanging cups and tins @ \$9.75 per M—\$ 97.50			
Raising cups and tins			
3 years @ \$7.10 per M			
	310.50		
Prorated over 4 years	\$ 77.63	\$ 77.63	\$ 77.63
Supervision—Salaries, car and horse maintenance	216.16	216.16	216.16
Depreciation—All property	169.70	169.70	169.70
Maintenance—Buildings, still, tools, etc.	31.00	31.00	31.00
Fire protection, raking plus a small amount of fire line construction	41.63	41.63	41.63
Taxes and Insurance	6.68	6.68	6.68
Chipping @ \$4.85 per M, 10M—32 streaks	272.00	272.00	272.00
Interest 6 per cent on average investment <sup>1</sup>	50.42	50.42	50.42
<b>Costs—Dependent on Yield—</b>			
Dipping gum @ \$4.65 per bbl.—4 bbls. per unit	78.00	104.00	130.00
Scraping @ \$4.80 per bbl.—1.33 bbl. per unit	31.97	42.56	55.20
Hauling @ \$5.50 per bbl.—5.33 bbls. per unit	79.95	106.60	133.25
Still operation \$6.00 per unit (includes labor, barrels, material)	180.00	240.00	300.00
Total Producing Cost at Still <sup>2</sup>	1254.93	1338.37	1481.66
Selling Cost @ \$5.00 per Unit	150.00	200.00	250.00
Total Cost (Exclusive of Timber lease) at Port	1384.93	1538.37	1731.66
Gross Sale Value, 5 years average, at Port—\$46.40 per Unit <sup>3</sup>	1392.00	1856.00	2320.00
Realization Value for Timber and Profit	7.07	317.63	588.34
Actual Lease Payment for Timber (with int.)	200.00	250.00	300.00
Average Profit	-292.93	67.63	288.34
<b>COSTS PER UNIT</b>			
Total Cost of Production at Still (Excl. Lease)	\$ 41.16	\$ 33.46	\$ 29.63
Selling Cost	3.00	5.00	5.00
Actual Average Lease Paid (Plus Interest)	6.66	7.14	7.50
Total Cost at Port	52.82	45.60	42.13
Sale Value at Port	\$ 46.40	\$ 46.40	\$ 46.40
Average Profit per Unit	-6.42	.80	4.27

1. Timber leases interest excluded.

2. Lease and lease interests excluded.

3. Average gross returns for Naval Stores handled by Cason Naval Stores Co., Savannah, Ga.

## USES

Turpentine is used primarily for paint and varnish thinners,<sup>4</sup> more than 80 per cent of the total output going into these products. Eleven per cent is used for shoe polish and leather dressing; 4 per cent goes into automobile and wagon industries; and 3 per cent is used in making oils and greases. Smaller proportions are used in pharmaceutical and chemical supplies, sealing wax, and insulators.

Thirty-one per cent of the rosin produced is used in paper and paper-size manufacturing; 28 per cent is used by the soap industry; 23 per cent in paint and varnish making; 7 per cent in manufacturing rosin oil, greases and printing ink; 4 per cent in sealing wax and insulation; and nearly the same amount for making linoleum, oil cloth, and roofing. Other purposes for which rosin is used are the making of steel and iron, chemicals, and matches.

## OUTPUT

Most of the rosin and turpentine produced in Florida goes to the storage yards in Jacksonville and Pensacola. For several years Jacksonville was the largest receiving point for naval stores in the country, but Savannah, Georgia, has lately taken the lead. From April 1, 1931, to March 31, 1932, Jacksonville received 134,658 barrels of turpentine and 467,533 round barrels of rosin. Pensacola handled 38,593 barrels of turpentine and 128,238 barrels of rosin.<sup>5</sup>

## OUTLOOK FOR THE INDUSTRY IN FLORIDA

Florida, with its present stands of advanced second growth timber and thrifty reproduction coming on, shows great possibilities for ample supplies of naval stores timber. Careful woods work, proper processing and packaging will go a long way to re-

4. Gamble's Naval Stores Yearbook for 1928-29.

5. Naval Stores Review, 43(3):18 Apr. 9, 1932.



Fig. 24. Thrifty slash pine seedlings planted 12 by 12 feet at Springhill, Florida. Six years after planting these saplings now average 3 to 5 inches in diameter, measured 4½ feet above the ground. Fire has been excluded from the plantation.

duce costs and to sustain the present demand for gum naval stores. It is felt, however, throughout the industry that the old days of high prices are gone.

