THE MODERN MANUFACTURE OF WRITING PAPER

Eastern manufacturing company

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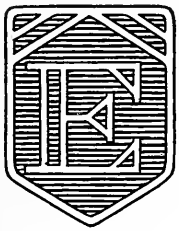
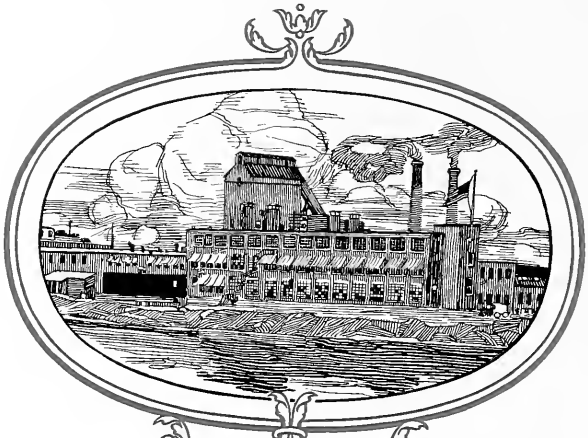


A STORY CONCERNING
THE MODERN PROCESSES OF MANUFACTURING
AN ANCIENT PRODUCT, WITH SOME SIDE-LIGHTS
ON ITS HISTORY



COMPLIMENTS *of*
THE EASTERN
MANUFACTURING
COMPANY
501 FIFTH AVE. NEW YORK
Mills at Bangor
and Lincoln,
Maine

THE MODERN MANUFACTURE OF WRITING PAPER

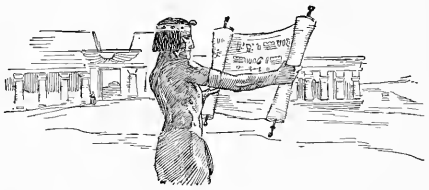
PRIMITIVE man first wrote on rocks. He used a crude, sharp-pointed instrument to illustrate familiar objects or to convey information. Rocks were sufficient for such simple purposes, but gradually, with the development of the race, man needed a more convenient medium on which to express his thoughts. Had he been rightly aware of it, he must have seen, here and there, the original paper-maker, the wasp, at work busily building its nest of pulp; but there is no record that man was wise enough to go to the wasp for instruction and borrow a useful hint. Instead, at a very ancient date, in widely separated quarters of the globe, he began to use various other materials—stone, clay, bark, papyrus, skins of animals, metal, wood, parchment, linen and wax. But paper, once discovered, rapidly outstripped them all, and since then human progress and civilization have been bound up with the art and science of paper-making. In this day and age, paper plays a vital part in each of the great activities of life—cultural, business, and social. Of course, the

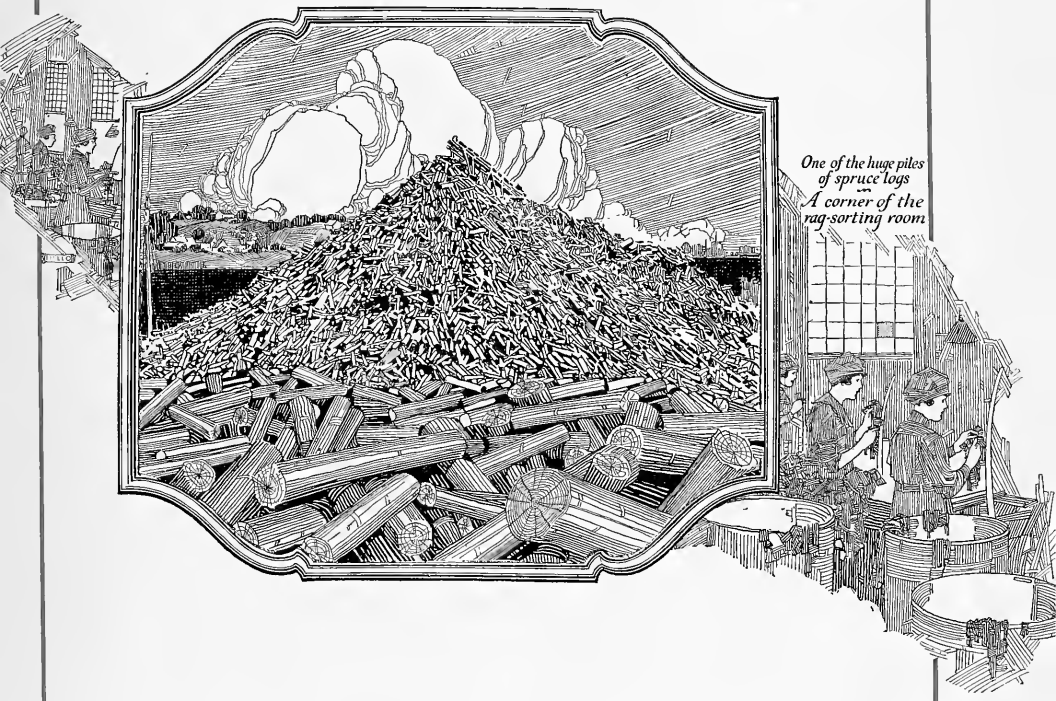
oldest known civilization in the world is that of China, and the Chinese are credited with originating the manufacture of paper, which they made of silk waste.

