

The Story of Papermaking

How Champion Papers are Made

BEFORE paper came into being, mankind resorted to other substances for his written messages and his wrappings for packages. The skins of animals, principally those of the sheep (parchment) and cattle (vellum) were utilized and indeed were even so employed until recently. Hence the slang expression "sheepskin" to denote the high school and college diploma. Also, our vellum announcement stationery used for invitations, weddings and the like is a hold-over in nomenclature from the days when smooth calfskin was used for such purposes.

Paper made from cotton and linen rags increased the use of writing and wrapping materials many fold. But not until the process of extracting cellulose from wood was perfected did paper become a substance of universal usefulness.

Paper—practically all paper—as we know it today is basically a mat of felted wood fibres. Wood itself is composed of tiny fibres, almost microscopic in size, and lignin, which is the binder material holding the fibres together. Reduced to its simplest terms, the papermaking process involves the following steps.

The fibre-bearing material—wood—is cut into convenient lengths for handling and is transported to the pulp mill by truck or rail. Standard length for

pulp wood throughout the Southern papermaking industry is five feet. Pulp wood is measured in cubic feet. Today, Champion uses about 128 million cubic feet of pulp wood per year.

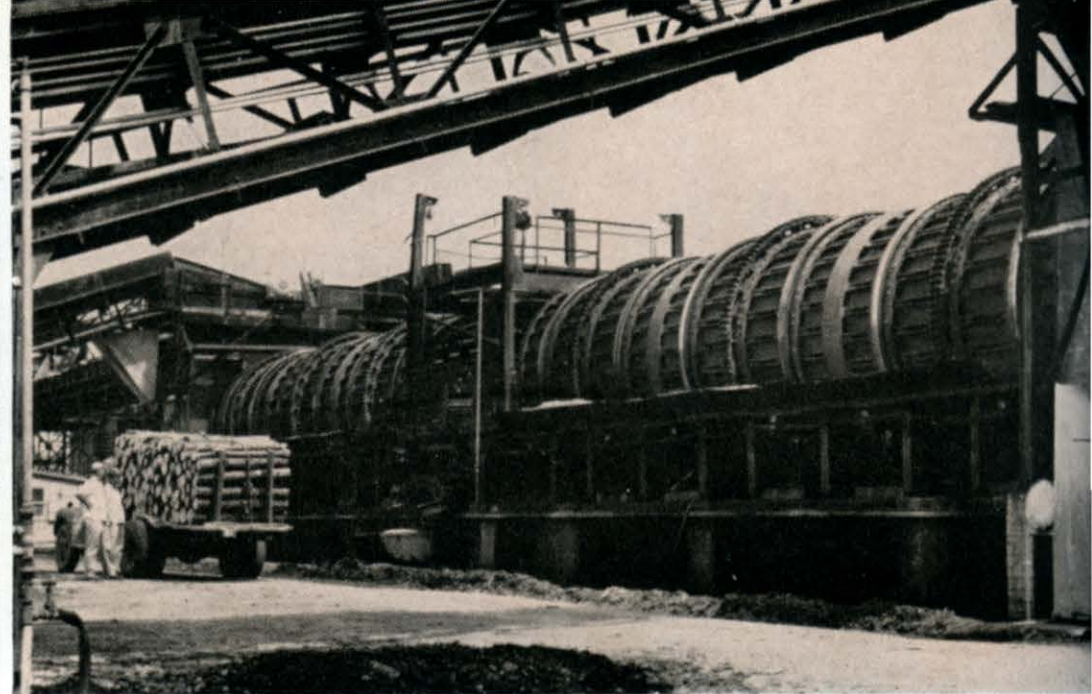
When the wood has been delivered to the mill it is first barked; that is, the bark from each stick is removed by mechanical means. There was a time when this barking operation was performed by hand—much of it right in the forests where it was cut. Today, however, most of it goes through huge barking drums, hollow steel cylinders which rotate in gigantic cradles. The sticks, or bolts as they are called, tumble round and round against each other and against the sides of the barking drum. This rough action rubs off the bark, which falls through the slots in the drum onto a conveyor. The conveyor carries the bark, which is useless in the production of fine paper, to the bark burner where it is used as fuel. The bark burner furnishes steam which is used, in turn, to generate electric power and for other processing purposes throughout the mills.

When the bolts are clean, they are fed into a chipper. The chipper is a huge machine with a whirling disc, set with sharp knives.

Each bolt, as it goes into the chipper, disappears with a roar to emerge, instantly, as chips on the con-



Champion receives hundreds of cords of wood each day by truck and train.



Huge barking drums make short work of stripping the bark from the logs.

veyor belt. The entire log has been reduced to chips less than the size of a domino in the twinkling of an eye.

As the chips fall from the chipper they are carried automatically to big chip storage bins, high above the digesters, so-called because they “digest” or separate the fibres from the binder material—or, to put it another way, the cellulose from the lignin.

The digester is, quite accurately, a gigantic pressure cooker five stories high. It is filled with chips from the storage bins. Then chemicals are added and the whole contents is literally cooked under controlled temperatures and pressures with steam for a predetermined period of time.

When a valve on the digester is opened and the pressure is released, the contents burst forth with great force into blow pits near the digester. What comes out is a hot, soggy mass of material. It contains chemicals, dissolved lignin, uncooked particles of knots and other residues, gums, resins and brown fibres.

The next step is washing, to separate the fibre from the other materials. The materials separated from the fibre go to a chemical recovery plant where much of the chemicals originally used is salvaged for use again, and where certain by-products such as tall oil are recovered.

The washed fibre is screened to remove oversized fibre bundles, and the fibre is then ready for bleaching. The bleaching process is a further continuation of the process of purifying the fibre from the non-

cellulose impurities. The bleaching agent is basically chlorine, manufactured in Champion’s own electrolytic chlorine bleach plants.