A large number of high yielding trees per acre on a reduced acreage for the operation will enable the producer to make a substantial profit. Hang 60 to 100 faces per acre instead of 10 to 18 per acre which is now common, produce 55 barrels per crop average, cut down investment, operating costs, and taxes by a reduction in acreage, and good profits can again be realized.

Good turpentine practices in the woods and at the still, fire protection for the timber, thinning, pruning, and forest management are all necessary for a paying business.

#### ADVICE AND ASSISTANCE

Those who wish help or advice in conducting their operations may call on three government agencies for assistance.

##### Fire Protection and Reforestation

Fire protection, reforestation, and general timberland management assistance can be obtained from the State Forester's office in Tallahassee or from the District offices in Panama City, Tallahassee, Gainesville, Jacksonville, and Lakeland.

##### Woods Practices

Details of woods work, hanging cups, chipping, et cetera, can be obtained from the Lake City office of the Southern Forest Experiment Station. Any unusual woods problem may be taken up with the trained foresters at that station.

##### Equipment and Still Practices

Information on cup, gutter, and apron materials, design of turpentine stills, proper stilling methods, gluing barrels, and other points of production and processing are available at the Naval Stores Station, Bureau of Chemistry and Soils, U. S. Department of Agriculture, near Olustee.

### Cooperative Agent

By a joint agreement between the Bureau of Chemistry and Soils and the Florida Forest Service, a naval stores Cooperative Agent was appointed in August, 1932, to carry to the operators and timber owners in Florida improved naval stores practice in the woods and at the still.

The present naval stores agent has an office at the Naval Stores Station, near Olustee, Florida, on Florida Highway No. 1. This turpentine specialist is available on demand to demonstrate desirable practices or to take up any problems connected with woods work, stilling, or naval stores management in Florida.

### NAVAL STORES LEASE

THIS NAVAL STORES LEASE, made and entered into this the \_\_\_\_\_ day of \_\_\_\_\_, A. D., 19\_\_\_\_, between \_\_\_\_\_ of \_\_\_\_\_ County \_\_\_\_\_, hereinafter called the Owner, and \_\_\_\_\_ of \_\_\_\_\_ County \_\_\_\_\_, hereinafter called the Producer.

WITNESSETH, That the Owner, for and in consideration of the rents and royalties hereinafter mentioned, does hereby grant, bargain, lease, let and convey unto the Producer the exclusive right to work, for naval stores and turpentine purposes, by the cup system only, in accordance with the restrictions and provisions hereinafter enumerated, the longleaf and slash pine timber, hereinafter described, now standing and growing upon the lands of the Owner, in \_\_\_\_\_ County \_\_\_\_\_, Florida, and more particularly described as follows, to-wit:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Excepting, however, from this lease, all trees upon the above described lands, as have been reserved and designated by the Owner, and all trees as are unfit for turpentine, because of defects, abnormality or inaccessibility.

That the Owner hereby fully warrants the title to said timber and will defend the same against the claims of all persons whomsoever.

