

THE PULP AND PAPER INDUSTRY OF CANADA



Paper

This is a book about paper: where it comes from, how it is made, the people who make it, and the way it is used. It is the story of a useful and essential product and of an enterprise that, more than any other, benefits every Canadian.

Paper is the basis of social, intellectual, and economic advancement. It is the handmaiden of commerce and of culture, the universal container, and the courier of news. In a variety of forms it is also used in immense quantities for construction and industrial purposes.

Owing to its versatility paper is everywhere. It appears as book and writing paper, wrapping paper, paperboard, building board, and newsprint. It is used for everything from newspapers, books, and magazines to tea bags, shipping containers, dollar bills, wall board, and wallpaper.

Its importance in day-to-day living cannot be exaggerated. Everything is either written on it, made of it, wrapped in it, designed on it, or sold by it or in it. Paper, transports and sells goods and communicates ideas and, in doing so, adds ease and comfort to life.

Without paper, early man scratched pictographs on cave walls, or carved them in wood and stone. The Babylonians etched their ideas on clay tablets and the Greeks wrote on parchment or carved in marble. The Egyptians made papyrus by weaving reeds into flat sheets which they rubbed to a smooth surface.

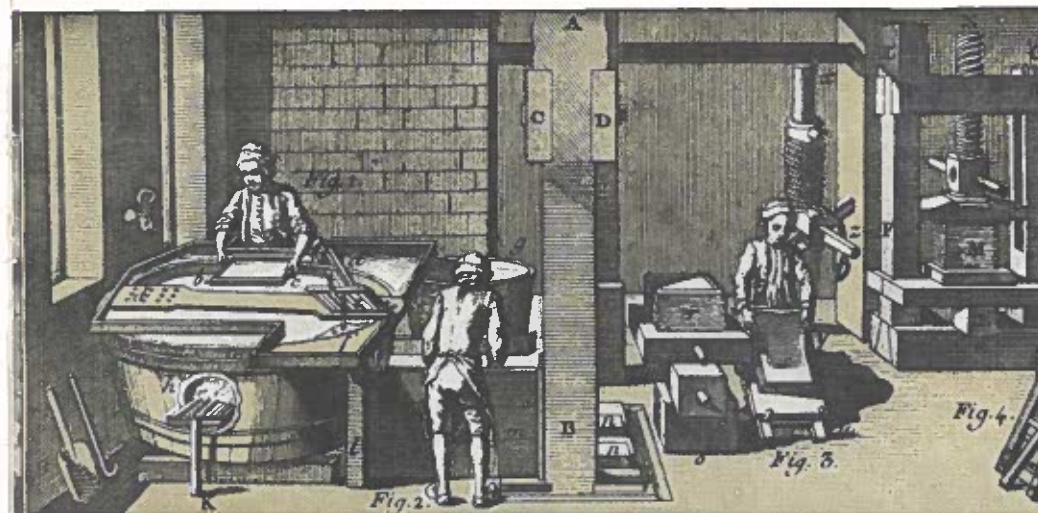


The early Chinese discovered how to make paper from pulp.

Below: In this 18th century French mill, mechanical means were used to press and dry the wet layers of pulp to form paper.

For containers, people originally used leaves, bark, animal skins, or clay. Sacks were woven from animal and plant fibres and larger containers were made of wood or metal. These were the forerunners of all our modern containers: the paperboard boxes that carry and protect everything from corn flake to washing machines; the paper bags and sacks that move everything from groceries to chemicals; and the glittering cellophane, also made from wood pulp, that protects, reveals, and helps sell merchandise.

The Chinese of the early Christian era were the first to make paper. They made it by soaking and pounding rags and plant fibres into a watery pulp which they poured onto a bamboo screen. As the water drained off, a thin layer of pulp was deposited on the screen. The sheet of wet pulp was carefully lifted out and, as it dried, it matted into a sheet of paper. Basically, this is the same process that is used today, but machines have replaced hand methods, and wood, rather than rags, is the principal raw material.



In Canada

Canada's first paper mill was established in 1805 in St. Andrews, a little village near Lachute in Quebec. Its output consisted mainly of wrapping and printing papers which were sold to local merchants and publishers. Rags were the raw material and they were converted into paper by hand. A mill built near Toronto in 1826 was the first in Canada to have a paper-making machine.

Throughout the nineteenth century, there was a great growth in the demand for paper. At the same time there was a continual scarcity of rags from which to make it. But processes were soon developed for converting wood into pulp and then into paper. The first mill in Canada to make paper from wood was established in 1864 at Windsor Mills in Quebec where the pulp, or wood fibre, was obtained by cooking wood chips in a chemical liquor; a second mill, built in 1869 at Valleyfield, Quebec, was the first in Canada to produce pulp by pressing logs against a grindstone. By 1900 Canada had more than fifty pulp and paper mills. Virtually all of their output was sold in the domestic market.

