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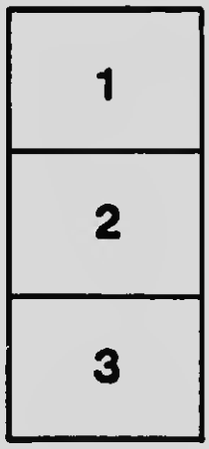

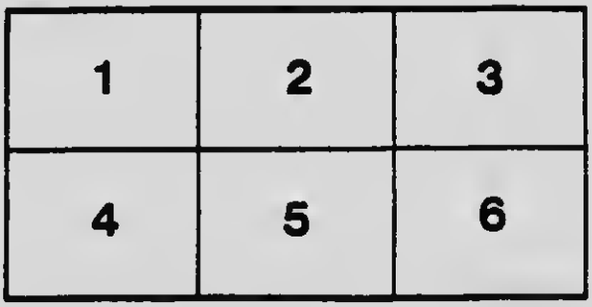

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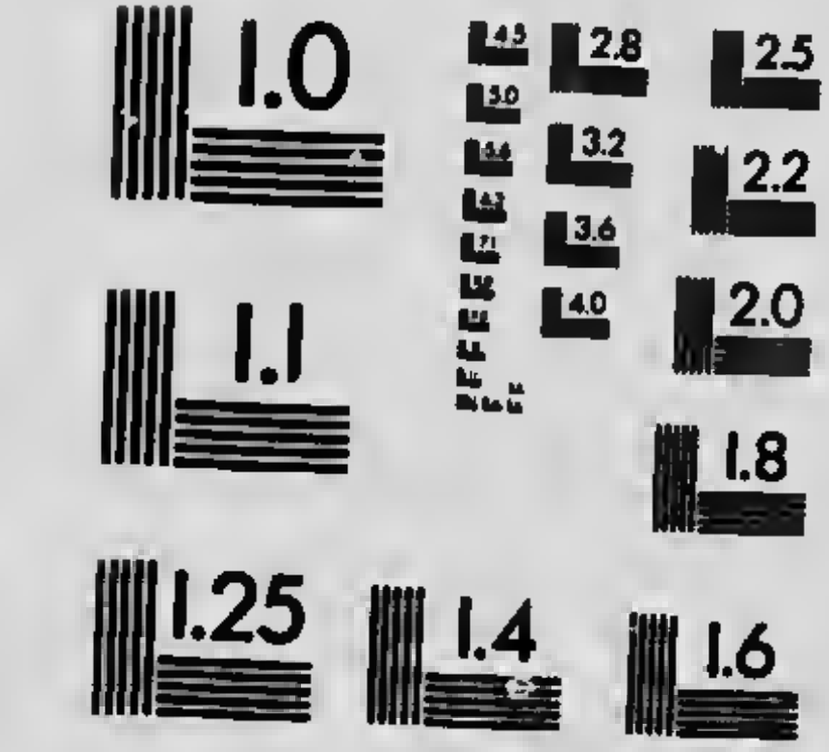

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SOME FACTS ABOUT CANADA'S PULP AND PAPER INDUSTRY


CANADIAN PULP & PAPER ASSOCIATION
CPPA
MONTREAL

SOME FACTS
ABOUT CANADA'S PULP AND PAPER INDUSTRY

CANADA is the second largest pulp and paper producing country in the world, and is rapidly overtaking the United States, which holds first place.

***

Paper was first made in Canada at St. Andrews, Que., in 1803.

***

Canada's first large paper mill was built in 1865, and produced 1½ tons of paper in 24 hours. To-day a modern paper mill produces from 250 to 300 tons in the same length of time.

***

Prior to 1800 all paper was made of rags. Since that time wood-pulp has formed the basis for all the ordinary grades of paper, including that used for printing newspapers.

***

Canada's pre-eminence as a paper-producing country lies in the possession of hundreds of thousands of acres of pulp-wood forests and to conveniently located water-powers.