IN ANCIENT EGYPT

However, the earliest material resembling modern paper was made by the Egyptians from papyrus. An account of the manufacture of writing material from papyrus has been given us by the Roman historian, Pliny, whose description of the process forms an interesting comparison in the light of modern methods of manufacture. According to Pliny, the stem of the papyrus was cut into longitudinal strips, those from the center being, of course, the broadest and therefore the most valuable. These strips were laid on a board, side by side, until the desired width was obtained; across them another layer of shorter strips was laid at right angles. The two layers thus formed were then soaked in sacred water of the Nile. It is probable that they were joined either by the juice of the plant or by a thin gum. After soaking, they were pressed and dried in the sun. Any inequalities in the surface were removed by the use of an instrument made of ivory or shell. Newly made papyrus was white and flexible—not as we see it carefully preserved in museums, brown with age and so brittle as to break at the touch.

It is a far cry from these slow and laborious methods of the Egyptians to present-day methods as exemplified in the great mills of the Eastern Manufacturing Company; it is a far cry from the hand-pressed sheet of papyrus to the daily output of crisp, fine-surfaced Systems Bond, uniform year in and year out, with the water-marked sign of quality in every sheet. And in what this vast difference implies—the invention,





One of the huge piles of spruce logs

A corner of the rag-sorting room

ONLY by source-control of raw materials can a manufacturing plant become firmly established and its product be uniformly reliable. Here are shown a rag-sorting scene and one of the piles of four-foot logs cut from the Eastern Manufacturing Company's own sprucelands.

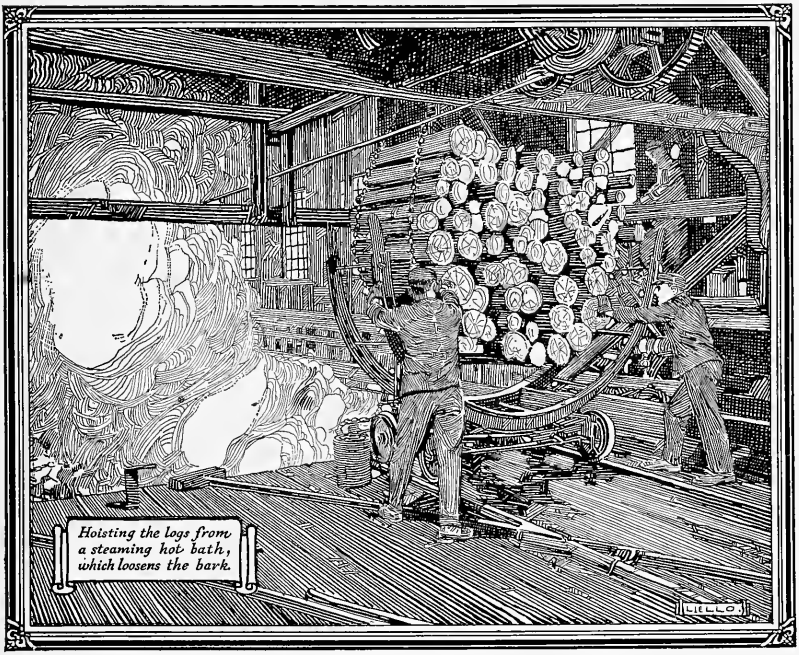
the enterprise, the diligent labor and craftsmanship of centuries—lies the whole romance of paper-making as we trace it briefly.

PAPER APPEARS IN EUROPE

By the Chinese the art of making paper from silk waste, or from the fibrous inner bark of mulberry trees and the fiber of the cotton-plant, reduced to a pulp, was made known to the Hindus and the Persians. In 704 A.D. a force of nomadic Arabs conquered the Persian city of Samarkand, where a paper manufactory had been established, and learned there the use of the material. From this time paper became available for the rest of the known world, the first paper manufactured in Europe being made by the Moors, in Spain.

Strange to say, the Moors seem to have overlooked the possibilities of one raw material for their industry, although it grew wild, literally under their very feet. This was esparto, a tough grass found in abundance in Spain and in the Barbary States of North Africa. Years later, this esparto grass was extensively used in the manufacturing of papers for printing purposes, especially in England, for an Englishman first discovered the process—but it never became an important element in the making of fine writing papers.

Meanwhile, knowledge of the art of paper-making quickly spread from Spain to France and England. Paper mills were established throughout Europe and the industry flourished. Paper, superseding in general use both parchment and vellum, was hailed with delight as a new discovery. During the new industry's period of development cotton and linen rags, by-products of textile manufacture, were its sole dependence; and, indeed, even today they form an essential ingredient in making



Hoisting the logs from a steaming hot bath, which loosens the bark.

ONLY the fibers of the wood proper—and not the bark—are suitable for the manufacturing of the sulphite pulp. Here we see the logs, after the bark has been softened in a huge vat of boiling water, on their way to the drum barker.