In the early years of the twentieth century, one by one the Canadian provinces restricted the export of pulpwood cut on Crown lands. So the papermakers of the United States, many of whom had been buying wood in Canada to supplement their own forest resources, began to buy Canadian woodpulp which they made into paper. This partly met their needs. But the demand for paper, particularly from the newspaper publishers, continued to grow. So in 1913, the United States removed its tariff on newsprint, the paper used by newspapers. This permitted the Canadian mills to sell in the world's largest newsprint market. The result was the expansion of the Canadian newsprint industry which to-

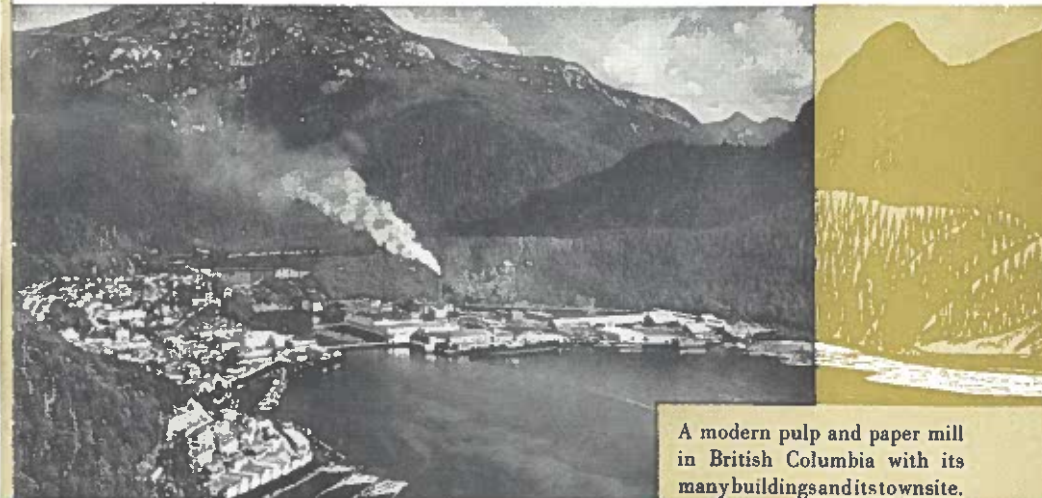
day supplies four-fifths of the needs of the United States and, indeed, half the newspaper pages of the world. In the meantime, too, the volume of pulp produced for sale also increased substantially and Canada now is the source of one third of the world's international trade in wood pulp.

With the growth of the newsprint and pulp industries, the Canadian mills also greatly increased their output of book, writing, tissue, wrapping, and other papers, and of paperboard. For example, paperboard production is five times greater than it was twenty-five years ago.

While more than ninety per cent of Canada's output of pulp and of newsprint paper is sold in foreign markets, most of her production of other paper and paperboard, owing to tariff restrictions abroad, finds its chief market at home. Hence, the great increase in the demand for these grades and for paperboard chiefly reflects, not only the increasing use of paper, but also Canada's growing population and her higher standards of living. All told many hundreds of varieties of paper and paperboard are made in Canada today.

The growth of the industry through the first three decades of the present century was interrupted by the depression of the 1930's. Later came six years of war during which the industry was called on to supply increasing quantities of pulp and paper products essential to the Allied cause. Following the war, the mills once again expanded their output to meet the needs of their customers at home and abroad. New products were developed and plants were modernized and expanded. The expansion of the industry in the post-war period more than kept pace with the industrial growth of the nation as a whole; and today it occupies its traditional position as the nation's leading manufacturing enterprise.

An early Canadian paper mill, built at Crook's Hollow near Toronto, Ontario, in the year 1825.



A modern pulp and paper mill in British Columbia with its many buildings and its townsite.

From the forests

Most paper is made from wood. And most of the wood used by the pulp and paper mills is harvested from the publicly-owned forests that they lease from the provinces. The companies are tenants on these woodlands. They are good tenants: they make useful products from the forest crop; their great world trade generates income for all Canadians; and they manage their forests to yield wood forever.

The mills are vitally interested in forest conservation. They are leaders in fire prevention, insect control, and the tree farm movement; they conserve the forests by reducing waste; and they have added value to the forests of Canada because, for the most part, they utilize trees that could never make anything but poor lumber. Their forests are the best managed and best protected in the land.

Harvesting wood and moving it to the mills is no haphazard operation. Long-term harvesting programs are carefully planned by trained foresters, and these plans together with the operating methods used must be approved by the government foresters. To assure the growth and proper utilization of the crop, cutting methods are based on the best scientific knowledge available. Woods work no longer requires merely strong backs, rather it is a complex industrial undertaking requiring modern skills and technical knowledge.