***

Canada has the largest forest area of any country in the British Empire.

***

Canada's forests embrace 350,000 square miles of pulp-wood timber, estimated to yield 1,033,370,000 cords of pulp-wood.

Canada has developed water-powers estimated at 1,941,700 h.p., besides undeveloped water-powers incalculable.

***

There are 91 incorporated companies and other concerns in Canada engaged in manufacturing pulp or paper.

***

Their combined capital is estimated at $200,000,000, which is a greater amount of capital than is invested in any other industry, with the exception of hydro-electric power development.

***

The total annual output of the Canadian pulp and paper industry exceeds in value $85,000,000.

***

It gives employment to 25,000 individuals.

***

Its annual payroll exceeds $15,000,000.

***

It has sent more than 3,000 men to the war.

***

In 1890 Canada's exports of pulp and paper products amounted to but $120. In 1910 they were worth $10,000,000. For the fiscal year ending with March 31, 1918, they reached a total of $71,755,325.

***

Canada exported paper last year to the value of $37,742,697; pulp, $25,673,350; pulp-wood (unmanufactured), $8,339,278.

***

Last year's exports of pulp and paper exceeded those of the preceding year by $18,830,437.

Canada's pulp and paper exports lead all manufacturing industries, except that of explosives.

***

Last year's exports of pulp and paper products exceeded in value Canada's total industrial exports of 1913.

***

Canada's exports of pulp and paper products create "exchange" for Canada, in the United States, at an average rate of $205,000 a day for every working day in the year.

***

While the bulk of Canada's pulp and paper exports go to the United States, they are also sent to Great Britain, Japan, Australia, New Zealand, South Africa, India, Cuba, Mexico and South America.

***

In the first three months of 1918, Canada's exports of wood-pulp to Japan amounted to 11,394,629 pounds, an increase of 2,777,486 pounds over the corresponding period in 1917, and an amount equal to five times Japan's total imports of pulp from all other countries.

***

Canada produces for sale 2,525 tons of news-print paper and 2,500 tons of pulps of all kinds every day.

***

The United States has 2,500 daily and Sunday newspapers, and 14,000 weeklies, with an approximate total circulation of 71,000,000 copies.

***

With one-fifth of the world's population the United States consumes one-half of the world's production of paper. Canada, in proportion to her population, is a close rival of the United States as a paper-consuming country.

The newspapers of the United States consume 2,000,000 tons of news-print every year, of which Canada supplies, approximately, one-fourth.

***

In 1917, Canada produced 650,000 tons of news-print paper, of which 492,890 tons, or 76%, were exported to the United States.

***

Since 1912 Canadian-made paper has been admitted to the United States free of duty.

***

Canada has 138 daily, and 921 weekly newspapers.

***

It takes the product of 20,000 acres of pulp-wood forests every year to supply Canadian newspapers with white paper.

***

Canadian newspaper publishers pay about $3,500,000 a year for their white paper.

***

Some of the largest Canadian and American newspapers consume from 50 to 100 tons of paper daily.

***

The daily consumption of newsprint paper in Canada is, approximately, 250 tons; in the United States, 5,750 tons.

***

Canada's daily output of paper, made into a continuous strip three feet wide, would be long enough to girdle the globe at the equator.

The principal pulp and paper mills of Canada are located in the provinces of Quebec, Ontario, New Brunswick, Nova Scotia and British Columbia.

***

Spruce, balsam fir, hemlock, jack pine, tamarack, poplar and basswood are used in the manufacture of pulp.

***

Quebec's annual production of pulp-wood exceeds 1,000,000 cords. Ontario comes next with about 800,000 cords.

***

It takes, approximately $1\frac{1}{2}$ cords of wood to make a ton of paper.

***

Spruce trees, best suited to the production of pulp, require from 100 to 150 years to arrive at maturity.

***

Reafforestation is practiced to a limited extent in some of the provinces.