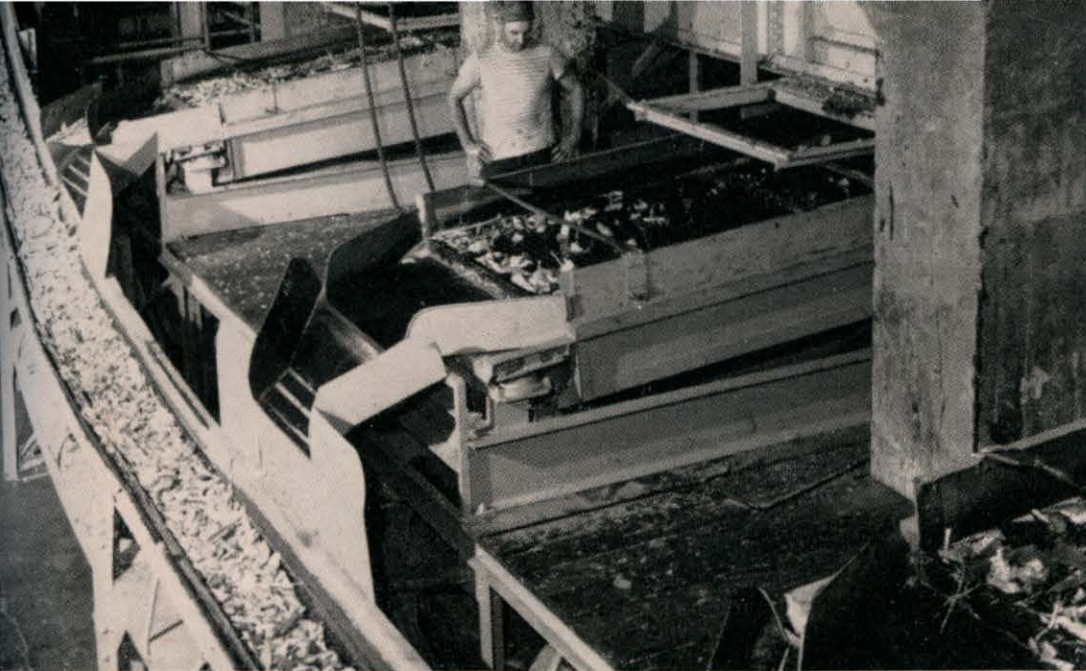
When the fibres are bleached to the degree of whiteness desired, they are ready for use in making paper.

The pulp, as the fibre mass is called, is produced in the Canton or Pasadena mills. It is utilized in two ways by Champion. When it is to be used for making paper at the Ohio Division, most of the water must be removed, leaving a heavy, matted web of pure fibre. This is cut into sheets, baled and shipped in its relatively dry state to the Hamilton paper machines. If the pulp is to be used at the mill where it is produced, this drying process is unnecessary.

THE PAPER MAKING PROCESS

The paper forming process is practically the same, whether you start with the pulp as it comes from the bleaching operation or use it dry from the bale. In both cases you add lots of water—much more in the case of the dry pulp, of course.

The first step in the making of paper is to mix and blend together all of the different materials required for a particular kind of paper. Sometimes only a single pulp is used, but this is the exception. Usually a mixture of several different pulps is required. In addition, paper usually contains a number of other materials such as fillers, dyes, sizing materials and other chemicals.



After the logs are chipped a conveyor carries the screened pieces to storage.

All of these materials are brought together in the proper proportion and mixed and blended in any one of several types of equipment which have been specially developed for this purpose. In this equipment, the small clots and lumps are teased apart and thoroughly mixed with the other chemicals that have been added.

After thorough blending, the mixture of pulp and chemicals is passed through refining engines known as Jordans. These engines consist of a cone equipped with knives which revolves inside a conical cylinder also equipped with knives. Here the fibres of the pulp are beaten, bruised, frayed and cut exactly to the degree necessary to produce the grade of paper wanted. Control of this refining process is what enables the papermaker to produce such different grades as blotting and glassine from almost the same raw materials.

When the furnish, which is the name given to the mixture of water, pulp, and chemicals, leaves the Jordans, it is ready for the paper machine.

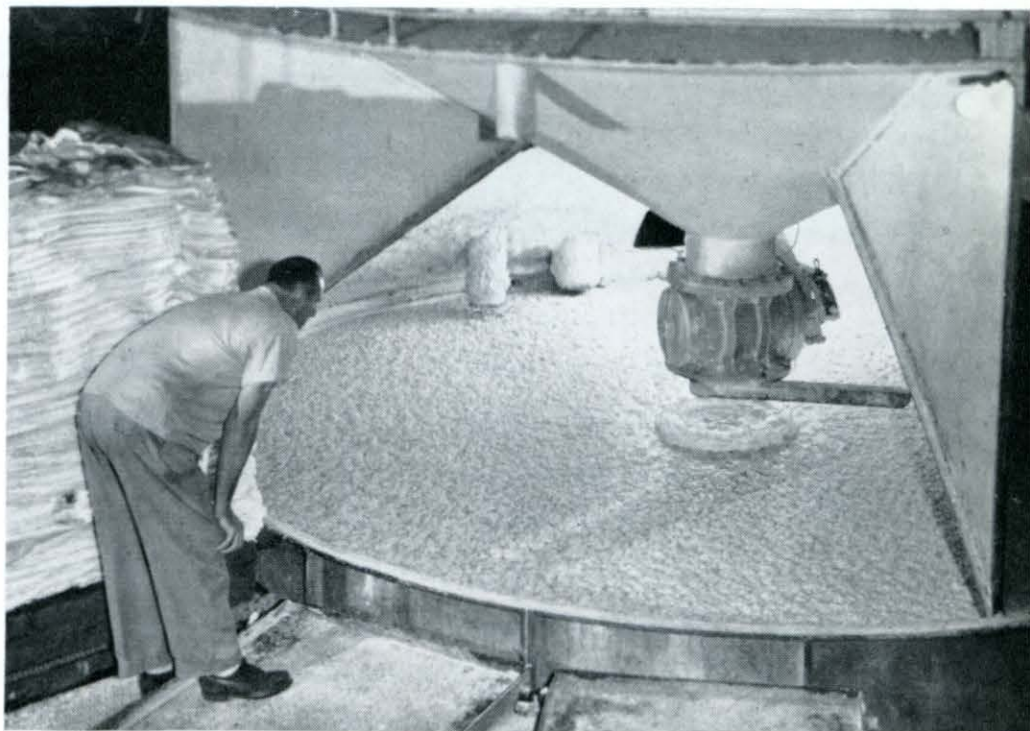
There are two types of paper machine. One is known as the Fourdrinier machine and the other as the cylinder machine. In general, the Fourdrinier is used for making light-weight paper, while the cylinder can either make light-weight paper or heavy board. There are two main divisions to a Fourdrinier machine, known as the wire section and the dryer section, or more colloquially, the wet end and dry end.