East of the Rocky Mountains, work in the forests is generally a seasonal occupation. Most of the wood is harvested in the winter, for summer work is impossible in many areas owing in part to insects, and in part to swampy land which prevents the movement of vehicles.



Much of the work is mechanized and most trees are now felled and cut into lengths with power saws. Increasingly is the wood moved in the forest to the hauling roads with specially devised machines. And from the forest roads the logs are generally moved by truck to the nearest river or lake where they are dumped on the ice to await the spring thaw and the annual river drive.

Despite the increasing movement of pulpwood by other means, the river drive remains the chief method of moving wood from the forests to the mills. In it, vast tonnages of pulpwood are moved great distances, often from areas where there is no other possible means of transportation. The drive begins with the spring thaw when the logs, piled on the frozen rivers and lakes during the winter, start their rough-and-tumble trip down the swollen waterways to the mills. It is one of the most colorful of all industrial operations. Success depends upon the nimble footed "draveurs", who with peavy and pike-pole, shepherd the logs through the maze of rivers and lakes that wind through the woodlands.

West Coast forest operations differ from those east of the Rockies owing to the mountainous terrain and the larger sized trees on the Pacific slope. Some of them may be six feet in diameter and 200 feet tall. In addition, the climate permits year round operations in the woods. In British Columbia the forest work is completely mechanized, the trees are cut with power saws and the logs are moved by a rigging attached to a high, strong tree. Then they may be stacked, or moved by great tractors or trucks to the mills. Sometimes the logs move directly into tidewater where they are chained into huge rafts which are then towed through the coastal waters to the mills.



Pulpwood is generally harvested in the winter when it is easily moved from the forest to the waterways.

In the spring drive, the logs are floated from the forest to the pulp and paper mills.



To the mills

When the pulpwood arrives at the mill it moves up a conveyor, called a jack-ladder, into huge revolving drums where the bark is removed. Then the logs go to the wood pile where they stay until they are needed for pulp-making, the first step in converting wood into paper.

Wood is composed of fibres and of lignin, the binder that holds the fibres together. In pulp-making, the logs are either pressed on a grindstone, or, after being cut into chips, cooked under pressure in an acid or alkaline liquor in huge kettles called digesters. In the grinding process, pulp is made simply by shredding the wood; but in the cooking process the liquor dissolves the lignin which holds the fibres together. The first method produces groundwood pulp, sometimes called mechanical pulp; and the second produces chemical pulp of which there are three chief types: sulphite, sulphate or kraft, and soda pulps.

The pulp is cleaned by running it through screens which remove coarse particles. It may be further purified by washing or by bleaching. Sometimes, before being made into paper, chemicals or dyes are added to the pulp or several kinds of pulp are mixed together. This is done to give the finished paper greater strength, to colour it, or to endow it with special folding or printing qualities.

Some mills make only pulp. Others make only paper. But most make both pulp and paper by a continuous process similar to the newsprint process illustrated on the next page.

The fundamental phenomenon of papermaking is that wood fibres when wet will adhere one to the other as the water is evaporated. The