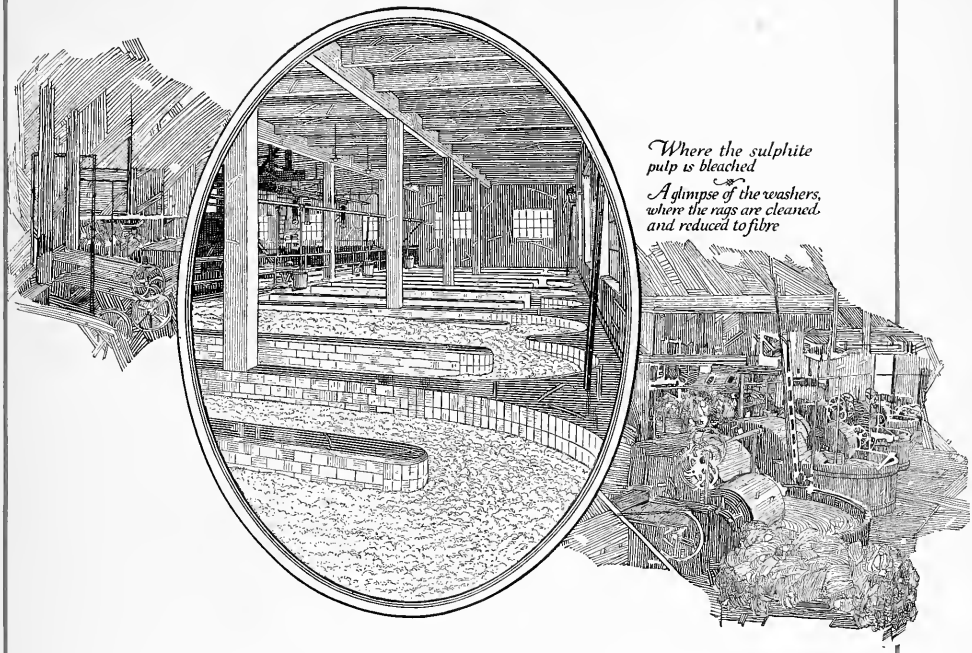
writing paper of high quality, where beauty of finish is desired in combination with durability.

MACHINERY BRINGS NEW METHODS AND MATERIALS

MODERN paper, like the ancient product, at first was made entirely by hand. Changes, however, followed quickly in so important an industry — changes in both method and material. Since 1820 paper made by machinery has supplanted hand-made paper, except for special purposes. Although cotton and linen sufficed for centuries before 1820 as raw material, and although the textile element — the rag-content — has always retained its important place in first quality writing papers, the tremendous demand for paper has made it necessary to consider the problem of quantity production. After many experiments with vegetable fibers, the idea of making paper from the readily available supply of wood came to the fore early in the nineteenth century. Tree trunks—thousands of them at hand! Their new utility and value were soon recognized. The woods now generally used are spruce, hemlock, pine, and poplar: of all these, spruce is best for writing papers of quality.

CRAFTSMANSHIP

EXACT as it is, modern manufacture of paper is not only a science; it is also an art. Fine paper is not made by formula alone; it is the result of expert human knowledge and judgment. Difficulties encountered by the paper-maker are so many and so varied that the wonder is that papers of standard qualities are produced over and over again. Different woods produce different results; even the same kind of wood, if brought from different parts of the country, is apt to show changes in its known characteristics. Further-



Where the sulphite pulp is bleached

A glimpse of the washers, where the rags are cleaned and reduced to fibre

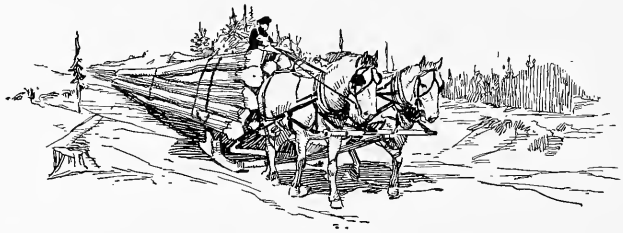
BLEACHING the sulphite pulp is a process that must be very carefully performed. Too much bleach weakens the fibers—too little will not effect the desired shade. Certainty concerning the exact quality of the sulphite pulp, then, is a great aid in achieving quality in the finished product.

more, even the weather plays a part in the manufacture of paper. Dry days and humid days, hot days and cold, all mean a variation in treatment, a variation which may happen at any time in the process. Eternal vigilance is necessary in order to prevent variation in the quality of the finished product. Thus in the case of Systems Bond no sheet of paper bearing that impress is allowed to go forth from the mill without undergoing frequent rigid tests.

It is a question of knowledge and craftsmanship, from the very beginning. Improved craftsmanship and manufacturing methods have gone hand in hand with better materials. In due time, various patents on the invention of wood-pulp paper were granted, and before the end of the nineteenth century wood-pulp took the lead in making an ever-increasing supply of printing paper, but for fine grades of writing paper a combination of rag pulp with the wood-pulp is absolutely essential.

TWO ADVANTAGES OF WATER-POWER

In the United States the manufacture of paper from wood-pulp began in 1867. As the years passed the rapid increase in the use of wood-pulp shifted the center of the paper industry to the forest districts of New York and New England. These favored regions furnish sufficient spruce wood to manufacture three-fifths of the wood-pulp used in this country. Another factor, too, contributed to the transfer: namely, water-power. So important is the relationship of water-power to paper —not only in reducing the cost of transportation of logs, but also in actual use at the mills—that in the United States more than sixty per cent of the water-power utilization is devoted to paper manufacture.



