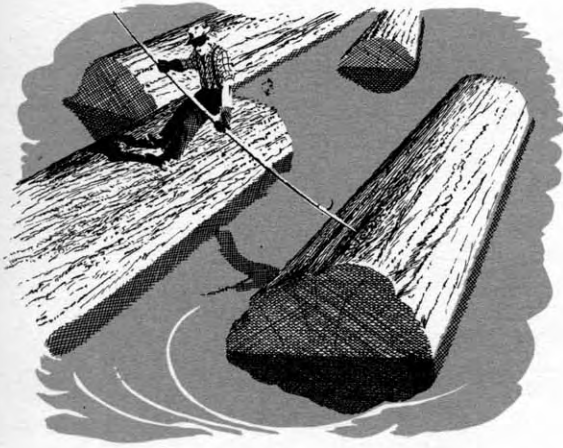


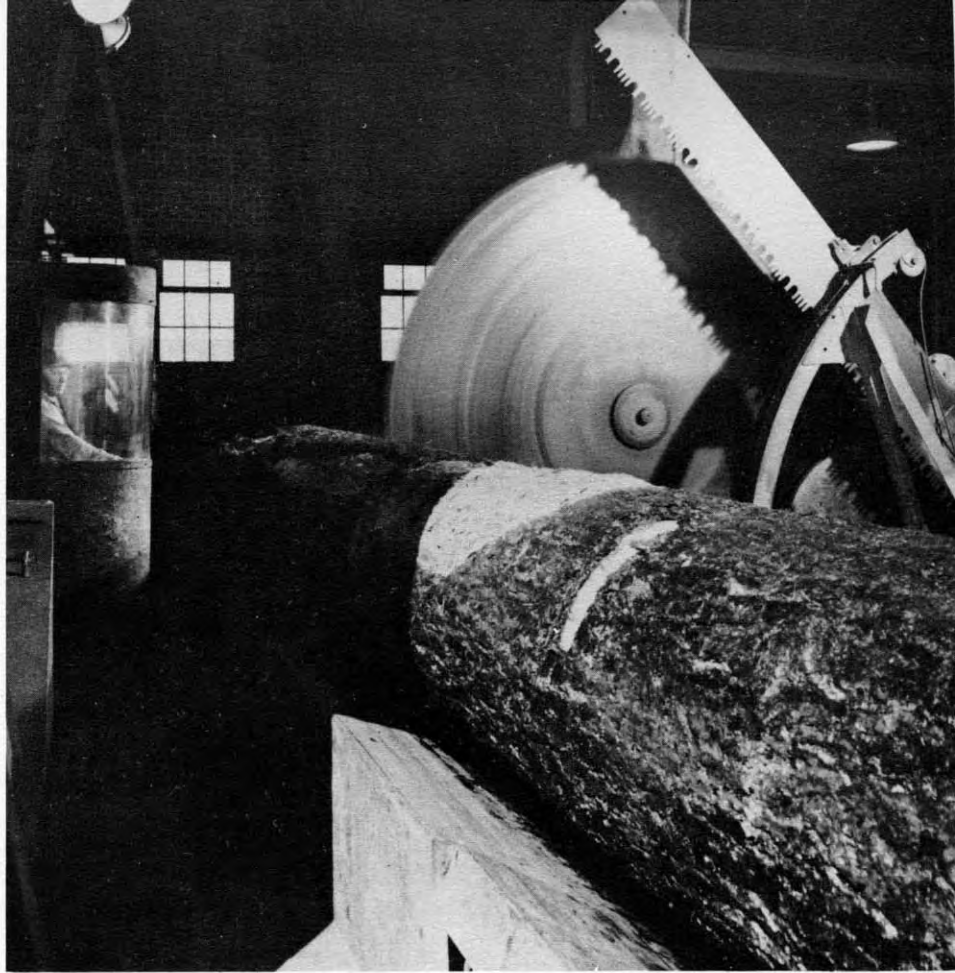
## HOW A PULP LOG IS MADE READY FOR THE DIGESTOR

Pulp logs arrive at the millside log pond on trucks and in tow of tug boats. Commencing with the inclined chain belt, the log is carried by a system of conveyors through a series of operations by which it is reduced from its original size to chips about the size and twice the thickness of a silver dollar.