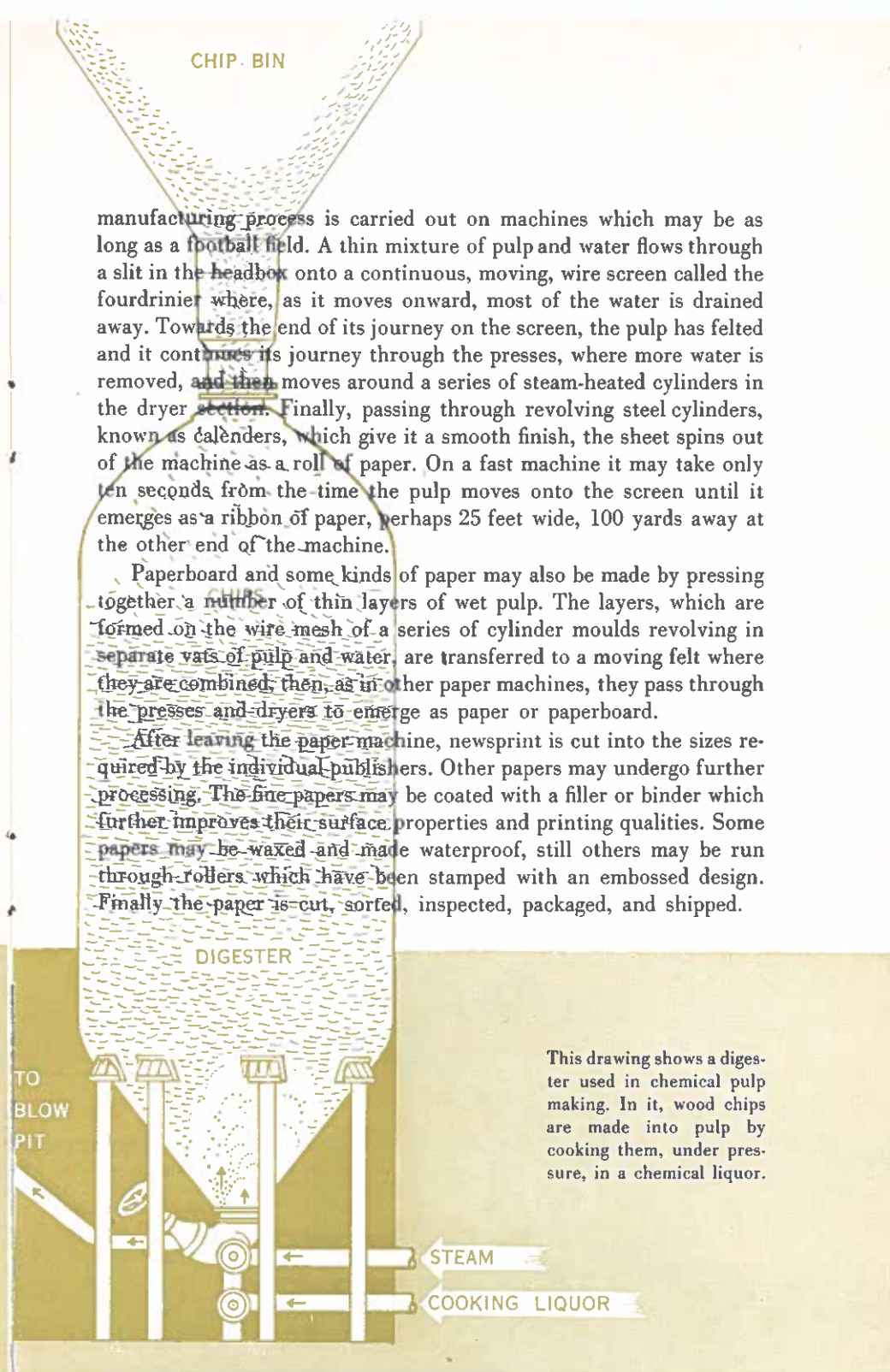
manufacturing process is carried out on machines which may be as long as a football field. A thin mixture of pulp and water flows through a slit in the headbox onto a continuous, moving, wire screen called the fourdrinier where, as it moves onward, most of the water is drained away. Towards the end of its journey on the screen, the pulp has felted and it continues its journey through the presses, where more water is removed, and then moves around a series of steam-heated cylinders in the dryer section. Finally, passing through revolving steel cylinders, known as calenders, which give it a smooth finish, the sheet spins out of the machine as a roll of paper. On a fast machine it may take only ten seconds from the time the pulp moves onto the screen until it emerges as a ribbon of paper, perhaps 25 feet wide, 100 yards away at the other end of the machine.

Paperboard and some kinds of paper may also be made by pressing together a number of thin layers of wet pulp. The layers, which are formed on the wire mesh of a series of cylinder moulds revolving in separate vats of pulp and water, are transferred to a moving felt where they are combined, then, as in other paper machines, they pass through the presses and dryers to emerge as paper or paperboard.

After leaving the paper machine, newsprint is cut into the sizes required by the individual publishers. Other papers may undergo further processing. The fine papers may be coated with a filler or binder which further improves their surface properties and printing qualities. Some papers may be waxed and made waterproof, still others may be run through rollers which have been stamped with an embossed design. Finally the paper is cut, sorted, inspected, packaged, and shipped.



The log pile identifies a pulp and paper mill.



This drawing shows a digester used in chemical pulp making. In it, wood chips are made into pulp by cooking them, under pressure, in a chemical liquor.