The wet end consists of a headbox, the Four-

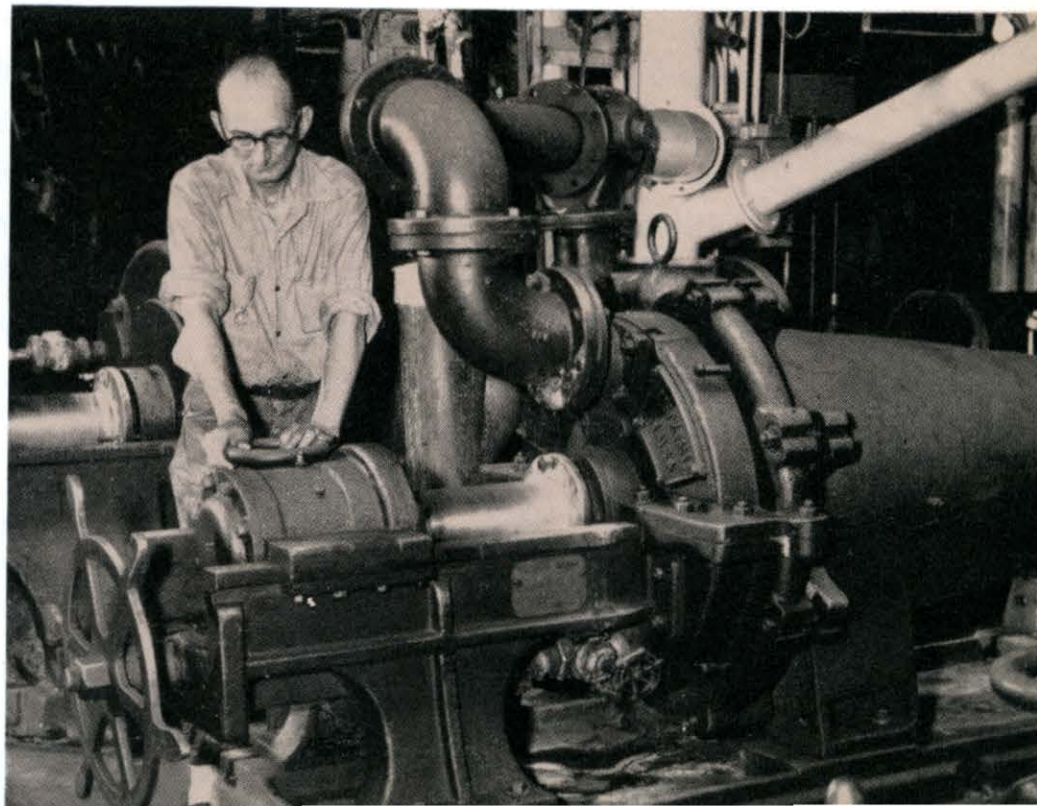
Now ready to be made into paper, the pulp is first refined in the Jordan engine.

