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Activities of a Large Pulp Company and a Forest Engineer’s Relation Thereto

W. J. Damtoft, Forest Engineer

The Champion Fibre Company, manufacturers primarily of all kinds of chemical wood pulp, and also makers on a large scale of paper, container board, and tannin extract, operates the largest mill of its kind in the world. The daily consumption of raw material is 650 cords of wood, and 70,000 board feet of saw-timber, which is equivalent to the yield of an average 70* acres of the section from which it draws its supplies. The location of the plant is such that it can tap a wide territory, heavily timbered and within reasonable freight haul.

The mill is located at Canton, N. C., eighteen miles from Asheville. It is on the Murphy Branch of the Southern Railway, a road which runs from Asheville 120 miles westward between, and paralleling the Pisgah and Great Smoky Ranges, crossing over the Balsam and Nantahala Mountains at high altitudes, and terminating at Murphy, N. C. Tributary to this railroad are some of the largest and finest boundaries of mountain hardwoods, hemlock and spruce to be found in the South, including over 100,000 virgin acres owned by The Champion Fibre Company itself, and from which it draws a certain amount of its raw material.

The species of wood used in the manufacture of pulp and paper, by the Company, in order of quantity consumed, are Chestnut (Castanea dentata), Spruce (Picea rubra), Balsam (Abies Fraseri), Hemlock (Tsuga canadensis), Pine (Pinus echinata, palustris and taeda), Yellow poplar (Liriodendron tulipifera), Gum (Nyssa sylvatica, Nyssa aquatica and Liquidamber styraciflua), Cucumber (Magnolia acuminta), Maple, Beech and Buckeye. Of these the principal ones used and the respective daily consumption of each are: Chestnut (300 cords), Spruce and Hemlock (250 cords), Pine and Poplar (100 cords). All these species are found in large quantities in the nearby mountains, except pine and gum, which two species are obtained principally from the lower

*Such an average includes cut-over and poorly timbered lands. It must not be overlooked that the yield from virgin timber lands of the region is greatly in excess of this figure.
Piedmont and Coastal sections of North and South Carolina and Georgia.

Lumber manufacturing by the Company is rather incidental to its own pulpwood operations. In the purchase of timberlands, for the supply of pulpwood, it was necessary to corral large areas which contain a considerable quantity of hardwood peculiar to the Southern Appalachian region, of such size and quality as to make it more advisable to convert them into lumber than into pulpwood. For this reason two saw mills have been installed upon these lands, manufacturing lumber of the following species: Ash, basswood, beech, birch, black gum, box elder, buckeye, cherry, chestnut, hemlock, maple, oak, poplar, spruce and yellow pine.

Although the Company has some 300,000 acres of timber lands, either owned by it in fee or controlled by it through subsidies or contracts, its policy is to draw but a limited quantity of raw material from them in order that it may hold them in reserve as long as possible. Therefore, it looks to the following three sources for its greater supplies of wood:

(a) Custom wood, or wood purchased f. o. b. cars, from farmers, small operators and other individuals.
(b) Contracted wood, or wood from operations subsidized or financed by the Company.
(c) Saw mill refuse, i. e. slabs, edgings, trimmings and other odds and ends from lumber mills.

Three chemical processes for the manufacture of pulp are used, to-wit: Sulphite, soda and sulphate. The species treated by these various processes are as follows:

Sulphite Process—Spruce and hemlock.
Soda Process—Chestnut, poplar and other hardwoods.
Sulphate Process—The yellow pines.

The sulphite process of converting wood chips into pulp was developed by B. C. Tilgham about fifty years ago. This pulp, originally made from spruce, and in more recent years from hemlock also, took the place of rags in the manufacture of paper, its long fibre giving the necessary strength. Pulp made by this process is, in unbleached condition, mixed with about nine times the quantity of "Ground wood pulp" (i. e. pulp made by the mechanical tearing of fibre from wood pressed against large stone wheels) for the manufacture of "News print" and is also used in larger proportions for the making of "Bag" and "Wrapping". Bleached pulp made by this process is mixed with pulp of shorter fibre, such e. g. as is produced from species reduced by the soda process, for the
Diagrammatic Representation of Products Manufactured and of Processes and Raw Materials Employed by The Champion Fibre Co.