MAINE AN IDEAL STATE FOR PAPER MANUFACTURE

The combination of water-power and large tracts of spruce land makes the states of northern New England and New York the greatest paper-manufacturing district in the United States. Maine, in which state the Eastern Manufacturing Company has its mills at Bangor and at Lincoln, is an important paper-making state, because of its generous wood supply, its wide-spread water-power, its abundance of skilled labor, and its nearness to population centers and points of rag import.

Before the world war, large quantities of pulp were imported from Norway and Sweden and were sold in competition with the product of the American mills. The Eastern Manufacturing Company, however, gets its supply of raw material for making sulphite pulp direct from the forests of northern Maine, principally from its own timber-lands and from the timber-lands held in the name of the Lincoln Pulpwood Company, owned by it, consisting of thousands of acres. In addition, the Eastern Manufacturing Company holds many thousands of acres on lease. The cuttings are almost entirely of spruce. The trees are felled principally during the winter and spring. A large part of the trees cut during the spring, when the sap is running, are peeled before being cut into four-foot lengths; the pulp-wood is then known as peeled wood. Logs of similar length, cut at other seasons of the year and not peeled, are called rough wood.

THE VOYAGE OF THE PULP-WOOD

In the spring, this pulp-wood, clearly marked, is set adrift in the many rapid streams that vein the state, and is driven into a holding boom, a structure of larger logs

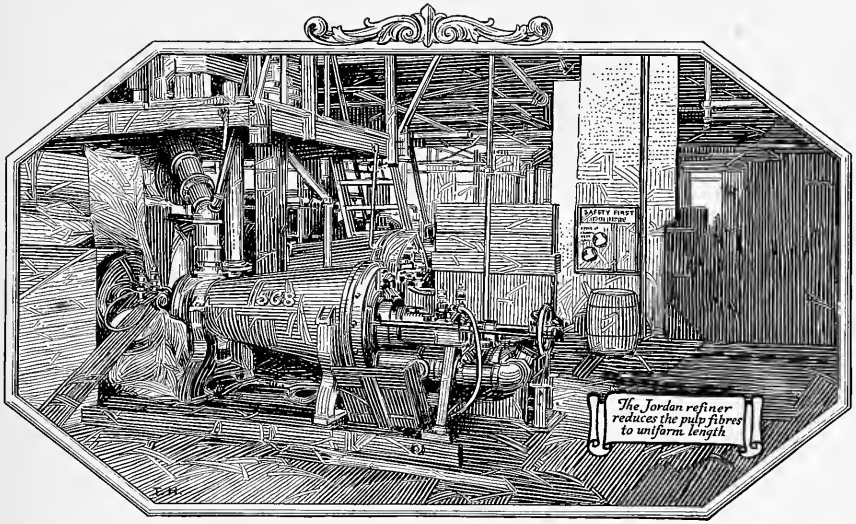
chained together to hold thousands of cords of the four-foot logs. From this boom it is driven down the main Penobscot River and put in storage at the mill at Lincoln, or floated still farther down the river to the mill at Bangor. Additional pulp-wood, cut on land holdings on water-sheds other than the Penobscot, is brought to the Bangor mill in car-loads.

After being taken from the river, the four-foot logs, fresh and clean, are conveyed to huge storage piles, occupying a very large area and representing thousands of tons of potential pulp. From these storage piles the logs, as needed, are conveyed to the pulp-mill and, in a large revolving drum, are tumbled against one another until the bark is removed. The barked wood and peeled wood are for convenience put into the drum together and both go on to the next process, which is washing under high-pressure showers and in tanks of hot water.

Thus stripped of their bark, the logs are carried along on an endless-chain conveyer and dropped, one by one, in swift succession, down an inclined trough into chippers: very heavy, rapidly revolving steel discs, each set with three radial knives which, with a slicing motion, cut the log into small pieces or chips. Out of these machines come the chips on a conveyer of another type: a shaking, sifting wire screen through which chips of the right size fall on to a belt, leaving on the screen itself those that are too large and have to be re-chipped. In vast hoppers, above enormous steel tanks called digesters, the chips are stored in sufficient quantity to supply the mill's demand several days.

WHERE THE CHIPS ARE COOKED

The digester is an upright cylindrical boiler forty-two feet high



TEAR a piece of paper jagged-wise. You will see that it is made up of innumerable fibers side by side. The strength of the paper depends in part on how uniformly even in length and thickness the many pulp fibers are. The knives in the Jordan Refiner achieve the right degree of uniformity.

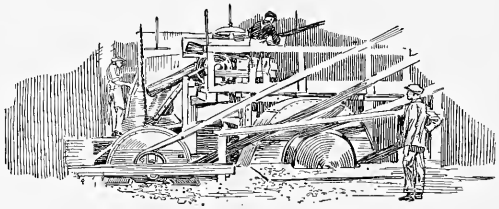
and fifteen feet in diameter, riveted into one piece and lined with acid-proof brick. The chips from about sixteen cords of wood are dropped into a digester, containing sulphurous acid in which they are to be cooked, the heat being supplied by means of live steam admitted into the digesters. The temperature is gradually increased and the desired degree maintained from eight to sixteen hours, the length of cooking and intensity of heat being varied according to the quality of pulp desired. Absolute uniformity of pulp is essential. Automatic recording instruments reflect conditions within the digester and the "cook," by constant vigilance and correct manipulation of the controls, produces the uniformity and quality which are, to almost ninety per cent, the determining factors in the finished sheet of Systems Bond. This relation between quality of pulp and the quality, as well as uniformity, of the finished sheet of Systems Bond emphasizes the Eastern Manufacturing Company's advantage in having absolute control of its pulp.