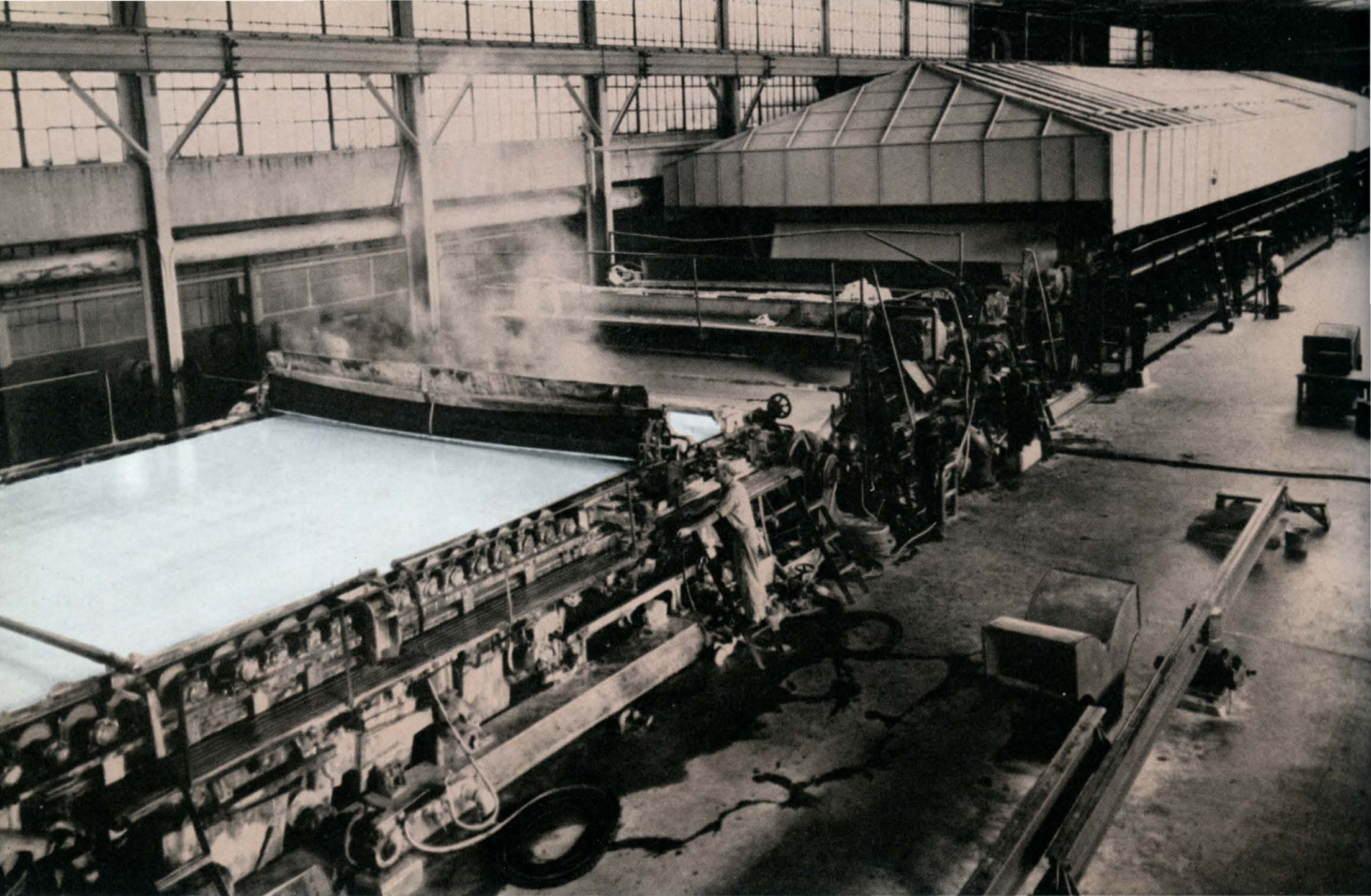


Chips are cooked in these huge digesters until reduced to wood pulp.



After washing and bleaching it is mixed with huge quantities of pure water.





After final refining and hydration, the watery mixture is poured out on the fast-moving wire of the Fourdrinier papermaking machine.

drinier wire, and a press section. The dry end consists of steam-heated dryer drums and calenders.

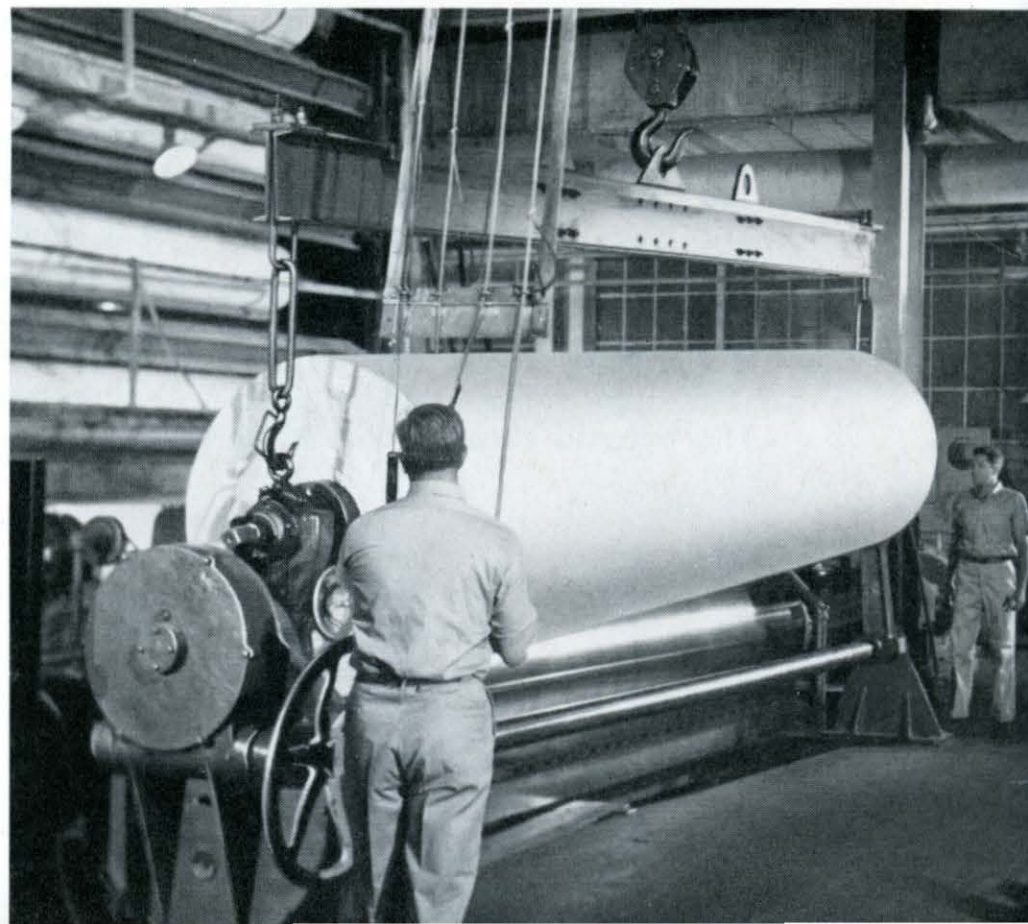
The headbox receives the furnish, which at this point consists of ninety-nine and one half per cent water. The furnish is fed from the headbox onto the rapidly moving machine wire. This wire is made of brass or bronze and has about 3500 openings to the square inch. The wire is shaken sideways while it is moving forward. As the stock solution flows onto the wire, the side-to-side action tends to interweave the fibres. While this is occurring, water is continually draining through the wire by means of gravity or by suction at such a rate that, in the course of about twenty feet, the furnish is converted into a wet sheet of paper.

The wet sheet of paper in its very tender and fragile state is conducted from the wire onto a wool

felt which carries it through a number of heavy press rolls. The purpose of these rolls is to remove further water and to consolidate the fragile sheet.

The wet sheet is now ready to enter the dry end of the machine. Here it is led up and around and down under the steam-heated drying cylinders, all the time moving forward at the rate of hundreds of feet per

At the other end of the Fourdrinier the paper emerges sparkling white and perfectly dry, where it is wound into huge rolls weighing several tons. Some paper is coated right on the papermaking machine.



minute. By the time it reaches the end of the bank of drying cylinders, the paper is dry. At the dry end of the Fourdrinier the paper is given a preliminary calendering operation, which smooths and polishes the somewhat rough paper delivered by the dryers.

The process results in basic printing paper. It is a good product, adaptable to many uses. But, for certain purposes, further refinements are desirable. A smooth, high gloss finish makes paper much more suitable for printing fine illustrations, for example.