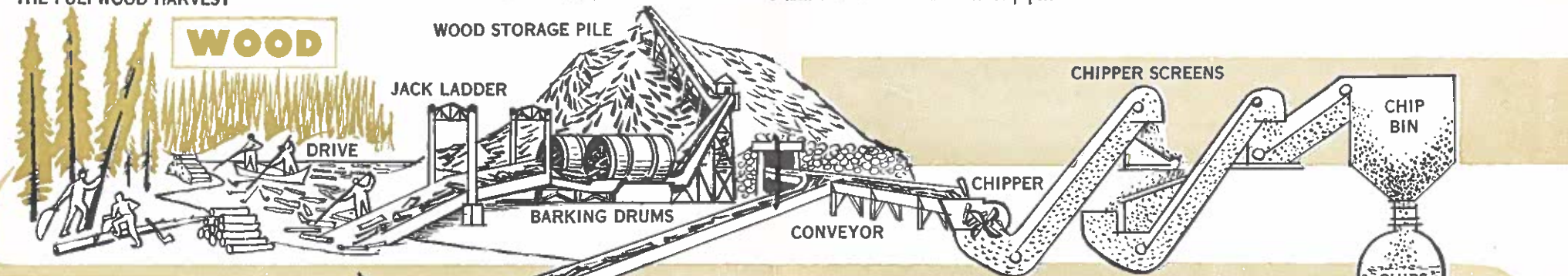
FLOW CHART OF THE NEWSPRINT PROCESS

Newsprint is produced from a mixture of groundwood pulp, made by grinding wood on grindstones, and chemical pulp, made by cooking wood chips in huge digesters. The pulp mixture flows onto the paper machine where, as the water is removed, the wood fibres adhere to each other and form a ribbon of paper.

THE PULPWOOD HARVEST

WOOD

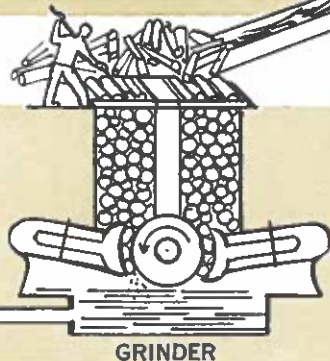
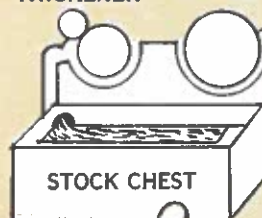
WOOD STORAGE PILE



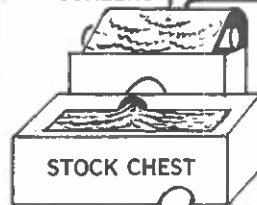
GROUNDWOOD PULP

PULP

THICKENER SCREEN



SCREENS

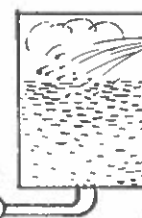


KNOTTER SCREEN

WASHER

SULPHITE PULP

BLOW PIT



DIGESTER

STEAM

COOKING LIQUOR

PROPORTIONER

MIXED STOCK CHEST

PAPER

THE WEALTH MAKER

The operations of the newsprint mills, the producers of pulp, and the manufacturers of all the other kinds of paper and paperboard benefit every Canadian. Prosperity in pulp and paper and in Canada are inseparable.

HEAD BOX

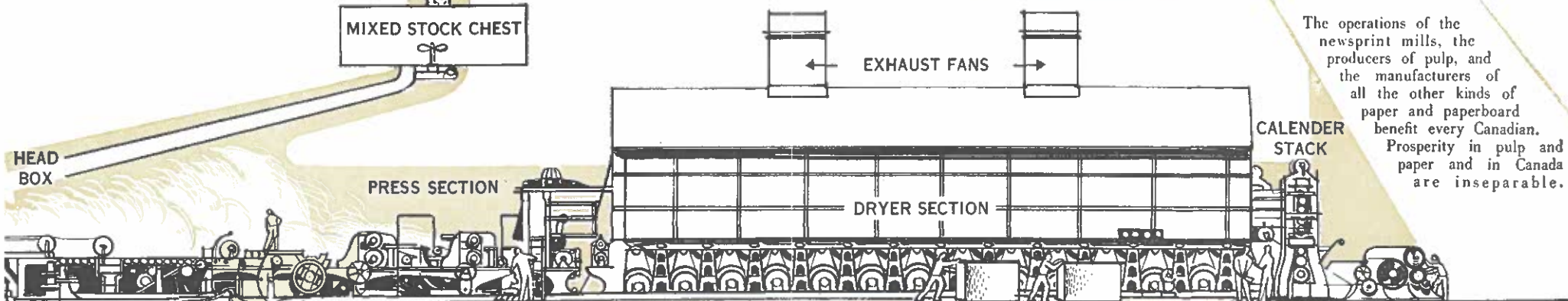
PRESS SECTION

DRYER SECTION

CALENDER STACK

EXHAUST FANS

FOURDRINIER



To become

The output of the Canadian mills is divided into four broad groups: pulp for sale, newsprint, paperboard, and a wide variety of other papers and boards. The last group includes book and writing, wrapping, tissue and sanitary, industrial and commercial papers, together with building papers and building boards.