***

Forest fires are a source of great loss to the Canadian pulp and paper industry and eat up millions of cords of wood-pulp every year.

***

Where coal is used to generate power in the operation of paper mills it takes, approximately, a pound of coal to produce a pound of paper.

***

The average labor cost of producing a ton of paper has increased 75 per cent. in the period 1912-1918.

HOW PAPER IS MADE

The first step in the process of converting a standing tree into a sheet of white paper takes place in the forest, it may be 200 miles or more distant from the paper-mill proper. The tree is cut down and in time—it may be a year or longer—it finds its way to the storage yards at the mill. The logs are usually floated down to the mill on nearby streams; where streams are not available they are carried by rail.

The first step in the process of converting the wood into paper after the logs have arrived at the mill is that of removing the bark. This is accomplished by one of two types of machines. The first type is called the tumbler. It consists of a large cylindrical drum. Into this drum the logs, in 2-foot lengths, together with a suitable quantity of water, are introduced. The drum is then caused to revolve, and the friction of the logs against the side of the drum and against one another removes the bark. The second type is called a barker, or rosser, and consists of a heavy iron disk, provided usually with three knives fixed to its surface and projecting about half an inch from it. The disk is rotated rapidly and when the logs are pressed against its surface the bark is shaved off by the knives.

After being barked the pieces of wood are converted either into "mechanical" pulp or into "chemical" pulp. The former is not suitable alone for paper-making because it contains only about 55 per cent. of cellulose, which is the essential ingredient of the finished paper, and the fibres are too short and stiff to felt or interlace together properly; hence it is mixed with a certain quantity of chemical pulp which is pure cellulose with fibres of greater length.

Mechanical pulp or ground wood is produced by applying the pieces of wood by hydraulic pressure to the face of a large grindstone, usually about 54 inches in diameter and 27 inches thick. This grindstone rotates at a high rate of speed within a casing, which is pro-

vided with pockets into which the pieces of wood are introduced and pressed against the stone. The wood grinders are operated almost exclusively by water power, but are sometimes propelled by electricity.

The ground wood comes from the grinders in the form of slush, which is then screened in order to remove the coarser particles. In the older mills this screening is done in small troughs with fine screen plates in the bottom. Rotary screening is now coming into general use. The slush is run into a revolving cylinder with screen plates in its surface. The centrifugal force throws the finer particles of slush through these screens.

After the slush has been screened it is ready to be used for paper-making. Where the ground wood mill is a part of the paper mill, or not too far distant from the paper mill, the ground wood slush is piped in without converting into pulp. Where it is necessary to ship the ground wood by rail it is compressed until from 30 to 50 per cent. of the water is squeezed out.

THE SULPHITE PROCESS

Spruce wood, in addition to cellulose, contains a considerable amount of non-fibrous material, which is dissolved and separated from the cellulose by cooking the wood under pressure, with a solution of bisulphite of lime. This is known as the sulphite process. The wood is first chipped up into small pieces by a machine which consists of a massive iron or steel disk about 84 inches in diameter, with two or three steel knives projecting from the surface of this disk and radiating from the centre. This disk is caused to revolve rapidly, and the logs are applied to the surface of the disk, usually at an angle of 45°. The knives then chip off flakes of wood from the end of the log at that angle.

There are two methods of preparing bisulphite of lime for use in the sulphite process, designated respectively the "tower" system and the "tank" system. In the tower system, which is in most general use, sulphur is burned in specially constructed ovens with

a limited amount of air, so as to form sulphur dioxide gas. This is run out through pipes, which enter into a tank of water to cool the gas and then into tall towers, usually of wood, with a lining of lead. These towers may be considerably over 100 feet in height and from 5 to 10 or more feet in diameter. The towers are filled with blocks of limestone, and a continuous stream of water is introduced from the top of the tower. As the gas passes upwards through the limestone it enters into combination with the water and lime, so that the liquid flowing out at the bottom of the tower is a solution of bisulphite of lime.