It is these further refinements which impelled Peter G. Thomson to establish The Champion Paper and Fibre Company. And the idea of providing a product of superior quality has always guided the men and women who make up the company.

THE COATING PROCESS

Coating the paper after it is formed and dried on the paper machine, is a fascinating story in itself. There are several methods of accomplishing it.

First, you must have mineral pigments, much the same in several respects as those found in paint. Many substances have been tried. Today, Champion largely uses fine, white clay. Such clay was originally available only from abroad, but a quarter century or so ago, Champion developed a domestic source in Sandersville, Georgia, and today operates a large, open pit clay mine there. Some other fillers, precipitates like calcium carbonate and titanium oxide, are also used. Whatever the substance, the major purpose is to fill the hollows in the fibre mat, smooth out the surface of the sheet, make it opaque to prevent show-through and provide a highly receptive surface for the ink which will be applied.

Once you have the proper coating material, you must add an adhesive to make it stick to the paper, for otherwise it would flake and powder off when it dried. Adhesives in general use in papermaking to-

day are starch and casein, although in the earlier days, animal glue was widely used.

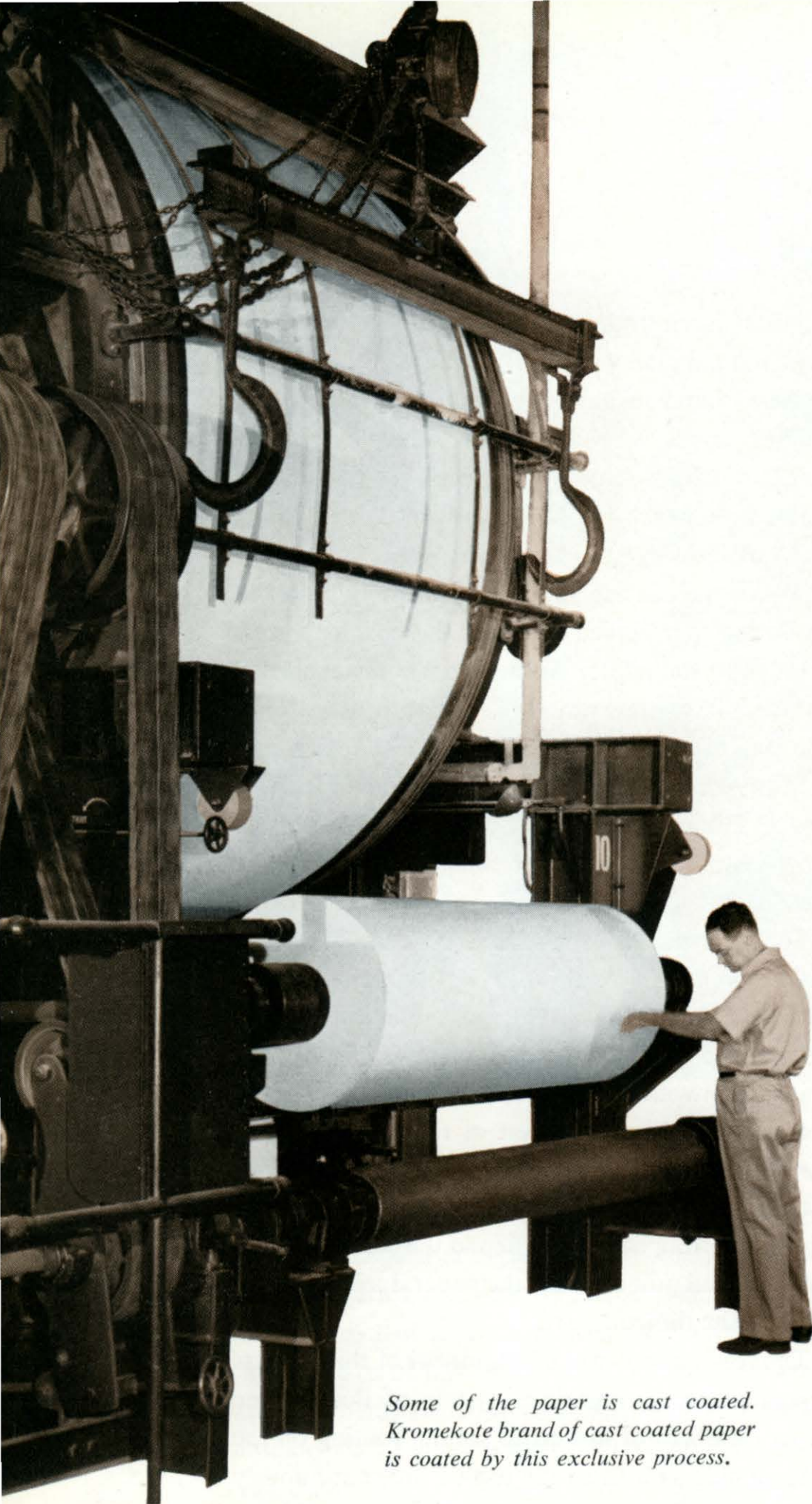
Now that you have the filler material and the binding agent, you add color. There are many shades of white—blue-white, which is a cold white; pink-white, which can be quite warm; green-white, which relieves eyestrain, and the like.

When the coating solution is properly prepared according to specified formula, the next step is to get it onto the paper. When Mr. Thomson started out, the only known method was to brush it onto one side of the paper mechanically, let it dry, and then prepare the second side in similar fashion. It was a laborious and time-consuming operation. No wonder coated paper was so expensive in those days!