- Spruce
  - Bleached pulp
  - Bond paper

- Hemlock
  - Sulphite Pulp
  - "Bindex" liquor
  - Screenings used in making container board

- Chestnut
  - Bleached Soda Pulp

- Poplar and other hardwoods
  - Unbleached
    - Book paper
      - (with 25% sulphate and 50% sulphite pulp)
  - Bleached
    - Chlorine
      - by electrolysis
      - Hydrogen
      - Caustic Soda

- Pine
  - Sulphate pulp
    - Kraft paper
      - (75% pine—25% hemlock)
    - Container board
      - (from screening

- Turpentine

- Chlorine
  - by electrolysis
  - Hydrogen
  - Caustic Soda
making of "Book" paper, and an excellent grade of "Bond". A by-product of this sulphite process is marketed as "Bindex."

Bindex is a ligno-sulphite liquor, obtained as a by-product from the cooking of spruce and hemlock wood (from which the bark has been removed) in the preparation of cellulose (wood pulp). The wood is digested with a solution of Calcium polysulphites prepared by passing sulfur dioxide gas into milk of lime. The digestion is carried on under pressure in large autoclaves. The cellulose fiber (pulp) is removed and the remaining liquor is employed for the preparation of Bindex, principally by concentration. Bindex contains the original resins of the wood, glucose and ligneous matter, which consists principally of embryo cellulose matter, besides the sulphite of Calcium. Bindex is freely soluble in water in all proportions. According to Dr. Joseph Hyde Pratt of The North Carolina Geological and Economic Survey, Bindex extract actually enters into intimate chemical combination with sand and clay, forming a bond which becomes permanent in time, and for this reason it is especially adaptable for binding the surfaces of sand and gravel clay roads.

The soda process of pulp manufacture produces a "short fibre" which is used in mixture with sulphite pulp for making a high-grade paper. It insures a strong, well-closed sheet, with a surface well adapted for coating or supercalendering for the highest class printing.

Tannin extract is obtained from the chestnut wood previous to the pulping of this species. Owing to the very large quantity of chestnut used by the plant, this industry is a very important part of The Champion Fibre Company's activities, and its daily production of tannin exceeds that of any plant in the country, not excepting those which are devoted exclusively to this one product.

The sulphate process of pulp making is a comparatively recent development, and is well adapted to the treatment of pine wood, or wood too rich in resinous matter to yield readily to the other methods. It is by this process that the "kraft" (German for "strong") papers are made. This pulp, in its unbleached state, is converted into "wrapping" paper, and high-grade container board, its special value being in its strength. The problem of bleaching sulphate pulp economically, has only recently been solved. It is interesting to note that in connection with the operation of reducing pine chips by this process, turpentine is secured as a by-product.

The agent employed in the bleaching of the pulps from all the processes is chlorine, which is produced by the elec-
trolysis of Na Cl (salt). A by-product of this process, caustic soda, is marketed in considerable quantity.

The foregoing gives a general outline of The Champion Fibre Company's activities, and its requirements in the way of raw-material. The responsibility of meeting these requirements lies with two departments within the organization, namely, the "Wood Department" and the "Wood Buying Department". The former has charge of the Company's timberlands, their purchase, sale and development, including opera-

Portion of the great Smoky Mountains, North Carolina

tions both for pulp wood and saw-timber. The latter is responsible for keeping up the current supply for the pulp mill by outside purchases, contracts, etc., for the amounts required in addition to that supplied from the Company's own operations.