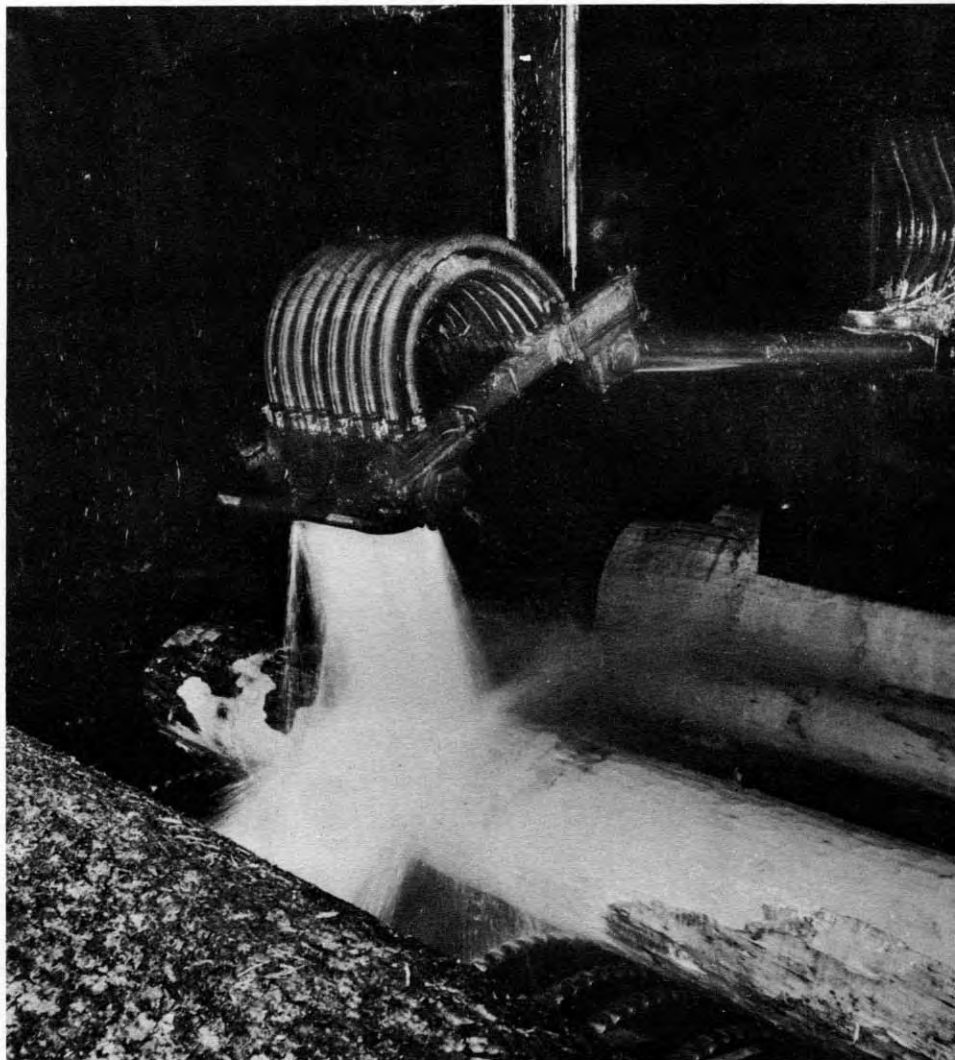


At the start, a 9-foot circular saw slices its way through each log, cutting it into 20-foot lengths for barking. The Bellingham hydraulic barker was designed and patented by company engineers. In this machine logs revolve on cog wheels while the hydraulic barking nozzle travels from one end of the log to the other, removing the bark by water shot at 1,300 pounds pressure to the square inch. Knotty, irregular logs are debarked as easily as smooth ones. Oversize logs are diverted to a machine which cuts them down to 40-inch cants, the maximum size which the chipper can handle as a single piece.