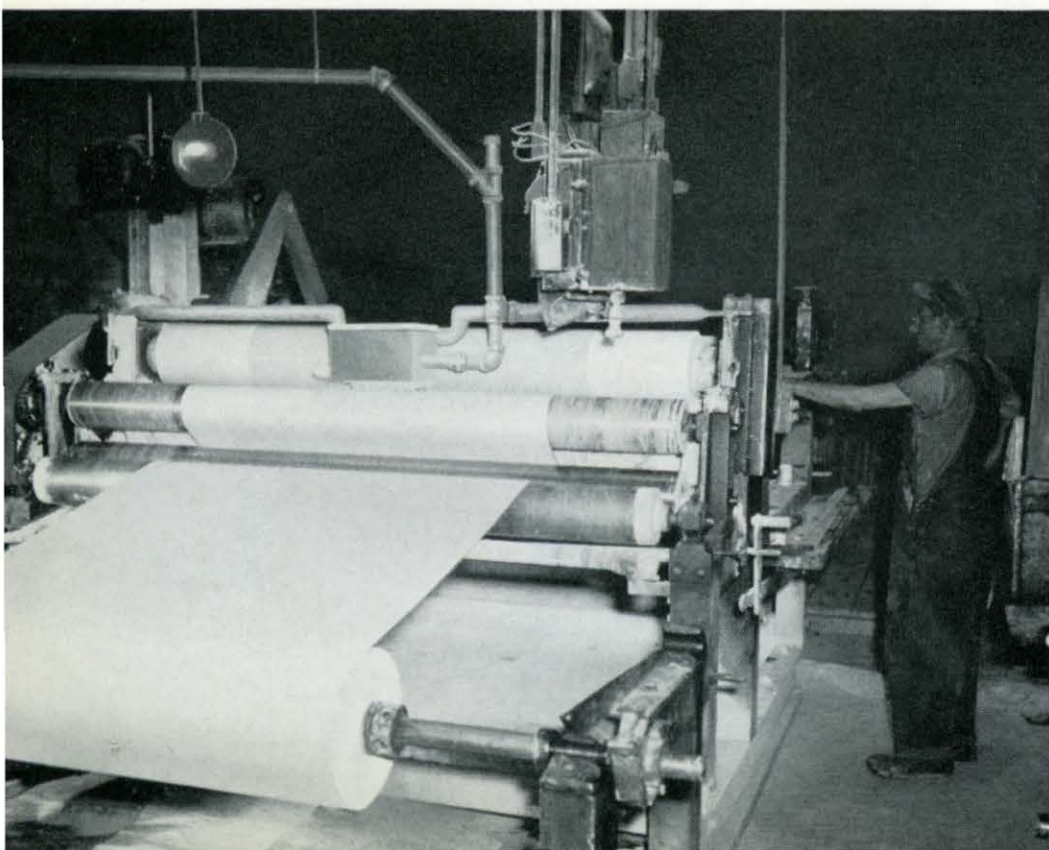
The first machines installed at The Champion Coated Paper Company by Thomson employed a new, patented process by which the coating solution was applied with brushes on both sides of the paper as it was unwound from the roll. Champion was the first paper coating mill west of the Alleghanies to use this principle. Application of coating to both sides simultaneously actually was a relatively simple matter. Getting both sides dry so the coating would not stick and pull and tear the paper during rewinding was the difficult part.

The really successful development of this process depended on an ingenious system of floating the paper on blasts of hot air to set the coating on the bottom side as well as the top of the continuously made strip of paper to a point where it would not stick. Then the paper was festooned and the drying completed before being rewound. This method is still used in some instances by Champion and others, although newer methods are supplanting it.

One of these newer methods is called machine coating. Here, the coater, instead of being a separate operation, is actually a part of the papermaking machine. The method of application is different, too.



Some of the paper is cast coated. Kromekote brand of cast coated paper is coated by this exclusive process.



The paper, after it has been formed and after a certain amount of moisture has been removed, goes through the coating process. The coating is spread on both sides of the web while it is on the machine and the paper continues upon its drying progress through the Fourdrinier and the machine calenders. The machine coating method saves considerable work and the cost of machine coated stock reflects this saving. Machine coated stock is widely used for publications, advertising printing and catalogues and sales promotion literature which speed the distribution of commodities.

CAST COATING

In recent years Champion has developed a revolutionary method of making coated paper called cast coating. This type of paper, which Champion markets under its registered trademark, Kromekote, has the finest surface for color printing now possible.

In some respects, the preparation of cast coated paper resembles a process any amateur photographer knows well, the finishing of glossy photographs. In that process the wet photographic prints are laid face down on a dust-free, polished "ferrotype" tin or smooth chromium plated surface, and the water is squeezed out from between the photographs and the metal. When the prints are dry they magically come off with the same smooth, glossy finish as the metal.

Applying the same principle to a freshly coated sheet of paper sounds very simple. But undried coated paper sticks to the metal, as the long-suffering experimenters at Champion found. It took years of research and engineering skills to overcome this difficulty. But the result is a process in which the coating and drying and finishing are all done in one operation. The coating itself duplicated exactly the smoothness of the metal on which it is cast. Starting

Some of the paper is coated on the brush coaters, modern counterparts of the coating machines with which Mr. Thomson established the business.



Cranes lift the finished paper, which is sold in rolls cut to proper size for the printer, and carry them to the roll storage bays.

from small laboratory tests, the operation is now carried out on huge chromium plated drums on a continuous mass production basis. Facilities for producing Kromekote brand cast coated papers have been doubled, tripled and quadrupled in the past few years. Even so, it is hard to keep up with the demand.

Cast coated papers fresh off the drums are ready for use. Other types of coated papers, though, normally have to go through one more step before they are used for printing. The coated surface is given an added smoothness by a compressive smoothing operation called supercalendering. Here the web of paper passes through a vertical stack of alternate metal and fiber rolls whereby the coating takes on a high gloss or finish—the degree depending on the coating formula used, the amount of pressure from the rolls, and so on.

Rolls of both coated and uncoated papers are supplied to printers who have web-fed printing presses; that is, presses that print from rolls.

But the majority of printers print from sheets, so many of the rolls are cut into uniform sheets of a specified size. A sheeteer can cut one or several rolls at a time, piling the sheets into neat, compact piles.

Each one of these sheets is inspected by hand before it leaves the mill. Hundreds of quick-eyed inspectors, deft of hand, manually turn every sheet and scan both sides before it is allowed to become a representative of Champion quality.

After the sheets have been inspected, they are trimmed on four sides to exact measurements, packaged and cased or carefully placed on skids, ready for shipment to customers all over the country and in many other parts of the world.