Most of the pulp which is sold is exported, chiefly to the United States, where it is converted into paper and paperboard. Some highly-refined chemical woodpulp go to the chemical industry for the production of a variety of products: rayon, photofilm, cellophane, plastics, explosives, and artificial sponges and leather. These high quality pulps are sold in Canada, the United States, and overseas. Pulp exports alone account for some seven per cent of all Canada's exports.

Newsprint, both in volume and value of production, is the leading product of the industry. It is made from groundwood pulp with some chemical pulp added to give it strength. The annual output now exceeds six million tons of which only some six per cent is consumed in Canada. The remainder is exported, chiefly to the United States, making Canada the world's leading exporter as well as producer of newsprint. Canada accounts for half the world's newsprint production.

In volume of output, the paperboard mills rank after the newsprint mills. Paperboard serves many purposes. As container board it is used for heavy cases that carry everything from canned goods to refrigerators. And as boxboard it not only permits mass pre-packing of nearly every consumer product, but adorns and helps sell it as well. Indeed more paper and paperboard is used today in the manufacture

of containers than tin, steel, glass, plastic, and all other packaging materials combined. Its use has contributed significantly to changing distribution methods and has permitted the development of the chain store and the super-market, the shopping centre, and the frozen food industry. Paperboard is truly the universal container.

The finest grades of paper are still made from rags. And the Canadian fine paper mills produce a substantial tonnage of rag or partly rag papers. But most fine papers, like the paper in this book, are now made from carefully bleached chemical woodpulp. There are more than five hundred different kinds of fine papers produced in the Canadian mills. They all have lasting qualities and are generally used for permanent records and in books.

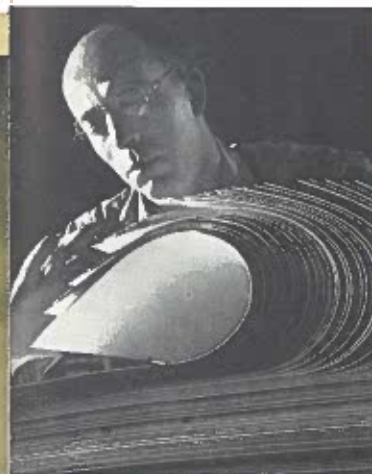
The industry also has a substantial output of wrapping paper, made chiefly from kraft pulp. Kraft paper, as it is known, is the most versatile quality of paper made. Owing to its great strength it is used for multi-wall sacks that carry everything from sugar to cement, for refrigerator bags, and for ordinary wrapping purposes. Some of its other uses are for coin wrappers, gum paper, paper towels, and for heavy-duty envelopes.

Then, too, the mills make many special products such as tissue paper, and the paper for drinking cups, pie plates, ledger sheets, and roofing. They make building boards of many kinds including wall board, ceiling tile, decorative board, and hardboard which is superior for many purposes to the wood from which it is made. The by-products resulting from the output of these primary products include alcohol, yeast, vanillin, cement additives, soil stabilizers, road binders, turpentine, tall oil, and chemicals used in tanning leather.

NEWSPRINT



PAPERBOARD & WRAPPING



FINE PAPERS

PULP FOR EXPORT & CHEMICAL INDUSTRIES





People

A roll-call of all the skills employed in pulp and paper making sounds like a directory of occupations. In addition to actual pulp-makers and paper-makers, those who work in the industry include veterinarians and plumbers, foresters and waitresses, economists and cooks, labourers and accountants, salesmen and research workers, aviators and mechanics, stenographers and dieticians, lumberjacks and machinists, psychologists and millwrights, and all manner of engineers. They all help to make products essential to human needs and human progress everywhere.

In its woodlands, the industry employs not only engineers and foresters, but also men skilled in harvesting wood, and those capable of moving it by land, by river, by lake, and by sea, not to mention those needed to provide food and living accommodation for men in the woods. Thus, in the industry's woods operations are also found doctors, carpenters, pilots, road builders, rivermen, photographers, paymasters, store-keepers, electricians, and firemen.

In the mills, all the skills, trades, and training required in any sizeable community help to convert wood into pulp and then into paper. There are the technical and non-technical people directly concerned with production; then there are town planners, lawyers, chauffeurs, personnel people, hotel managers, purchasing agents, nurses, and policemen.

There are 70,000 permanently employed people in the pulp and paper mills and woodlands, more than in any other Canadian Manufacturing in-

A high-rigger tops a giant west-coast tree.

