CHEMISTRY

Stumps Yield Chemical Wealth

Rosin, turpentine and pine oil now extracted from pine roots, stumps and tops are utilized in products ranging from plastics to perfumes.

By MARTHA G. MORROW

➤ CHEMICAL wealth from old pine stumps is finding its way into:

Super solvents for lacquers and waxes.

Trusty thinners for paints and varnishes.

Invaluable ingredient for synthetic camphor.

Suitable sizing for paper and paper board.

Mass manufacture of laundry soaps and soap powders.

The three basic chemicals extracted from stumps are rosin, turpentine and pine oil. They are used in products ranging from protective coatings to plastics, printing inks to shoe polish.

Within the last few years a wide variety of new uses has been developed for these materials extracted from the stumplands of the South. An insecticide with turpentine as a basic ingredient is proving successful against cotton insects. An industrial alcohol from rosin is now commercially available.

The pines, both longleaf and slash, from which these valuable materials are extracted, grow in the South, along the Atlantic coastal plain and the Gulf coast. Although found from North Carolina to Florida, and South Carolina to Mississippi, most of the rosin and turpentine from stumps comes from Georgia and Florida.

Last year more turpentine and rosin were extracted from pine stumps and fallen tree-tops than was obtained by tapping live pines. The resinified stumps and wood remaining after the sapwood has rotted off are being turned into a chemical gold mine.

Known as Naval Stores

Chemicals from pine trees, known today as centuries ago by the name of "naval stores," were the first products exported from what is now the United States. Turpentine, tar and pitch were first produced on this continent at Jamestown in 1608, according to the most authentic reports available.

With ax and chipper, the early settlers bled the sap from living southern yellow pines found in the vast Colonial forests. This they converted into pitch for caulking the seams of wooden sailing ships and tar for waterproofing their rigging.

Pitch and tar accounted for nearly all of the production of naval stores around George Washington's time. Today boats and shipyards use only a fraction of the total output, but the name "naval stores" still sticks. Turpentine and rosin, by far the most important products of the industry today, are used in linoleum, disinfectants, matches, adhesives and even perfumes.

Until World War I, practically all of the naval stores chemicals obtained in the United States came from the gum of living trees. But recent processes have made it practical to extract these from pine stumps and fallen pine tops.

Within the last few years the wood industry has grown to overshadow the gum industry. In 1947-48, wood turpentine amounted to 54% and wood rosin to 58% of naval stores production. Before 1924, these accounted for less than 10% of the total production.

Millions of Tons of Roots

Pine stumps left by sawmills that ate their way through the virgin forests of the Southeastern and coastal Gulf regions offer an available and nuisance source for the chemicals. Millions of tons of roots, stumps and top wood are gathered each year.

The stumps are rooted out of the ground with bulldozers, then chopped into a better size for handling. Reaching the plant, they are washed, ground and shredded. How these large splinters and chips are handled next depends upon the process used.

The wood chips are placed in huge closed boilers in the steam-distillation process. Steam and a solvent separate out the turpentine, pine oil, rosin and other products. The spent wood may be used either as fuel, cutting down the cost of production, or as pulp for paper making.

The basic wood is destroyed in a second process. Here the chipped stumps and fallen tops are placed in a retort, sealed to keep the air out, and heated to the charring point. The gases are driven off and condensed. This process yields wood turpentine, tars, tar oils, rosin pitch and charcoal, but no rosin.

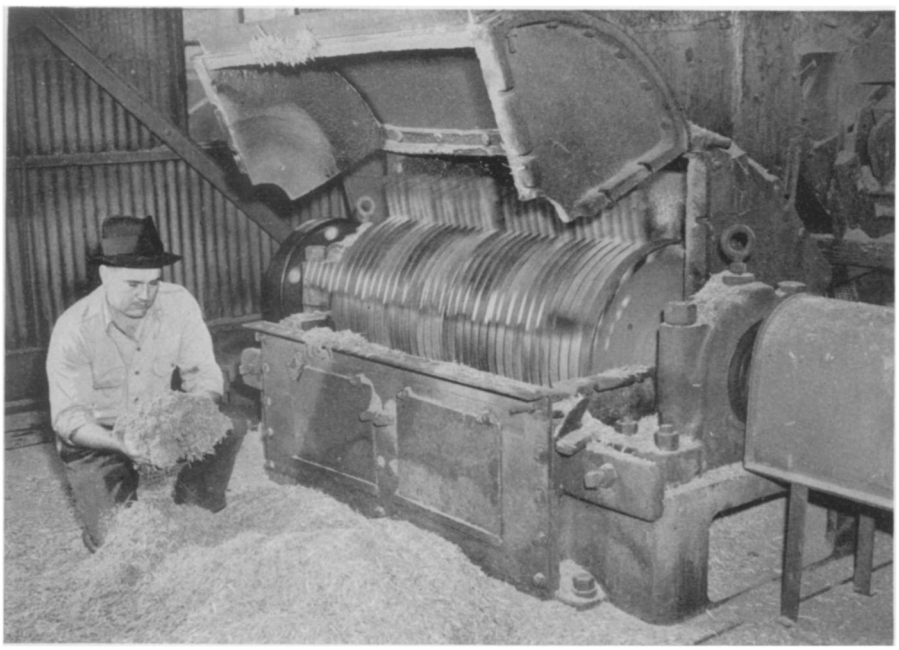
Paper Making By-Product

Sulfate wood turpentine is a byproduct of paper making. It is recovered by condensing the vapors released from the pulping digesters in producing pulp from pine wood by the sulfate process. Sulfur compounds contaminate the crude byproduct, and so must be removed.