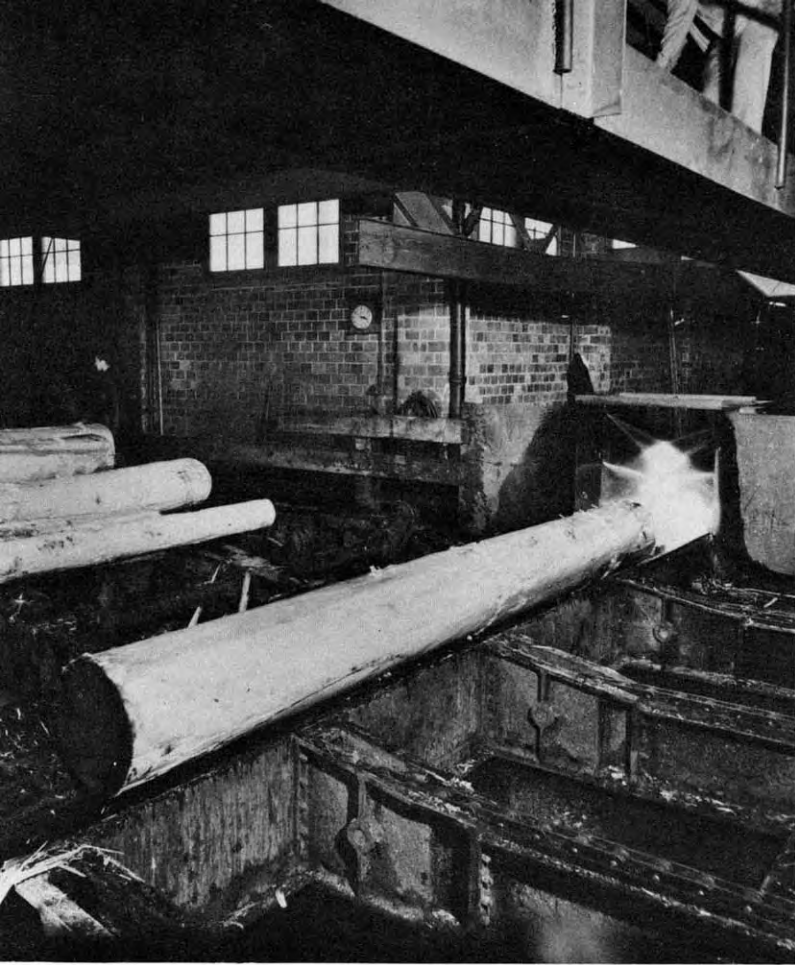
En route to the chipper, each log is given a thorough drenching or second wash. Then, diving into the throat of the chipper, it en-



*A 9-foot circular saw cuts logs into proper lengths for hydraulic barking process.*



*Water forced at 1,300 pounds pressure to the square inch strips bark from pulp logs.*



*Barked logs are given a cleansing shower before they arrive at the chipper.*



*Over-size logs are cut down to 40-inch diameter enroute to the chipper.*

counters keen-edge knives, whirling at angles, and in a matter of moments is reduced to chips. In terrific din, the mighty struggle which the vibrating log puts up suggests a prehistoric monster in his last battle.

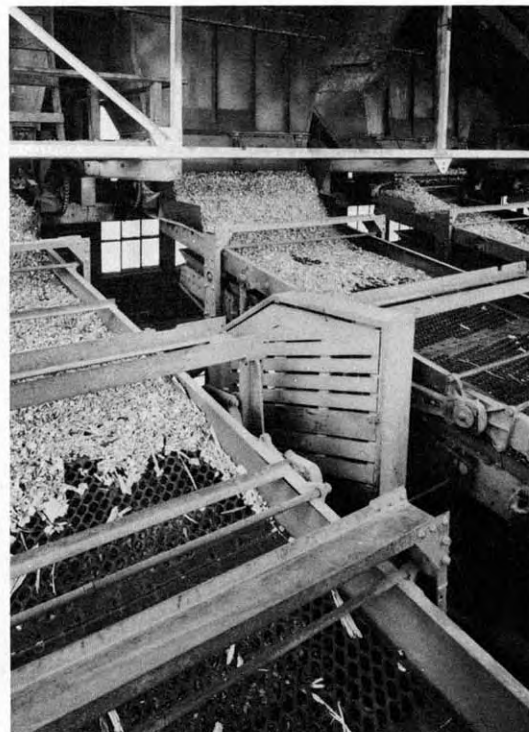
This hydraulic barking and whole-log chipping process, installed in June 1946, gets about one-fifth more pulp out of a given amount of wood than was obtained by a former

process in which logs were cut down to chips by several stages which consumed more of the log in sawdust. The new process is also an important labor saver.