No story of Champion papermaking would be complete without the related stories of Champion's forestry operations and its research and engineering setup. For, while they may not always be in the direct line of flow from forest to finished paper, they are industrial efforts by means of which that line of flow is maintained.

WOOD SUPPLY

No company producing pulp can operate without a constant source of wood supply. Some companies buy their wood, some grow it. Champion does both.

The saga of forest conservation in the United States is an exciting one. When the white man came to these shores, there was an over-abundance of forests. They had to be removed in order that the early settlers might have open land upon which to grow grain and vegetables, and graze their cattle. Many stands of virgin timber were cut, and burned where they fell in those early days. A good burn was assurance of a full granary the next year for many a pioneer.

As the population increased rapidly, the demand for lumber for building grew and within the short



Paper trimmed to sheet size is packaged on skids, in cases and cartons, ready to be shipped to the hungry printing presses of the world.

span of half a century lumber operators cut a forest swath across the northern part of the country almost to the Pacific Coast.

Then came the reaction. It was soon apparent that we could not cut the forests and continue to have the wood we needed for the burgeoning building industry and for the rapidly expanding pulp and paper industry, unless we took the proper steps to replace the trees by replanting the cut-over forests. Tree farming became the fashion for perpetuating our supply of wood and Champion was in the forefront of the movement.

There is more to the business of forest conservation than merely replanting seedlings to replace the trees that have been cut. As the need for a new forest growth became more and more acute, colleges of forestry sprang up on the campuses of great universities. Through their facilities for research and experimentation and with the cooperation of the industries which used forest products, many scientific policies were worked out.

Today, forest management is both a science and an art. Protection plays a big part in the productivity of our woodland areas. Fire is a terrible potential enemy and Champion, along with many other companies, has spent millions of dollars to build fire access roads through the forests and develop techniques and equipment for preventing fires or for putting them out before they do extensive damage.

Disease is another factor upon which much research, time and effort have been expended. Allowed to run rampant, disease could easily destroy more wood than an entire industry could consume. So Champion employs graduate foresters to keep under control the diseases which attack its raw materials.

Optimum growth of new timber on the land it occupies is a major consideration of the modern forester, too. Allowed to take its own course, nature can be very wasteful, especially in the forest areas. Overcrowding reduces yield. Weed trees steal nutrients from the soil, which should be available to use-

ful species. Underbrush creates a fire hazard. Erosion reduces or destroys fertility. All these things are continual challenges to Champion foresters.

Reclamation of worn out and eroded land is another important part of Champion conservation practices. Hillsides and valleys which will no longer support crops and which, left open soon wash into the streams, are now growing seedling pines. Within a few short years, by selective cutting, they will again produce an annual revenue in terms of pulpwood harvests.

RESEARCH

Champion has done a great deal of research over the years; is constantly seeking new means of making its products better and less expensive. Take the case of the southern pine, for example. Originally, there was little use for this fast-growing species. Its fibres were strong enough for making brown paper, but when you bleached them white, all the strength went out.

Champion pioneered in perfecting a chemical process for producing fine white paper from southern pine. It thus opened a market in the southeastern part of the United States and in east Texas which had not existed theretofore.

The Champion research and engineering effort has produced some startling results; bids fair to keep on doing so. In addition to the utilization of southern pine for white paper, it is responsible for much progress in the coating processes. The development of the machine coating method made possible mass production undreamed of in the early days. And the cast coating method was a spectacular and exclusive triumph for Champion research and engineering people, working always in close cooperation with manufacturing personnel.

Champion research laboratories contain pilot models of production machinery used in the pa-

permaking process. Here, on a small scale, research men can experiment with and test any conceivable variation of an idea or inspiration which holds promise. Here they work out the details of new products and new processes, always searching for the better way of doing a job.

SALES

The sales organization of a modern industrial company is an integral part of its success, too, for without the wide distribution of the product among users there could be no progress in production.

Today, selling is a science, too. The men who manage Champion sales are expert in anticipating the needs of the market. They are experienced in supplying not only the product but user satisfaction along with it.

Champion's sales department has consistently been a leader in the papermaking industry. A billion pounds of paper and paperboard are distributed every year through Champion sales offices located in key cities across the country. It goes to paper merchants, converters and publishers in every part of the United States and in foreign countries.

Every modern method of communication is utilized in Champion Paper's highly developed merchandising and distribution organization. Direct telephone contact via leased wires is always available among divisions and to sales offices in New York and Cincinnati. Teletype facilities through the vast, country-wide network of the tele-communicating system are used daily to speed orders, instructions or information.

Paper to meet the needs of customers comes from stock maintained in the warehouses of merchants in many cities; from inventory available at the mills; and from manufacturing orders. All forms of modern transportation are utilized in getting the product to the consumer.

Selling through advertising has played an effective role in Champion's marketing program. Distinctive ads and inserts which appear in national magazines and trade publications, combined with merchandising folders and direct mail brochures have made the Champion slogan "Champion Sets the Pace in Papermaking" a byline within the industry. Through the advertising program the Champion Knight used as a trade-mark has become a familiar symbol of integrity, quality products and reliable service to all users of paper.

CHAMPION PEOPLE

In the final analysis, an industrial company is people. It takes on animation and personality from the people who operate it. It reflects the human traits which motivated the founding fathers and which have passed to their descendants.