In the tank system, otherwise called the "milk-of-lime" system, water and lime are mixed in a large vat, and the sulphur dioxide gas is forced into the mixture to form bisulphite of lime. The process varies in detail, of course, from plant to plant. An amount of sulphur approximating from 250 to 300 pounds is required in the production of a ton of air-dry pulp.

The chemical process of making sulphite is conducted in large boilers, commonly called "digesters." These may be of varying type, but the one in almost universal use is a tall cylindrical vessel, sometimes being of sufficient size to produce from 11 to 16½ net tons of pulp. The digesters are constructed of boiler plate and are lined with acid-resisting brick or tile set in acid-proof mortar. This, of course, is to prevent the acid developed in the process from corroding the metal of which the digester is constructed, but has also the further advantage of effecting a considerable saving in steam, because of the fact that this lining acts as a heat insulator. The digesters taper to a cone at the top and bottom ends.

The process of cooking varies considerably in different plants. In general, after the chips of wood and the bisulphite of lime have been introduced, the manhole is closed, and steam is gradually forced in at the bottom. This is continued until the steam pressure reaches about 80 pounds and the temperature about 365°. The process of cooking is continued about eight

hours. At the end of the cooking process the outlet at the bottom of the digester is opened, and the steam pressure quickly forces the material out into a large bin with a screen bottom, through which the liquid drains off. At this point the pulp usually is washed for about three hours by means of water delivered at the top of the bin. The ligneous and resinous portions of the wood, being in solution, to a great extent are washed away. Spruce-wood pulp obtained in this manner contains about 88 per cent. of cellulose, while untreated spruce wood contains only about 55 per cent.

Following this the chemical pulp is screened to remove coarse fibres, knots, slivers, and the like, in much the same manner as the mechanical pulp.