After correct cooking for the purpose required, the contents of the digester are blown into one of a series of washing tanks, commonly called "blow-tubs," with perforated false bottoms where the cooking liquor is drained off and the pulp given thorough washing.

Before being bleached, the washed pulp must first pass through the screening process.

SCREENING

The screens consist of long wooden cradles having bottoms of brass plates in which are innumerable slots less than $\frac{10}{1000}$ inch wide. A light, continuous suction is maintained beneath the plates by diaphragms, a suction which causes the fine pulp to flow through the slots, while the



coarser particles and dirt remain on top of the plates and are carried away into a sewer. Through the screen the pulp flows into a tank underneath, from which it is pumped to a thickener.

As its name suggests, the purpose of this machine is to thicken the pulp by reducing the volume of water in it. The thickener is a hollow cylinder covered with fine wire cloth. As it slowly revolves over a vat filled with loose, wet pulp, it picks up a film of pulp, the water running off through the wire into a trough alongside. Reaching the top of each revolution of the cylinder, the film of pulp passes under a "couch roll" covered with woolen felt; this roll, resting on the cylinder with a gentle pressure, squeezes still more water out of the pulp and lifts it off the face of the wire cloth. Presently it is scraped off the couch roll and delivered through big pipes to the bleaching tanks below.

BLEACHING THE PULP BY THE BELLMER PROCESS

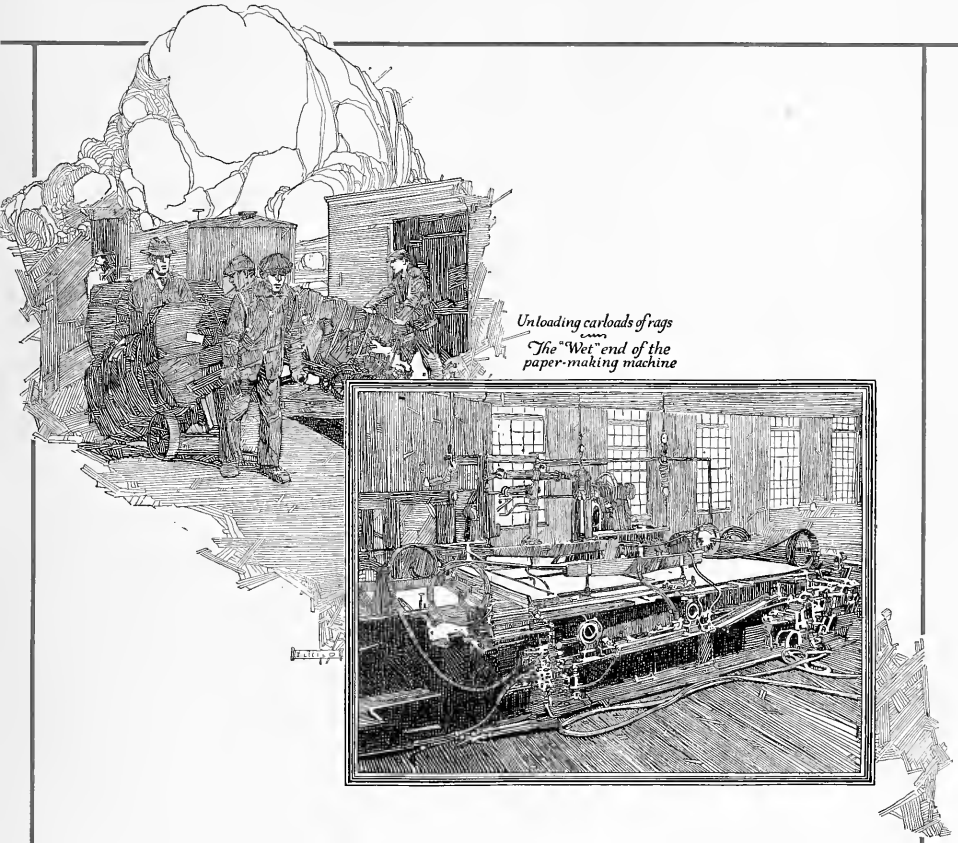
The bleaching tanks are in the new Bellmer plant of the Eastern Manufacturing Company, operated in conjunction with its own electro-chemical plant. As the necessity of bleaching pulp perfectly white without sacrificing strength of the fibers is an ever-present problem in paper-making, the combination of these two plants is especially fortunate; it not only reduces the cost of bleaching, but also makes it possible to minimize the quantity of bleach and thereby to conserve the actual strength of the pulp.