That the Owner warrants that there are no mortgages, liens, tax liens or other encumbrances upon the above described lands, except as follows, to-wit:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

That for and in consideration of the rights and privileges herein granted, the Producer agrees to pay unto the Owner the following sums at the times and in the manner following, to-wit:

(Cross out the two methods of payment not used)

## FORM I.

The sum of \_\_\_\_\_ cents per face for the full term of this lease, the amount to be determined by actual count when cups are installed. Said payment to be made in the following manner, to-wit:

\$ \_\_\_\_\_ on or before the \_\_\_\_\_ day of \_\_\_\_\_, 19 \_\_\_\_\_  
 \$ \_\_\_\_\_ on or before the 1st day of June, 19 \_\_\_\_\_  
 \$ \_\_\_\_\_ on or before the 1st day of June, 19 \_\_\_\_\_

## FORM II.

The following sums per face, payable on or before the \_\_\_\_\_ day of \_\_\_\_\_, each year during the terms of this lease, the number of faces to be determined by actual count when the cups are installed, to-wit:

\_\_\_\_\_ cents per face for the first year.  
 \_\_\_\_\_ cents per face for the second year.  
 \_\_\_\_\_ cents per face for the third year.  
 \_\_\_\_\_ cents per face for the fourth year.  
 and each year thereafter.

The above enumerated sums per face to be effective during said years, provided the average unit price of turpentine and rosin does not exceed \_\_\_\_\_ dollars per unit, but should the unit price of turpentine and rosin exceed the aforesaid average unit price during any or all of said years then and in that event, the Producer shall pay to the Owner an additional \_\_\_\_\_ cents per face for each \_\_\_\_\_ dollars advance in price over and above the aforesaid average unit price, such additional sum to be payable on the \_\_\_\_\_ day of \_\_\_\_\_, the following year. It is hereby agreed that a unit of turpentine and rosin consists of fifty gallons of spirits of turpentine and three and one-third round barrels of rosin of approximately five hundred pounds gross weight each. It is further agreed that the price per unit shall be determined by taking the average daily strong and firm Savannah markets of all grades of rosin and turpentine for the twelve-month period ending on the \_\_\_\_\_ day of \_\_\_\_\_ of each year.

## FORM III.

That the Producer, at the time of sale, shall pay to the Owner \_\_\_\_\_ per centum of the net returns received from the sale of all products. Said net returns to be determined by deducting all freight, loading, handling, grading, inspection, storage and commission charges from the gross re-

turns for the sale of the products. Should the average net returns per unit per year exceed \_\_\_\_\_ dollars per unit, hereinafter called the basic price, then an additional \_\_\_\_\_ per centum of the net returns shall be paid unto the Owner for each \_\_\_\_\_ dollars advance in price per unit over and above the basic price, said additional amount to be due and payable on the \_\_\_\_\_ day of \_\_\_\_\_ the following year after sale.

That the unit price per year shall be determined by taking the average net returns from all turpentine and rosin sold hereunder during that year, expressed in terms of unit value, that is, a unit of turpentine and rosin to consist of fifty gallons of turpentine and three and one-third round barrels of rosin of approximately five hundred pounds gross weight each.

All products shall be sold and/or contracted for to the best advantage of the Owner and the Producer, but should they fail to agree as to the advisability of selling and/or contracting such products, either party may at his option, take over his proportionate share of such products.

The Producer shall insure and be held liable to the Owner for the Owner's interest in all products in the process of distillation or held or stored at the still or in the yard, excepting such products as have been taken over by the Owner.

All rosin and spirits of turpentine shall be inspected by a Federal or authorized State Inspector before sale.

The Producer shall make arrangements with his factor or purchaser to furnish the Owner with a full statement, at the time of sale, showing in detail the amount of products sold, the amount received from the sale thereof and the items of expense deducted from the gross returns.