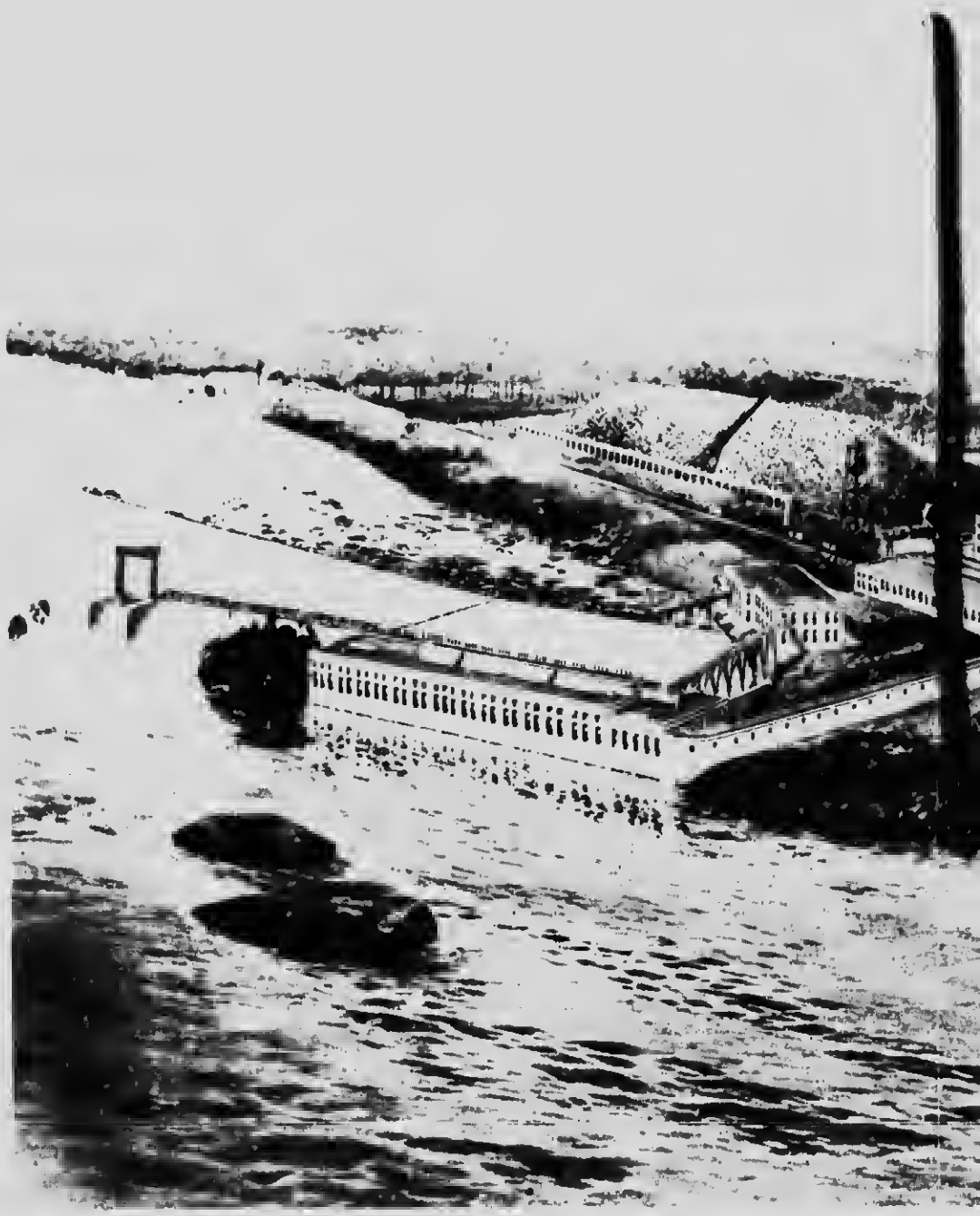
CONVERTING PULP INTO PAPER

The paper-making process proper begins in the "beaters," where the various component substances of the finished product are mixed.

The beaters are large receptacles of various types, the important common characteristic of which is a cylindrical roll fitted with steel or bronze blades, which revolves over a stationary concave bedplate equipped with similar blades. The pulp is caused to circulate in the vat so that all of it will pass under this roll about an equal number of times. At the beginning of the operation the roll is raised slightly above the bedplate and then gradually lowered as the operation is continued, until the fibres have been sufficiently torn apart, and the various ingredients have been thoroughly mixed.

In the case of newsprint paper the proportion of mechanical to chemical pulp varies according to the quality of the paper desired, type of machines, etc. On the average about 80 per cent. of mechanical pulp is mixed with about 20 per cent. of chemical pulp. Various other ingredients are also introduced, such as talc or china clay which is used as a filler to render the paper more opaque, and to give it a smoother surface,

A TYPICAL CANADI



A typical Canadien Paper Mill illustrating the process of turning logs into paper; on the extreme left are the falls supplying the motive p
pulp mill, after which it is pumped through the runway to the paper mill on the right. It will be seen that to facilitate handling th
which form the townsite. In many cases the mill is the only industry in the town.

ANADIAN PAPER MILL

plying the motive power, electricity. The wood is taken from the water and either stacked in the wood pile shown on side of river or sent to cilitate handling the railroad tracks run into the mill itself. In the background may be seen the homes of those employed in the mill and

and liquid rosin, which is used to "size" the paper so that the printing ink will not be absorbed and thus cause the impressions to become blurred. Red and blue aniline dyes are added, when obtainable, to make the paper white. Alum is also added to precipitate the rosin and the coloring matter upon the fibres.

After the beating process has been completed, the pulp, very much diluted with water, is run into a so-called stuff chest, in which it is kept in constant motion to prevent the pulp from settling to the bottom. From this chest the pulp or slush passes through a strainer and into a long narrow box placed at the head of, and across the full width of, the paper machine. Thence it overflows onto a wire screen belt consisting of fine copper wires, woven with 60 or 70 meshes to the inch. The length of this screen is often 75 feet and the width 150 or more inches. This belt moves forward on a series of rolls, and also has a lateral shaking motion. The pulp settles down upon this screen in the form of a wet sheet, much of the water draining through the mesh of the screen. Toward the farther end of the screen it passes over several vacuum boxes, which cause still more moisture to be sucked out through the screen. The speed at which the screen is run is as high in some cases, as 680 feet per minute.