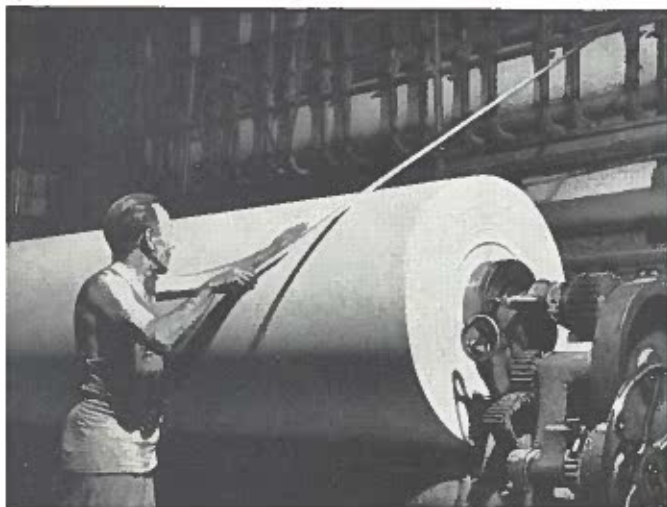


dustry. Another 230,000 seasonal workers, who generally work on farms or construction projects in the summer, earn good wages in the winter by harvesting and moving the pulpwood to the mills. All in all, the industry employs more people and pays more in wages than any other Canadian manufacturing industry.

Those who work in the industry may be employed in small woods communities or in great cities. Many work in the pleasant and well-managed mill towns where are provided modern schools and hospitals, community clubs, and excellent recreational facilities.

Unions are a firmly established part of the Canadian industry. There are locals in nearly all mills, and the relations between workers and management have been excellent over a long term of years. Wage rates and annual earnings are generally higher in pulp and paper than in other manufacturing industries. In addition, pulp and paper has been a leader in providing social benefits for its workers.

Supervisory positions in the industry are filled by men of experience: some have started in the mills, some in the forests, some in the office. Some are technically trained, either through their own efforts or by graduation from a university. Throughout its operations the industry provides opportunities for personal development and for advancement, especially for those with imagination and broad horizons.



Newsprint spinning from a large paper machine.

Pulp and paper is Canada's leading industrial employer and wage payer.



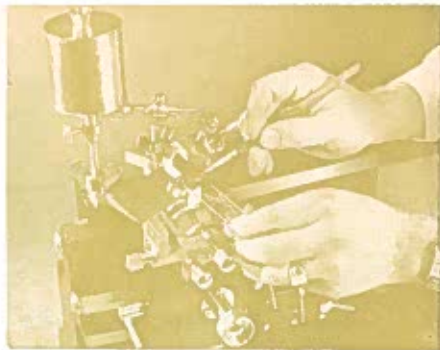
Research

The progress of the pulp and paper mills in their manufacturing methods, in the quality and variety of their products, and in the skilled management of their woodlands reflects the industry's awareness of, and activity in the fields of fundamental and applied research.

Research in the industry is continuous. It goes on in the mills, in universities, and in the forests. The purpose is always the same: to keep the industry in the forefront of progress. The relentless search for the secrets of wood and its products is ever increasing the value of the industry to the nation.

The companies sponsor, in cooperation with the Federal government and McGill University, the Pulp and Paper Research Institute of Canada, a centre of research and learning recognized throughout the scientific world. Its researches cover every aspect of converting wood into pulp and paper: from growing trees and forest management to the basic chemistry of wood and its manufacture into its many products. The Institute has helped to develop new processes, apparatus, and methods that have created more efficient operation and less waste both in the mills and in the woods.

The research program of the Institute is broad in its scope and in its application. In addition to being a source of knowledge for the industry it has, through its fundamental research projects, benefited



other industries and served to increase scientific knowledge everywhere. It has also been a source of trained technical and scientific personnel for industry. Significantly, the work of the Institute has not alone advanced the pulp and paper industry, but has benefitted the nation's industry as a whole.

The industry also sponsors two other scientific bodies: The Technical Section and Woodlands Section of the Canadian Pulp and Paper Association. These two learned societies conduct technical studies and carry out experimental projects in the mills and in the woods. They work closely with the Research Institute and from time to time suggest research projects related to day-to-day technical problems.

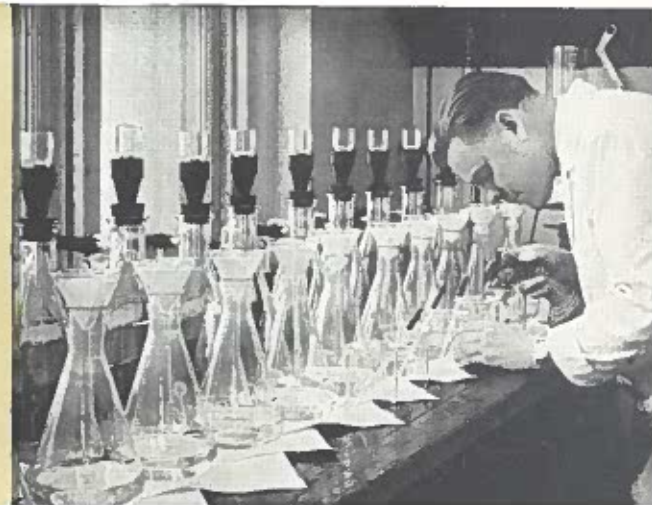
Research in the individual mills has generally been directed towards practical ends. Nevertheless, many companies conduct fundamental research. From company laboratories have come new products, by-products, and methods of recovering valuable chemicals from hitherto waste material.