The bleacher is a big, white-tiled tank about forty-five feet long, divided by two shorter partitions or "mid-feathers." At one end, and forming part of the tank, is the Bellmer screw propeller, named for its inventor, which circulates the pulp through the tank and mixes it with a sufficient

amount of steam and electrolytic bleach liquor. The pulp circulates slowly around the tiled tank under careful temperature control and when the bleaching is completed is dropped down into vats floored with perforated tile, where it is drained and thoroughly washed, in order to remove all traces of chlorine that may remain. After the showers of filtered water have been turned off and the pulp allowed to drain for a while, it is stirred and diluted by a heavy stream of cold water from a hose, so that the milk-white mass will flow through pipes to other thickeners which deliver the pulp at a constant density to the stock chest in order that a uniform sheet of pulp may be secured on the pulp machines. These pulp sheets of uniform moisture content make possible absolute exactness in the use of raw material in the paper mill. This is largely responsible for the constantly uniform quality of Systems Bond.

FIRST STEPS IN THE PREPARATION OF RAGS

The rags for the manufacture of Systems Bond are received in carload lots from the large rag markets of America or imported from abroad. On arrival at the mill, the compressed bales are cut open and the rags fed into a thrasher, where they are separated from one another and thoroughly dusted. After a few minutes of this treatment the rags go to the sorting room, where they are sorted by hand into different grades, according to their quality. This operation is done by women who stand before long tables to each one of which a knife is fastened. With this knife the sorter opens seams and cuts off buttons, hooks and eyes and rubber. This done, the rags are again inspected by other women, "overlookers,"



Unloading carloads of rags

The "Wet" end of the paper-making machine

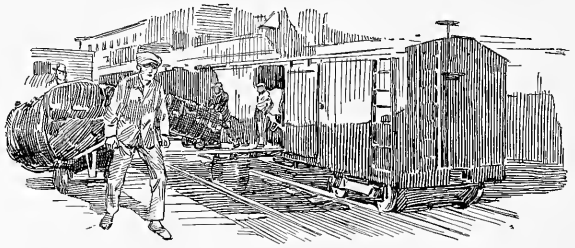
THE transmutation of pulp into paper occurs at the paper-making machine. But the quality of the finished product depends directly on the quality of the pulp ingredients—hence the advantage of combining pulp and paper making.

from whose hands they pass to the cutters: machines which quickly chop them into small pieces.

The cut or shredded rags are analogous to the chips in the sulphite mill, and, in fact, the remainder of the process of producing rag pulp is very similar. The "digesters" in the sulphite mill are known as "boilers" in the rag mill, and into these the rags are put with lime, and occasionally soda ash. Steam is admitted and the cooking is carried on for about ten hours. The cooked rags are washed and bleached as is the pulp, and dropped into similar drainers. At this point the rag pulp, commonly referred to as "half stock," is very similar in appearance to the sulphite pulp, except for the longer fiber and greater strength of the former. In fact, the difference is wholly mechanical as chemically both are the same pure cellulose.

MEETING OF THE TWO PULP STREAMS—RAG AND SULPHITE

Now comes one of the most important processes in the manufacture of high-grade paper: the beating process, by which the minute fibers in the two kinds of pulp are united and blended into a soft, white, silky mass. The engine which performs this operation is a tub about twenty feet long with oval ends. The stock circulates around the mid-feather, or partition, in the centre and each time passes between the bed plate and beater roll, the latter about fifty-two inches long and about the same diameter. Steel bars parallel to the axis of the roll are set into its periphery about two inches apart. The bed plate is set into the bottom of the tub immediately below this beater roll, and it is the adjustment of the distance between the bars and the bed plate that determines the strength, formation and general



characteristics of the paper that can be made with a given stock, as well as the clearness of the water-mark. Thus the beaters reduce the fibers to the condition in which, later, they will interweave on the moving wire cloth of the paper machine. After a certain number of hours, alum and rosin sizing are added to the stock in the beaters, to make the substance impervious to ink. Such is the process which forms the basic substance of each crisp, strong, crackling sheet of Systems Bond.

From the beaters the stock is dumped into large round wooden chests, from which it is pumped to the refining engine called the Jordan refiner: a stationary hollow cone with knives on the inside, fitting over a solid revolving cone mounted with similar knives on the outside. The pulp is circulated rapidly between these two sets of knives, which can be brought close together with great accuracy, so that the degree of fineness of the fibers can be adjusted and kept uniform. In this operation it is essential to maintain the same control as in the beaters.

From the refiner it goes into another storage chest, called the machine chest, equipped with a heavy vertical shaft set with long wooden arms; the shaft revolves slowly, keeping the stock constantly stirred. The machine chest holds the reserve stock for the paper machine. From there the stock goes to the stuff box, where the first step in the formation of the sheet of paper is taken.