In order to obtain the best yield and grades and to eliminate waste the Producer agrees as far as practical to:

Cup and streak all trees on or before the 1st day of February, A. D. 19\_\_\_\_; use rustless or rust-free cups and tins; use chip paddles which will cover cups and tins; place at least thirty-two streaks per year on all faces at one week or longer intervals; dip all gum at least every four streaks; raise cups at the end of each of the first four working seasons; distill the crude gum according to the methods of the United States Bureau of Chemistry and Soils as contained in "Directions for Running a Turpentine Still," dated April 1, 1927, "How to Charge and How to Discharge a Turpentine Still," dated

March 5, 1924, and April, 1924, respectively; insure the still from fire; cover the separator barrel and spirit tub; glue the spirit barrels by method contained in Bureau of Chemistry and Soils, leaflet "Gluing Turpentine Barrels," dated July 15, 1931, or ship the spirits of turpentine in tank cars or drums in such a way as to eliminate waste and discoloration; and strain rosin properly.

That the timber, embraced by this lease, shall be worked in accordance with the following restrictions and provisions, to-wit:

1. This Naval Stores Lease shall be for the full term of \_\_\_\_\_ working seasons, beginning as soon as this agreement is executed and delivered, and ending at midnight, on the 31st day of December A. D. 19\_\_\_\_\_.

2. All cups shall be installed not later than the 31st day of March, next after the date hereof.

3. All round trees nine inches in diameter and above shall be cupped with one face, provided however, that with the written consent of the Owner, trees measuring fifteen inches or more in diameter may be cupped with two faces. No trees measuring less than nine inches in diameter may be worked. All diameter measurements shall be taken four feet six inches above the ground.

4. One cup shall be installed on all trees previously worked that measure twelve inches or more in diameter four feet six inches above the ground, provided that no trees previously worked with more than one face or that measure less than twelve inches in diameter, as aforesaid, may be worked.

5. When two faces are placed upon any tree, they shall be located so that the width of one of the bark bars is not greater than eight inches.

6. Bark bars not less than four inches wide shall be left between faces.

7. The faces shall be chipped for the first year not to exceed sixteen inches in height from the shoulder of the first streak to the shoulder of the last streak of the season. The faces chipped or pulled yearly thereafter shall not exceed fourteen inches in height for each season.

8. Measured in the deepest place, the depth of the streak shall not exceed five-eighths inch in the wood of slash pine or three-fourths inch in the wood of longleaf pine.

9. The width of the face shall not exceed one-third of the circumference of the tree, and in no case shall the width of the face exceed twelve inches, measure from shoulder to shoulder.

10. No wood shall be exposed below the gutters or aprons at the time the cups are installed, however, it is permissible to chop into burls and

swellings to properly set the cups. All cups shall be installed as close to the ground as practicable and the first streak shall be cut as close to the gutters or aprons as possible.

11. Incisions in the wood for installing tins or raising in jump peaks shall not exceed one-half inch in radial depth. No incision or streak in the face for the purpose of raising tins shall exceed one-fourth inch in radial depth. Whenever tins or cups are raised, removed or abandoned, all tins, tacks and nails above a stump height, of fourteen inches from the ground, shall forthwith be pulled and removed, but not chopped out, by the Producer.

12. Should the Producer cup or fail to cup any tree or trees in violation of the above sections three and four, he shall pay unto the Owner, as and for full liquidated damages caused by said violation \_\_\_\_\_ cents per face cupped or that should have been cupped, provided, however, he shall have been notified in writing by the Owner, within sixty days from and after the date of the said violation or from and after the 31st day of March, A. D. 19\_\_\_\_\_, whichever is the later date. That upon being notified as aforesaid the Producer shall forthwith remove all cups installed in violation of sections three and four hereof, and his failure to so remove said cups shall constitute a breach of this contract, and the Owner shall have the right to remove said cups at the expense of the Producer.

13. Should the Producer violate any of the restrictions and provisions herein contained, the Owner shall notify him in writing, within sixty days after such violation has occurred, and if said violation is not ceased and any defective work corrected within twenty days from and after receipt of such notice, the Producer shall pay the Owner, as and for liquidated damages, as follows:

(a) For all faces that exceed the heights specified in section seven of this contract, \_\_\_\_\_ of a cent for each inch in excess of the specified heights.

(b) For trees split or windthrown during the life of this agreement in violation of the above section eleven, \_\_\_\_\_ dollars per thousand feet board measure full scale computed by Doyle rule.