The central organization of the "Woods Department" consists of an Operating Superintendent and a Forest Engineer. The former has the entire supervision of the Department, but, as a matter of fact, devotes the greater amount of his attention to the operating and production end, delegating to the Forest Engineer most matters of other nature.

In this arrangement the field of the Forest Engineer includes:

(a) Keeping alert for favorable purchases and sales of timber lands.
Making timber estimates, valuation examinations and surveys.
Investigating titles (co-operating with Company Attorney).
Keeping up status map and record of transactions.
Compiling records pertaining to timberlands.

(b) Making timber estimates and preliminary railroad surveys to assist Operating Superintendent in determining best methods of development.

(e) Keeping informed as to available supplies of various species, both on Company owned, and on other lands within shipping distance of the mill.

(d) Inspecting cutting operations with view to advising on best method of handling various types.

(e) Supervision of forest nursery and planting operations.

(f) Protection of Company owned lands from trespass, fire, insects, etc.

(g) General forestry activities, such as utilization investigations, co-operating with various public agencies devoted to forestry matters, keeping posted on forestry and land legislation, etc.

This field is large, and one which will not be entirely covered for several years to come, owing to certain of the activities being of more urgent nature, temporarily, than oth-

A splendid stand of Chestnut, Oaks and Poplar in the Southern Appalachians.
most entirely directed to current operations, to making preliminary railroad surveys, securing rights of way, estimating minor watersheds, etc.

The current woods operations of the Company are many, and diversified as to character. Three of them involve rather extensive railroad development, with steam machinery, and two of them are principally fluming propositions, although the combination of both these methods of transportation prevails on all the operations. Considerable preliminary work is necessary in determining which method or the extent of the combination of these methods is most economical for the various units. The factors to be considered are quantity of timber, character of timber, grades, available water, character of ground, etc. Much time must be devoted to this work when as many as five operations are under way at one time, and plans are always being made for beginning new ones.

As time goes on, however, purchase work and attendant title work should diminish, thus permitting attention to be centered upon operating and silvicultural problems. A very great amount of work will be necessary in order to get complete data upon which to base plans for getting the Company owned lands in the best condition to meet the future needs of the mill. Complete timber inventories must be obtained, growth studies made, requirements figured, amount of available wood from outside sources estimated, etc.

The problem of handling any considerable forest area in the Southern Appalachians to greatest advantage for future production is a difficult one. Even within the Company owned boundaries are found more than fifty species of commercial trees, occurring in a great variety of combinations (types) over a wide altitudinal range, with diversified topographical features. To determine the silvicultural requirements of these many types is difficult, and after this shall have been done there will arise the problem of making the method of cutting and skidding the timber to conform to these requirements, e. g., in the spruce type it is probably most advisable from a silvicultural standpoint to cut the trees to a diameter limit, leaving young saplings and poles for second growth. However, the only economical methods thus far found for operating in this type employs large overhead steam skidders which, in snaking or pulling in the logs, do great damage to the trees which have been left standing.

The question of utilization is also a broad one. With the many different tree species of the Southern Appalachians, and the many products that can be obtained from them, it will probably be at a very distant date that the ultimate in utiliza-
tion of them will be attained. Possibilities are continually presenting themselves in the way of new industries or in the raw material which might be employed in existing industries.

Then there is also a large field for the Forest Engineer in determining the best plan of management of the Company owned lands, which are suitable for other purposes than tree growth, or which have upon or within them, merchantable products other than timber. There are always within large timber boundaries of the Southern Appalachians, areas which make splendid farms, areas which afford a good stock range, areas which are well adapted to grass, areas which give indications of valuable mineral deposits, and last but not always of least consideration, areas splendidly adapted for game and fish preserves, which are in demand by clubs. It is not always an easy matter to determine how or when these various areas should be developed, and much study is required in connection with this problem.

To completely enumerate the phases of the work of a Forest Engineer, to a large pulp and lumber company, owning an extensive area of mountain land, is almost impossible. The number of activities which will receive his attention are limited mostly by his knowledge, ability and energy.