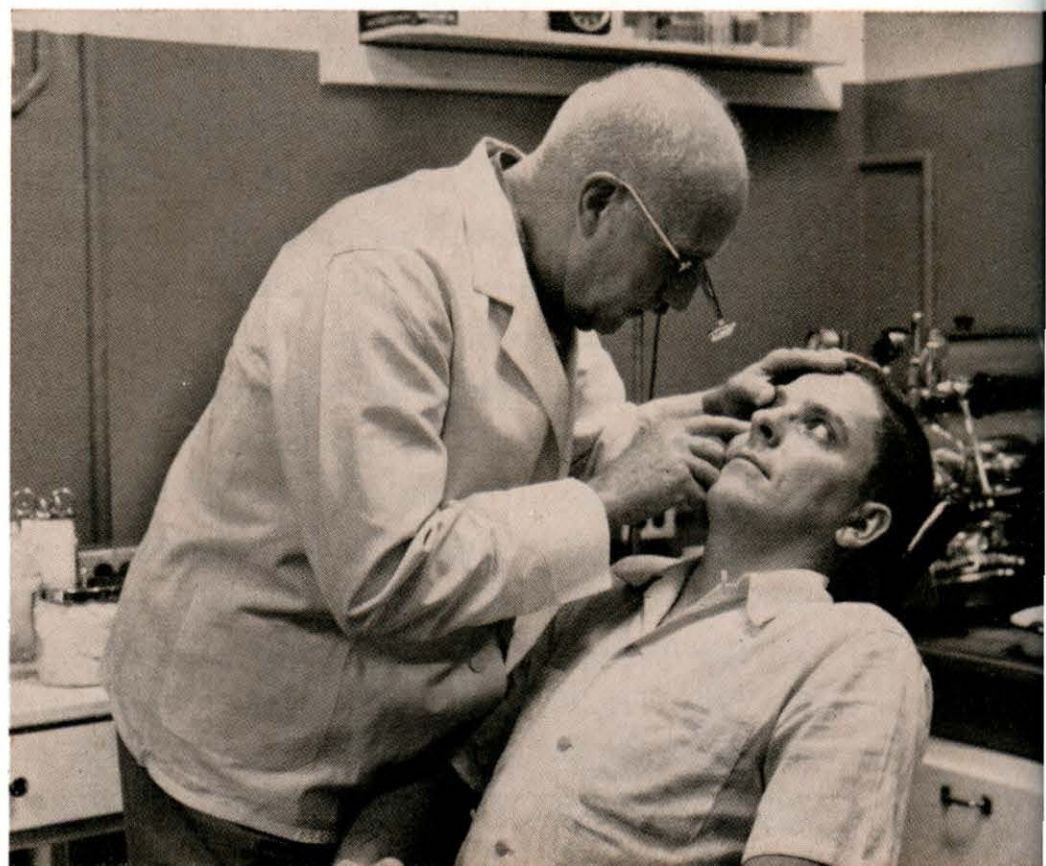
Champion has a strong faith that what is good for the individual is good for the company and for the country as well. For both company and country are made up of many individuals.

Champion's dealings with its customers, with its shareholders, its neighbors, and with its employees has always been based upon mutual understanding and good faith. It has always sought to provide superior products at reasonable prices, which would return a fair profit to shareholders and proper compensation to employees.

Champion employee practices include, in addition to fair wage rates, such other compensations as medical, hospitalization and life insurance; service bonuses; retirement pensions; safely engineered working conditions; modern low cost hot food service; medical service; aptitude placement tests; a credit union operated by employees; recreational facilities and training courses leading to advancement in individual earning power.



Champion forest management practices call for the preservation of seed trees.



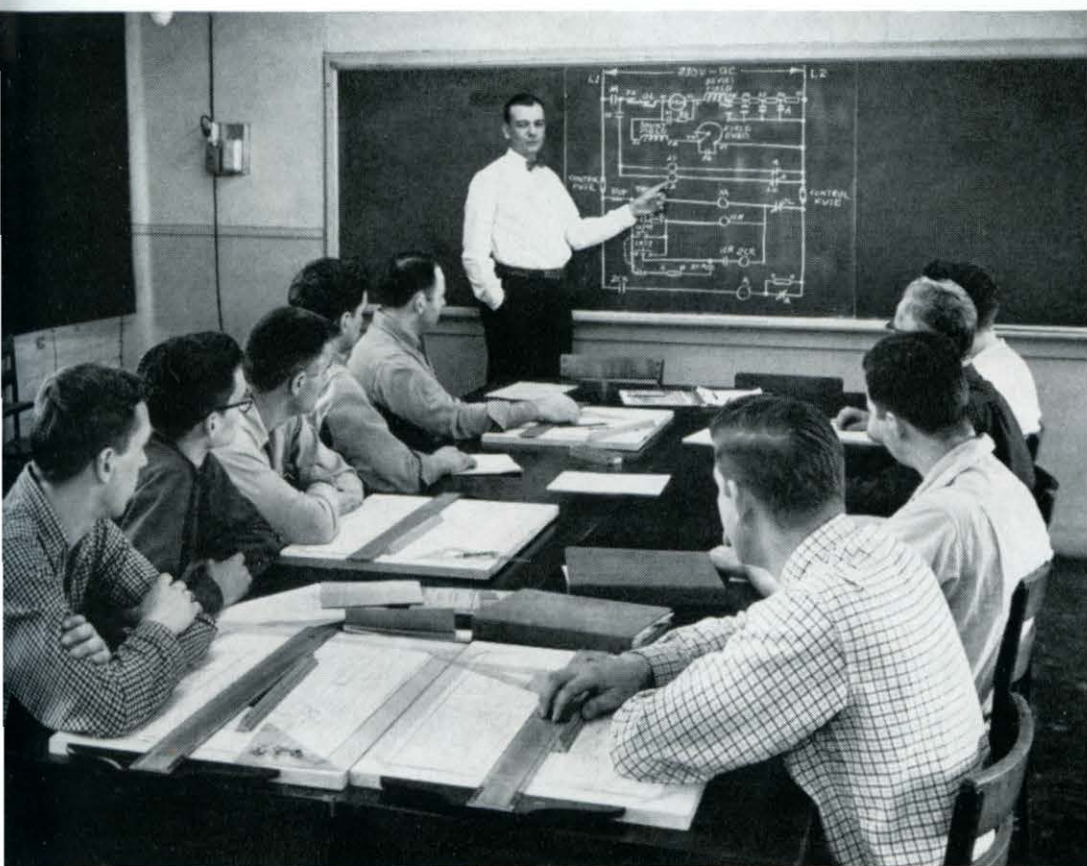
Champion medical service protects employees from hazards of everyday work.



Champion research and engineering keeps the company in the front ranks.



Champion hot food service replenishes the inner man when he can't get home.



Champion training prepares employees for advancement within the company.



Champion recreational programs lift the spirits in common good-fellowship.