(c) For violation of all restrictions and provisions, other than those mentioned in sections eleven, twelve, thirteen a, and thirteen b, hereof \_\_\_\_\_ cents for each face worked in violation of these restrictions and provisions.

14. Should the Producer fail or refuse to pay unto the Owner the liquidated damages herein provided for, within ten days from and after the same becomes due and payable, the Owner shall have a lien upon the equipment of the Producer used upon the lands above described, therefor, and may at

his option prohibit further work, under this lease, until such damages are paid in full.

That it is hereby further agreed by and between the parties hereto, that:

(a) The Owner reserves unto himself the right to list any or all of the lands embraced in this lease with the Florida Board of Forestry, for forest fire control. In case the said lands or any part thereof be so listed, the Producer hereby consents to such listing and agrees to cooperate with the Owner and the said Board in said control; to plow, rake and burn such fire lines as may be designated by the said Board or its agents for proper fire control; to aid and assist the said Board in preventing and suppressing forest fires on said lands; to require his servants, agents, employees, and all other parties under his control to cooperate in said forest fire control, and to aid and assist in preventing and suppressing fires.

(b) That in case the Owner lists the lands with the Florida Board of Forestry as aforesaid, and thereafter fails to carry out the terms of said protection agreement, then the Producer may carry out the terms of said agreement, in behalf of the Owner, and thereafter deduct the amount of the cost and expenses of so carrying out said agreement from any and all sums then due or to become due from himself to the said Owner, under the terms of this lease, and should there be no sums due or to become due as aforesaid, then said amount of costs and expenses shall be a lien upon the lands embraced in said protective agreement.

(c) That the Producer, his heirs and assigns, shall have the free and unrestricted right to enter upon, occupy, use and enjoy said lands for the purpose herein granted during the continuance of this lease. It is further agreed that the Producer shall have a period of sixty days from and after the expiration of this lease, within which to remove and take away, or otherwise dispose of, all cups, gutter irons, and other equipment belonging to him, provided he has carried out the terms of this agreement.

(d) That the Producer shall be allowed to use dead and down timber from the aforesaid lands as fuel wood for his still and fire wood for his hands and laborers but not for removal or sale.

(e) That the Producer shall have such free and unrestricted right of ingress, egress, and regress, upon the lands of the Owner as may be necessary for the purpose of working the timber, hereinabove described, for turpentine and naval stores purposes.

(f) That the Owner shall have access, to the lands above described, for any and all purposes not inconsistent with the terms and provisions of this lease, provided, however, that such use by the Owner does not interfere with the operations of the Producer. In the event of any such interference, the Owner shall be liable to the Producer for all injury and damage to his

cups, tins, cupped trees and products, caused by the Owner's operations on said lands.

(g) Should the timber embraced by the terms of this lease be damaged by fire, insects, drought, Act of God or vis major so that, in the judgment of either party, further work would be impractical, impossible or injurious to the timber, the parties hereto shall mutually agree as to what modification or suspension of work is necessary for the proper protection of the timber and the interests of the parties hereto, provided, however, that if said parties are unable to effect mutual agreement then such question shall be submitted to a committee of three arbitrators, one to be chosen by the Owner, one by the Producer, and the third by the two so chosen, and the decision of said board of arbitrators shall be binding and final upon the parties hereto as to all questions arbitrated.

(h) That the Owner shall pay the taxes upon the lands embraced in this lease before the same become delinquent and should the Owner allow the lands to become delinquent then, and in that event, the Producer, in order to protect himself from having his operations stopped, on account of the non-payment of taxes, shall have the right to pay such taxes and to deduct the amount of such payments from any payments due or to become due from said Producer to the Owner under the terms of this agreement, and in case there be no payments due from the Producer to the Owner aforesaid, the Producer is hereby given a lien upon the lands of the Owner to the extent of the taxes so paid.