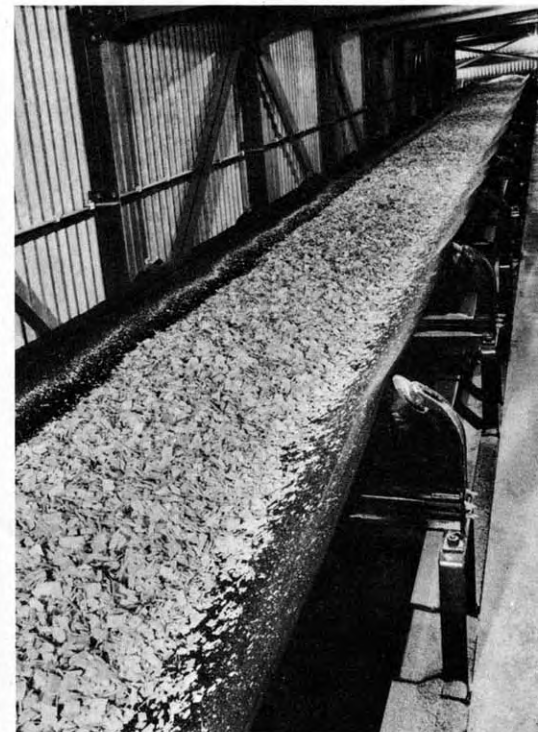
Showering from the chipper, newly cut chips move on conveyor belts to shaker screens for sizing. Only chips of uniform size and structure are admitted to storage; all others detour through a further preparatory process.