PAPER AT LAST

THROUGH a gate in the stuff box, susceptible of delicate adjustment, which will be referred to later in connection with the weight and thickness of the paper, the stock, which is about 99% water, flows through traps and screens, which remove all extraneous matter, on

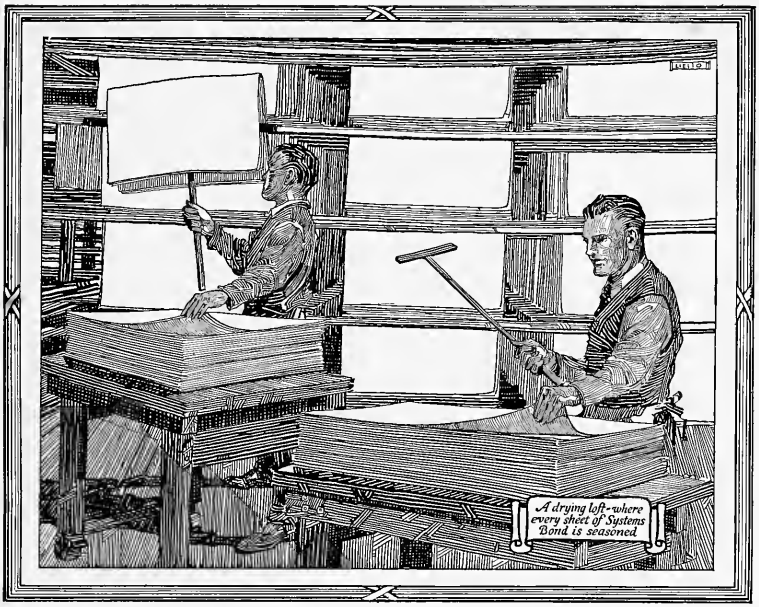
to the Fourdrinier wire, where for the first time there is apparent a resemblance to a sheet of paper.

The wire cloth, in the form of an endless belt varying in width from sixty inches or less on old machines, to over two hundred inches on modern machines for the manufacture of newsprint, and from thirty to one hundred feet long, is supported on small tube rolls. On to this almost level surface a certain volume of stock and water flows, the amount exactly controlled by the adjustable gate of the stuff box just referred to. It is this certain volume in relation to the speed at which the wire is running which determines the weight and the thickness.

As the stock and water are carried along by the wire, the water gradually drains through the wire cloth and a lateral shake, combined with the forward motion, interweaves the fibers so that at the point where there is no longer sufficient water to allow agitation, the sheet is entirely formed, but in a damp, impressionable state.

THE TELLTALE WATER-MARK

At this point it is run under a cylinder called the "dandy roll" which, instead of being plain, bears on its surface the raised design of the Systems Bond water-mark. This presses itself into the soft damp surface of the web, so that the design, after the paper hardens, remains in its texture as a semi-transparent character, the ineradicable impress of Systems Bond—the identifying insignia of its rank. If Systems Bond does its work, preserves its thoroughbred character, withstands the inroads of time without crumpling or discoloring in the files, there is the mark by which it can be known. On the other hand, should Systems Bond fail in any of these things, there again is the telltale water-mark—clear, indelible, per-



A drying loft—where every sheet of Systems Bond is seasoned

THE seasoning of writing paper, like the seasoning of timber, takes time—it is essentially a natural process. Genuine loft-drying results in toughened fibers and a crisp texture that delights both the eye and the sense of touch.

manent as the sheet itself. For the water-mark of Systems Bond is no surface design, printed, stamped or engraved. It is ingrained in the very texture of the paper itself, even as the veins in a block of marble or the concentric rings of the severed spruce.

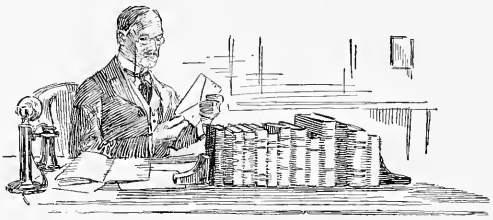
THE SLOW WAY TO SEASON, BUT THE BEST

As the wire turns down, taking the course of the lower part of the belt, the web of paper passes on to endless belts made of materials similar to blankets, called paper-machine felts, which carry the paper through press rolls where some water is squeezed out, and over revolving cylinders heated by steam, between which the remaining moisture evaporates. The cylinders vary in number approximately from fifteen to fifty. A modern paper machine in a writing-paper mill is from 100 to 120 inches wide, the total length from stuff box to dry end being about 200 feet. When ready to run, it represents a cost, in normal times, of something over $100,000.

All the usual grades of paper go through the initial stage of drying, and in the case of machine-dried paper, which is not tub-sized, this is the only stage of drying; but the higher grades of paper go through a size bath and a second stage of drying.

Tub-sizing consists of running the paper into a hot bath of glue, starch or starch and glue, which increases the strength and improves the appearance and "feel."

At this point comes the second stage of drying, which may be any one of three methods: Machine-drying, Air-drying and Loft-drying. The machine-drying method is identical with the process of drying before tub sizing. This is a quick method, taking but a minute or less, but as the dry-



ing is done under tension the paper thus made has less strength than paper which is not dried under tension.

Air-dried paper is dried in the web, but instead of going over steam-heated cylinders hot air is blown on to the paper to absorb the moisture. This process takes ten to thirty minutes, and the resulting product is distinctly better than machine-dried paper.

Paper to be loft-dried is cut into sheets, after coming out of the size tub. These sheets are hung over poles in a room where slowly-raised temperature gradually absorbs the moisture from the paper, the moist air being slowly drawn from the room, and fresh air allowed to enter. Under this method the size is allowed a longer time, twenty-four to sixty hours, to season into the paper, which, combined with the entire lack of tension, allows the sheet to shrink normally. It is this slow process, combined with standard sulphite of the Eastern Manufacturing Company's own making and its rag content, that makes Systems Bond good for all purposes, at a price not too high for any.