(i) Neither party hereto shall be held liable, if prevented from the performance of his covenants and obligations hereunder by an Act of God or major contingencies beyond his or their control.

(j) The terms "Owner" and "Producer" when used herein shall be taken as extending to and embracing the heirs, personal representatives, successors and assigns of the parties hereto.

(k) The rights and privileges, under the terms of this lease, accruing to the parties hereto shall be assignable and transferable and when assigned or transferred the rights and obligations hereunder shall devolve upon the assignee or transferee.

If any of the sums, herein referred to as compensation for this lease, be not promptly and fully paid within \_\_\_\_\_ days next after they become, severally, due and payable, the aggregate sum of unpaid compensation for this lease shall, at the option of the Owner, become due and payable forthwith, and if not fully paid within ten days, after notice by the Owner that he has elected to exercise his aforesaid option, this lease shall become terminated in toto and the Owner shall have the right of reentry.

IN WITNESS WHEREOF, The parties hereto have hereunto set their hands and seals the day and year first above written.

..... (SEAL)

..... (SEAL)

Signed, Sealed and Delivered  
in the presence of:

.....  
.....

**ACKNOWLEDGEMENT FOR PERSONS  
OTHER THAN MARRIED WOMEN**

STATE OF \_\_\_\_\_  
COUNTY OF \_\_\_\_\_

On this day, before me, a notary public, personally appeared \_\_\_\_\_  
\_\_\_\_\_ to me well known and known to be one of the  
persons who executed the above and foregoing Turpentine Lease, who  
acknowledged before me that he executed the same freely and voluntarily  
for the uses and purposes therein expressed.

Witness my hand and official seal this the \_\_\_\_\_ day of \_\_\_\_\_  
A. D. 19\_\_\_\_\_.

\_\_\_\_\_  
Notary Public.

**ACKNOWLEDGEMENT FOR  
HUSBAND AND WIFE**

STATE OF \_\_\_\_\_  
COUNTY OF \_\_\_\_\_

On this day, before me, a notary public, personally appeared \_\_\_\_\_  
\_\_\_\_\_ and \_\_\_\_\_  
his wife, to me well known and known to be the persons described in and  
who executed the above and foregoing Turpentine Lease, who acknowledged  
before me that they executed the said instrument freely and voluntarily for  
the uses and purposes therein expressed, and,

The said \_\_\_\_\_ wife of the said \_\_\_\_\_  
upon an examination taken before me and by me, separate and apart from  
her said husband, further acknowledged that she executed the said Turpen-  
tine Lease freely and voluntarily and without any compulsion, constrain',  
apprehension or fear of or from her husband.

**FLORIDA FOREST SERVICE**

**Board of Forestry**

HAROLD S. FOLEY, President, Foley  
JOHN B. GLEN, Vice-President, Chipley  
STANLEY S. SHEIP, Secretary, Apalachicola  
MRS. LINWOOD JEFFREYS, Jacksonville  
S. BRYAN, JENNINGS, Jacksonville

**Office of State Forester  
Tallahassee, Florida**

HARRY LEE BAKER, State Forester  
C. H. COULTER, Associate State Forester  
ROSA STANALAND, Secretary  
JANE ALLEN, Chief Clerk

**Fire Control—**

R. R. WHITTINGTON, Assistant State Forester

**Publicity, Information, and Education—**

H. J. MALSBERGER, Assistant State Forester

**Applied Forestry—**

C. H. COULTER, In Charge  
J. E. McCAPFREY, Forest Management and Utilization  
H. D. COOK, Cooperative Agent Naval Stores  
Naval Store Station, Olustee

**State Parks and Forests—**

C. H. SCHAEFFER, Director, Tallahassee

**District Organization**

District 1—District Forester, Panama City  
District 2—District Forester, Tallahassee  
District 3—District Forester, Gainesville  
District 4—District Forester, Jacksonville  
District 5—District Forester, Lakeland

**State Nursery**

Address the Nurseryman  
Olustee