At the end of the screen the sheet passes between two rolls called the couch rolls, the upper one of which is covered with a felt jacket. From the screen belt the sheet runs on to a woolen felt. Thence it passes between a series of so-called press rolls, the purpose of which is to squeeze out further quantities of water. Finally, the sheet is run over several large hollow cast-iron cylinders 4 or 5 feet in diameter, heated internally by steam. These rolls dry the paper thoroughly. The sheet then passes through the calender rolls, which polish the surface, and is wound upon a roll. The rolls of paper later are removed and rewound upon cores, the paper being trimmed and cut to the proper width at the same time. They ar then removed to the finishing room, where they are wound with

heavy wrapping paper to protect them in shipment, and from there are shipped to the newspaper establishments ready for the printing press.

CANADA'S TEN LEADING EXPORTS

(From the Annual Report of the Department of Trade and Commerce for the Calendar Year 1917.)

Grain and grain products (including flour)	$480,175,160
Explosives	434,970,810
Meats (beef, bacon and all other kinds)	77,040,771
Pulp and Paper products	*62,126,857*
Wood, unmanufactured	52,210,949
Dairy products (butter, cheese and milk)	52,959,684
Iron and steel products	43,929,069
Fish of all kinds	27,557,377
Vehicles	23,493,145
Copper	23,256,276

The Pulp and Paper industry is the largest of our *manufacturing* exports, with the sole exception of explosives.

WHAT PAPER AND PULP MEAN TO A COUNTRY AT WAR

A "scrap of paper" does not mean much to the German nation where the observance of a treaty is concerned, but as a means of carrying on the war it is of vital importance to them, and to all the nations engaged in conflict.

Early in the war Germany discovered that wood-pulp could be substituted for cotton in the manufacture of explosives and gun cotton.

Almost all of Sweden's pulp has been shipped to Germany for this purpose.

Thousands of tons of paper are used in despatches and military correspondence outside of the great volume of private letters between England and France, and all parts of the world.

Voluntary collectors are going through England gathering waste paper to be repulped and used for packing and washers in shells and bombs.

Great quantities of wrapping paper and cartons have been ordered by the U. S. Government for the packing of supplies.

The U. S. Government will use 100,000,000 pounds of paper this year for spreading information about the war. This is about four times the normal requirements.

Great success has attended the recent discovery that artificial cotton batting can be made from wood-pulp, and this, together with paper bandages for hospital use, has defeated the possibility of a shortage in these supplies.

Paper blankets are now being made for military use and will, no doubt, be available for civilian use in the near future.

In humorous vein the absolute dependency of the human race on "the Scrap of Paper" may be summed up as follows:

A PAPERLESS DAY

NO PAPER TO-DAY?
Is that what they say?
No checks, drafts nor notes—
No bills, blanks nor votes.
No letters from folks!
No need for dictation—
No bond in the nation.
No paper Containers,
No legal Retainers,
No paper men fawn,
No waste baskets yawn!
No parcels wrapped up,
No "scraps" for the pup!
No blotters to flout,
No dolls to clip out,
No crisp breakfast flakes,
No Parchment wrapped steaks!
No wrappers for Bread,
No books to be read.
No files to search through,
Why, there's nothing to do!

THE GHOST OF THE TREE

Strong as the weight of the avalanche,
Yet weak as brook-' ithed vapor,
I must obey—but then I sway—
Behold me—I am paper.

I am ha'nt of the heart of the Tree, the ghost of the hemlock and spruce,
Phantom of fibre and wraith of the wood by the axe of the chopper turned loose.
Cased in the coffining bark long was I hidden and furled,
But now by the manual magic of men I carry the news of the world.