After the seasoning come the "finishing" operations. Machine- and air-dried papers are "finished" in reels by running through chilled iron rolls,—the former while it is still on the paper machine, and the latter on the air-drying machine. Both are sometimes super-calendered by running through a combination of paper and chilled iron rolls.

Loft-dried paper, on the other hand, comes from the loft in sheets, to be finished on "sheet-calenders." There are three usual finishes. "Bond" is obtained by running the sheets through iron or cotton roll breakers. "Ledger" is the result of a combination of iron and cotton rolls. "Superfine," used mostly on flats, is ob-

tained with iron and paper rolls.

It is this sheet-finishing, in conjunction with loft-drying, which gives the "cockle" or "class" to the finish of Systems Bond.

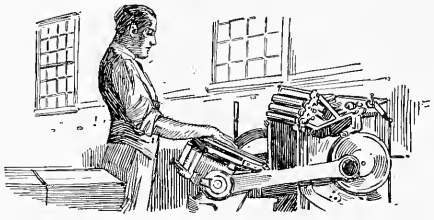
After finishing, every sheet of Systems Bond is carefully hand-sorted, trimmed, sealed, labeled, packed and shipped.

INSPECTION

Constantly during the making and finishing of Systems Bond samples must be taken and inspected. An entirely separate department for this work not only compares the strength, color, formation and finish of each lot of paper with rigid standards, but keeps careful records of all results, continually striving to produce the best possible sheet of Systems Bond.

Just as every process through which the paper passes in its creation, from the first to the last, must be carefully and skilfully performed, so with the finished product. The crisp, strong sheets of Systems Bond that please the eye and feel good in the hand and satisfy the self-respect of those who use them day by day must pass muster before they are allowed to leave the mill. Any speckled, spotted, wrinkled or damaged sheets—in fact, any sheets that show variation from standard quality, are promptly banned, properly sentenced to the discard. All the others, those which pass this strict final examination by experts, are rightly considered to have reached the highest degree of quality, and, therefore, can be relied upon at all times to give uniform service and satisfaction.

Systems Bond is the first nationally distributed paper to fill the gap between those bonds made entirely of sulphite pulp and those which are too costly for the careful buyer who must consider economy as well as quality.



THE final inspection of Systems Bond, sheet by sheet, is the last step which proves all the other steps were right. Besides the inspection for spotted or damaged sheets, the paper is tested for strength, durability, texture, bulk, and colors —and variation from standard means rejection. This assures uniform quality in every sheet that leaves the mill.

SOME FACTS ABOUT THE EASTERN MANUFACTURING COMPANY

Established and incorporated—1889.

Acreage of timberland owned—220,000. Additional acreage controlled—50,000.

Ground area of plants—11 acres. Floor area—19 acres.

Steam-power load—4000 H. P. Hydro-electric—3800 H. P.

Annual production of pulp—38,000 tons.

Annual production of paper—24,000 tons.

Average number of employees (including mill and woods)—2800. Labor conditions stable. There is an active Employees' Athletic Association numbering five hundred and fifty members.

The company controls not only the processes of manufacturing paper, but also the processes of manufacturing pulp—a combination which allows perfect standardization of quality.

The company owns its own rag mill. In its chemical plant it manufactures the electrolytic bleach liquor used in the bleaching of the pulp. This, of course, gives it absolute control of the proportions of the ingredients used in the liquor, and assures just the exact strength of bleach which will do the work without harming the pulp fibers.

BOARD OF DIRECTORS

S. W. WEBB *Chairman of the Board*

F. R. AYER
F. W. AYER
G. E. KEITH
H. C. KEITH
C. B. WIGGIN
C. F. FAIRBANKS
ALBERT BOYDEN
H. W. CUSHMAN

OFFICERS

S. W. WEBB *Chairman*

F. R. AYER *President*

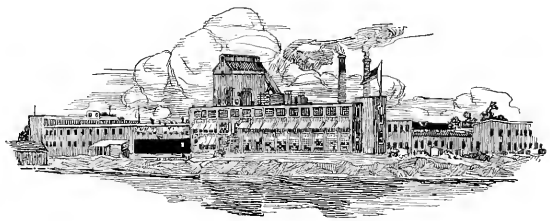
F. A. LEAHY *Vice-President*
H. J. GUILD *Vice-President*
S. B. COPELAND *Vice-President*
D. A. CROCKER *Vice-President*
B. M. PETRIE *Vice-President*
GEO. E. HYDE *Secretary and Treasurer*
A. D. POMEROY *Assistant Treasurer*
ALBERT BOYDEN *Assistant Secretary*

EASTERN MANUFACTURING COMPANY

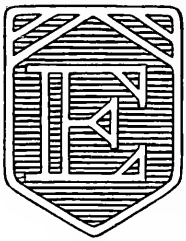
GENERAL SALES OFFICES
501 FIFTH AVENUE, NEW YORK CITY

Mills:
Bangor, Maine
Lincoln, Maine

Western Sales Office:
1223 Conway Bldg.
Chicago, Ill.



SYSTEMS BOND



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