As a result of research, forest operations have been improved. And new cutting methods that promote regrowth have been developed. In the tree farms, nurseries, test plots, and test forests that they operate, the companies conduct long-term projects aimed at conserving the forests, protecting them from insects and disease, and increasing their rate of growth.

Research has benefitted the industry and, in so doing, has benefitted Canadians. It is creating new and better products and by-products. And it is increasing the productivity of the forests, the source of the industry's raw material.



Research into every aspect of the conversion of wood into pulp and then into paper is conducted in the individual mills and at the Pulp and Paper Research Institute of Canada, located in Montreal.



In addition

Besides making products essential to mankind everywhere, pulp and paper is the largest single creator of wealth in the nation. The total value of its products equals that of all minerals produced in Canada including precious and base metals, iron ore, petroleum, coal, and asbestos. And amidst all producers, pulp and paper stands first in employment, capital invested, wages paid, purchases, and in value of production and of exports. So, directly and indirectly, the industry generates at least one dollar in eight of the income of every Canadian. And the standard of living throughout the Canadian nation largely depends on the well-being of this great industrial enterprise.

Located from coast to coast, the 130 mills of the pulp and paper industry are Canada's largest single manufacturer and the nation's greatest breadwinner. Their exports account for practically a quarter of the value of all Canada's exports and a third of the value of her exports to the United States. The industry thus provides a major part of the money needed to pay for all the essential goods Canadians must have from many other countries.

The wealth created by pulp and paper reverberates throughout the land, multiplies itself, creates employment for hundreds of thousands of people in countless other enterprises, and benefits every individual Canadian from corner grocers to bank presidents. The mills use a quarter of all the electric power consumed in Canada and, in many instances, were responsible for the development of power sites that

made electric energy available for other industries and for domestic consumption. They spend hundreds of millions of dollars each year for chemicals, fuel, and other mill supplies.

The pulp and paper mills are the largest users of the railways in Canada. One of every ten revenue freight cars loaded carries paper, paperboard, pulp, or pulpwood. Through purchases of agricultural products and of pulpwood, the industry also benefits farmers, many of whom work in the woods in their off season. Finally, the companies expend vast sums every year to improve and expand their operations in the mills and in the woods. All of which generates employment and expenditures in other industries and gives momentum and vitality to the whole fabric of Canadian business.

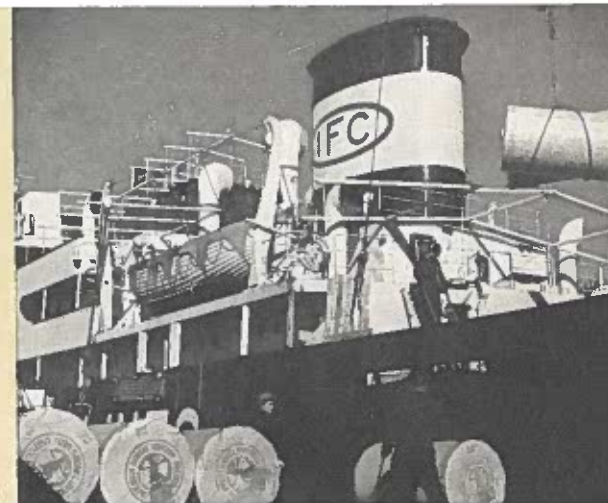
The industry is a leading taxpayer. Its annual payments of some \$200 million to federal, provincial, and municipal governments help to provide the funds for essential government services, and for all the social and other benefits governments provide.

Pulp and paper is a great native Canadian industry. It has assured the future of its woodlands in perpetuity. It provides products essential to civilization. And it has progressed against world competition without subsidies, price floors, guarantees or similar forms of public financial assistance. In peace and in war, the pulp and paper industry has always been a contributor to Canada and never a drain on the public treasury. Canadians have no more valuable asset, nor any more worth their continuing interest and care.



Newsprint being wrapped for shipment to newspaper publishers of the world.

In value of production and of exports, pulp and paper leads all other Canadian industry.



CONSERVATION



The pulp and paper companies of Canada operate their forests on a perpetual yield basis. They grow more wood than they cut. Thus they manage and conserve their woodlands in order that they may remain forever a great natural resource providing wealth for all Canadians for all time.



July, 1956

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