A total of 346,875 barrels—17,343,750 pounds—of wood turpentine were produced in the year ending March 31, 1948, reports the Production and Marketing Administration of the U. S. Department of Agriculture. Steam-distilled rosin production for 1947-1948 amounted to 1,162,703 drums—604,605,560 pounds. This is the first time production in the United States has exceeded a million drums.

The supply of virgin stumps in the South will probably be exhausted in an-

GRUBBING—Uprooting pine stumps is the first step in the manufacture of naval stores products.



SHREDDING—Roots, stumps and tree tops are shredded before the turpentine, pine oil and rosin can be extracted. The valuable resinous content is later removed from the chips.

other 20 years or so. Then second-growth pine stumps may be worked, but not so economically—they are smaller and the rosin content relatively low.

So new methods of extracting gum from live trees are being developed. Today in many areas strips of bark are removed instead of harming the wood by cutting deep into the tree. Treating the streaks with acid or spraying them with 2,4-D has been found to increase the rate of flow and also to keep the gum flowing longer.

The largest producer of woods naval stores products is Hercules Powder Company, a leader in the search for new products and new uses. Newport Industries, Inc., recently completed a $200,000 research laboratory at Pensacola, Fla. Crosby Chemicals, Inc., is also active in the research field.

Better ways of extracting the chemical wealth from pine trees and a wider variety of uses for these products are constantly being developed. Rosin and terpene oils will continue to flow from pines, both living and dead.

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CHEMISTRY

Better Coal Use Expected

Acetylene could be mother substance for hundreds of organic chemicals and so could ethylene. Hydrogen, as well as methane, could be saved and converted.

➤ COAL today is under scientific investigation as never before, the American Chemical Society was told by Dr. Edward R. Weidlein, director of the Mellon Institute of Industrial Research, Pittsburgh. Fundamental studies are now being made in many laboratories to determine its possibilities, not only in the manufacture of synthetic liquid fuels but particularly as a source of the thousands of essential chemicals which it can be made to yield.

Up to now, the nation's abundant petroleum supplies have discouraged the study of coal, Dr. Weidlein said. Far too little fundamental research has been done with this key mineral. We still do not know what coal is chemically, he said, and until we have this knowledge we are working under handicap.

Half the world's known reserve of coal is possessed by the United States, he stated. This nation has enough to meet all requirements for heat, light, power and transportation for more than 1,000 years at the present rate of consumption. Industrial leaders and technical experts believe that a large industrial development based on coal is in the making, and that a considerable expansion in coal production is imminent.

Atomic energy, in time, may replace coal for the production of power, he continued, but it can not succeed coal as a rich source of carbon compounds. Chemically speaking, the whole range of organic chemicals can be made from coal.

In the past, coal has been the source of the so-called aromatic compounds on which the dye, drug, and explosives industries were founded. Alcohols are among the many other substances which can be derived from coal. By-product ethyl alcohol from two synthetic fuel plants now nearing completion will equal about one-fifth of the nation's present production from all other sources.

Acetylene from coal can be the mother substance for hundreds of organic chemicals, and the same is true for ethylene. Great quantities of free hydrogen are released in the usual coking of coal, most of which is lost. The gas called methane, given off in the same process, is now being converted into valuable liquid products. The hydrogen could likewise be saved.

Wider uses of coal for all purposes are foreseeen by Dr. Weidlein. The petroleum supply picture has changed so radically that national security itself depends upon the development of new sources of liquid fuels, he declared. A World War III would require double the fuels of the past conflict.

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AERONAUTICS

Mock-Ups of Planes Used to Train Pilots

➤ WORKING mock-ups of airplane cockpits and fuselages were successfully used by the Navy during the war in training pilots and crews, and their use is now becoming widespread, the Institute of the Aeronautical Sciences meeting in New York was told by Luis de Florez, president of the de Florez Engineering Company.

The mock-ups were called synthetic aircraft by him. They are so designed and instrument-equipped that they can simulate the flight of any proposed aircraft. They can be used to reduce the risks and probably the costs of design and testing new planes, and make it possible to detect and correct faults before fullscale flight.

By the use of electronic computers, it is possible to portray the flight of the aircraft designed and furnish a preview of its performance. The task of familiarizing and training pilots and crews in the operation of new type aircraft is greatly simplified and made less expensive by these ground-based synthetic aircraft.

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Quarternary ammonium compounds are increasingly used as *germicides* and in cleaner-sanitizer preparations; they are derivatives of ammonium hydroxide or its salts in which hydrogen atoms are replaced by organic radicals.