I am free—free—free—
I, the soul of the Tree,
Joy and sorrow and terror or smiles—seek for them all through me.
Fame and name and shame,
To me they are all the same,
I carry them all to the ends of the earth,
Horror and pleasure and mourning and mirth,
And to me neither credit nor blame.

I am Paper, I am Paper, pallid spirit of the spruce,
Summoned far from soughing forests, patient servant for your use.
They were sent who stormed the mountains on which, silent and serene,
Crowding massed the ranks of woodland, mighty Army of the Green.
First the woodelves saw with terror flash and flicker of the axe,
And they watched the steady heaving of the broad, red-shirted backs;
Then they heard the pulsing chopping as the axes chocked and chocked,
And they felt the forest's tremor as the toppling giants rocked.
Then as back and ever backward were the elves constrained to flee,
On the bark they knocked and whispered: "Wake, O Genii of the Tree!"

I am Paper, I am Paper. Have you praises or abuse
For the message I am bearing ? ok to them, who set me loose;
Look to them who sent me . through the boiling sluices' jaws,

And to them who held the tree trunks to the yelling teeth of saws.
Yes, to them who tossed the gobbets of the sodden, dripping wood
To the slavering, grating grinder, grunting 'neath its iron hood.
For they free from solid fibre might and spirit of the tree
That in race o'er whirring steamdrums texture took and form in Me.
If I wrench your soul with anguish by the message that I bear,
Look to them who dull my whiteness those who spread the poison there.

I am Paper, I am Paper, standing ready for your call,
White and silent and unspotted; I am serf and slave to all.
Have you thought or inspiration?
Have you word to send or save?
I am waiting, calm and patient, still your servant and your slave.
Write! What is it, threat or secret, bargain, pledge, or sale, or boast?
Sign! Ah, mortal, I have bound you!
Mark you well the forest's ghost!
Here I stand and threat and mock you, shade of promise, debt, or fraud,
Work and pay or pray for mercy!
You are servant, I am Lord.

I am ha'nt of the heart of the Tree, the ghost of the hemlock an. spruce,
Phantom of fibre and wraith of the wood by the axe of the chopper set loose.
Bearing the news of the world, or message of cheer or of hope.
Binding to bondage of debt or of shame, or dragging a neck to the rope;
I, the soul of the Tree,
I hover from sea to sea —
Theirs the fault or theirs the praise who have helped to set me free.
Fame and name and shame;
To me they are all the same;
They who have dragged me out of the wood,
Be I for evil, be I for good, —
To them be the credit or blame.
Grim as the weight of the avalanche,
Yet weak as brook-breathed vapor,
I must obey—but then I sway:
Behold me—I am Paper.

HOLMAN F. DAY.

THE PULP AND PAPER INDUSTRY AND THE PERPETUITY OF OUR FORESTS

(From The Toronto Saturday Night)

Canada has the largest timber area of any country in the British Empire and the largest in the world, exclusive of Russia and the United States. Her area of pulp-wood forests alone spruce, balsam, fir, hemlock, jack pine, tamarack, poplar, basswood, birch and maple is estimated to cover 350,000 square miles and to be capable of yielding 1,033,370,000 cords of pulp-wood. Her forest products add upwards of $200,000,000 annually to the wealth of the country, and rank second among our wealth-producing resources.

Apart altogether, however, from their value as a wealth-producing agency our forests serve a still more useful purpose. They protect our arable lands from drought and devastation and keep them in a condition of productiveness. They also make possible our unrivalled water-powers, which are playing such an important part in our industrial development and upon which we must depend in greater measure as our fuel supplies become more and more exhausted.

To denude a country absolutely of its forests is to pave the way for its desolation, if not its ultimate destruction. China is pointed to as an example of what may befall a land which allows its forests to be destroyed. Once a country of vast wealth, both in timber and in agricultural lands, the removal of its forests allowed torrential rains to sweep down its unprotected hillsides carrying vast quantities of sand and gravel which covered and destroyed immense tracts of arable land and rendered them unfit for cultivation. To-day China is a desolate, treeless country, and finds great difficulty in wresting a meager sustenance from her impoverished soil. Other countries to a less extent, have suffered heavily through their improvident use of their forest resources. Where they have not utterly destroyed the productibility of their agricultural lands, they have been put to enormous expense to reclaim lands so misused. In some of them it has been possible to replant denuded mountain slopes, at great labor and expense, to cope with drifting sands and torrential rains, which threatened obliteration of their agriculture as well as the destruction of many of their villages.

A bulletin on this subject recently issued by the United States Department of Agriculture says that: "Injudicious clearing of land on which forest cover should always have been maintained has been one of the main causes of unnecessary land erosion in that country. Thousands of acres have been rendered uncultivatable

from this cause." The Department estimates the annual loss to the United States from this erosion of land at not less than $100,000,000.

In our own country we have samples of the ruin wrought by tree-destruction in the sterile and blackened fire-swept wastes of Northern Ontario and in the barren sand-covered areas in Quebec and other provinces.

The influence of trees upon climatic conditions is also an important consideration in the question of the preservation of our forests. Trees moderate the severity of both heat and cold. They equalize the rainfall, afford protection against hurricanes, retard the melting of accumulated snows, regulate the run-off to the streams and rivers, prevent floods and by equalizing the water-flow throughout the year render an incalculable service to our navigable streams and water-powers.

Contrary to a popular misconception, the forests of Canada are by no means inexhaustible. Neither are they, as some believe, self-perpetuating. From 35 to 75 years is declared to be the maximum life of our present forests at our present rate of consumption, and with our present meagre attention to reafforestation. Some of our once-important tree species are already practically extinct or rapidly approaching that condition. We no longer supply England with her oak for ship-building. White pine, our wood of greatest utility, is exhausted in Quebec. Spruce, once regarded as the only desirable species for the manufacture of pulp and paper, is being supplanted by inferior woods owing to its increasing scarcity. Trees which escape the woodman's axe not infrequently fall a prey to fire, to the natural elements or to disease.

In recent years the importance as well as the actual necessity of doing something to conserve and to renew our forest growths—if we are to continue to use them as a source of national wealth, as well as to enjoy the natural advantages which they undoubtedly bestow—have impressed themselves upon all who have given the subject any thought. The Government of the Dominion as well as those of the various provinces have taken some steps in the matter. But it has remained for private interests—the owners and the lessees of the timber lands—to attempt to meet the situation in a really effective way. This has been done by the organization of various co-operative systems of fire protection, by experimentation in reafforestation, and by the adoption of scientific methods of cutting, etc.

All these things, of necessity, consume capital. It takes a spruce tree, suitable for the manufacture of pulp, from 100 to 150 years to attain its full growth. Private capital engaged in the work of replanting our forests for the benefit of generations so far in the distant future, needs to have a broad vision and an undeniable faith. But private capital can only do its work

effectively where it is allowed an adequate return on its operations. If the people, as a whole, are unwilling to assume the burden of keeping up our forests and of looking to their future renewal by scientific systems of re-planting, if they continue to pass along this responsibility to the people who cut and manufacture the wood from our forests, they surely ought not to deal niggardly with them when fixing a rate of return which they may lawfully receive for their labors.

The pulp and paper industry, which is probably most concerned in the perpetuation of our wood supply, and which has shown a strong desire to do its share in bringing about such perpetuation, cannot be expected to work impossibilities. If it is to be held down to the point of a bare sustenance in the carrying on of its activities, it cannot be expected, nor will it be able, to devote the means necessary to the present upkeep and the future renewal of our forests. The question is one that should engage the attention of the authorities at Ottawa. For going on two years now they have been engaged in enforcing repressive measures upon our pulp and paper manufacturers, and have greatly reduced their effectiveness in carrying on this much-needed national service.