*Keen knives quickly reduce big logs to tiny chips.*



*Shaking screens sort chips for size and structure.*

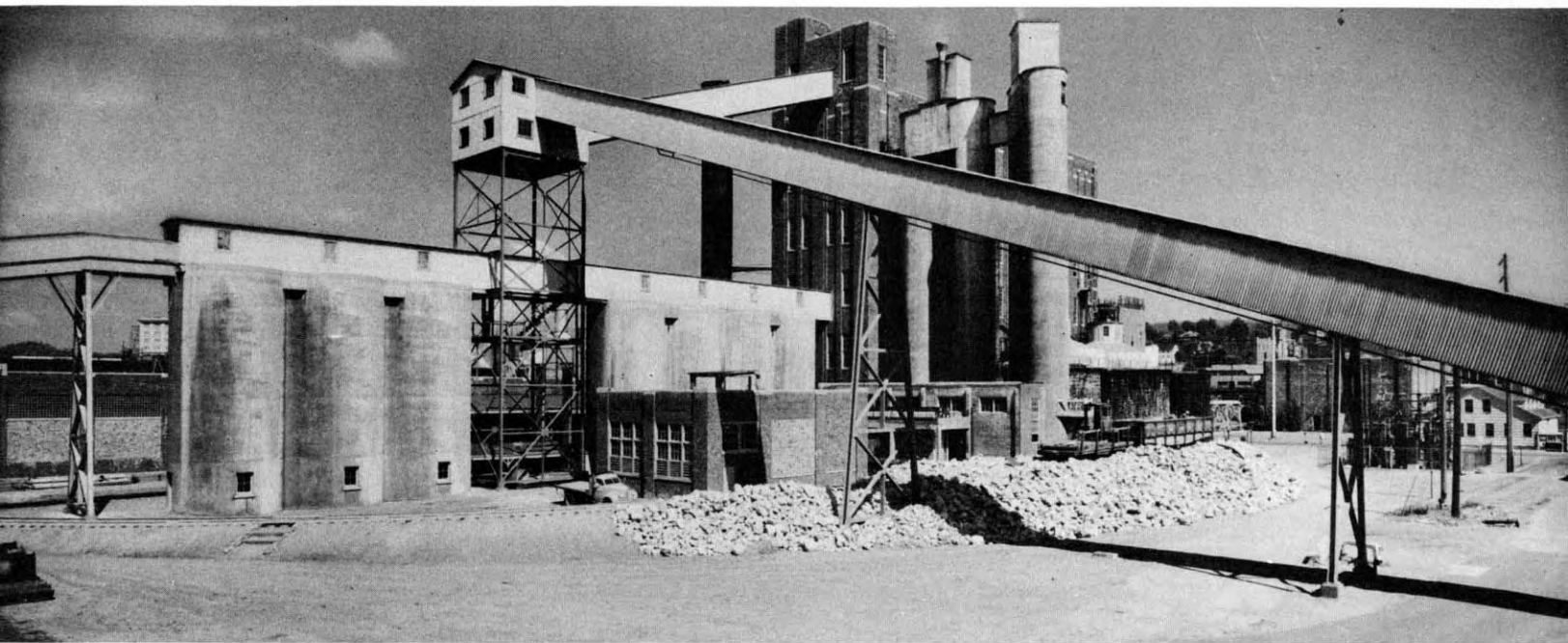


*Graded chips are carried to bins over the digesters.*

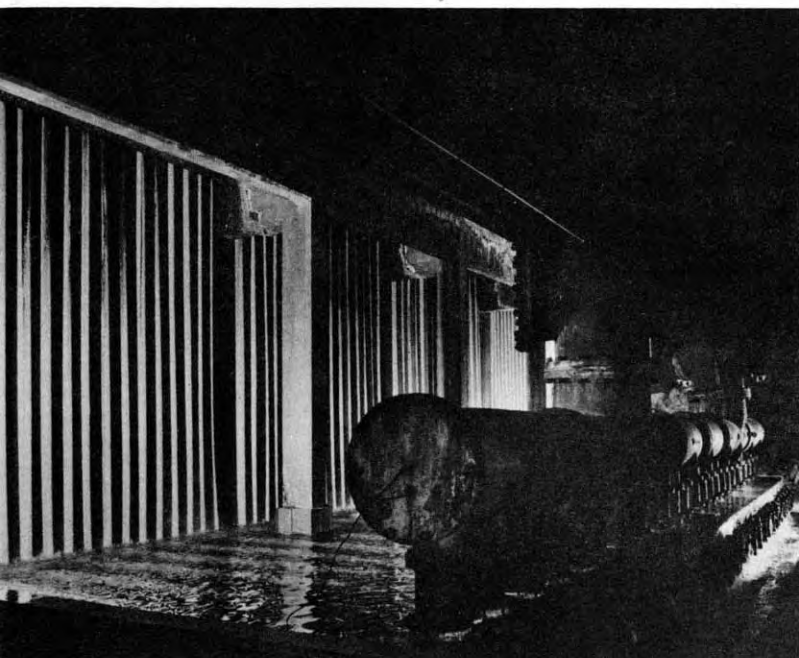


## PREPARATIONS FOR COOKING THE CHIPS

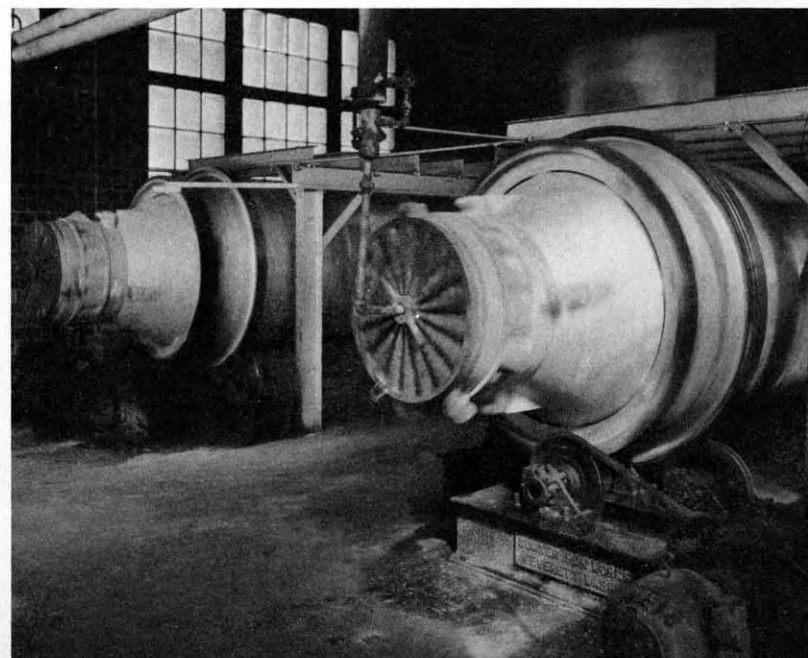
In the acid plant the chemical solution used in making Puget Pulp is produced from Texas sulphur, Washington limerock, air and water. Sulphur is melted in a tank equipped with steam coils, and in liquid form is pumped to slowly rotating burners where it is combined with air to create sulphur-dioxide gas. After being cooled, a fan forces this gas into the base of 90-foot towers, 12 feet in diameter, in which cooking acid is produced. These towers are completely filled with limerock, over which water flows from top to bottom, counter-current to the upward flow of gas. Sulphur-dioxide gas absorbed in the water forms sulphurous acid, which reacts with the limerock in forming calcium-bisulphite. The solution, in proper proportions of free sulphurous acid and calcium-bisulphite for efficient cooking, flows through a settling basin for removal of dirt and is then pumped to storage tanks, adjoining the digester building to be drawn upon as wanted.



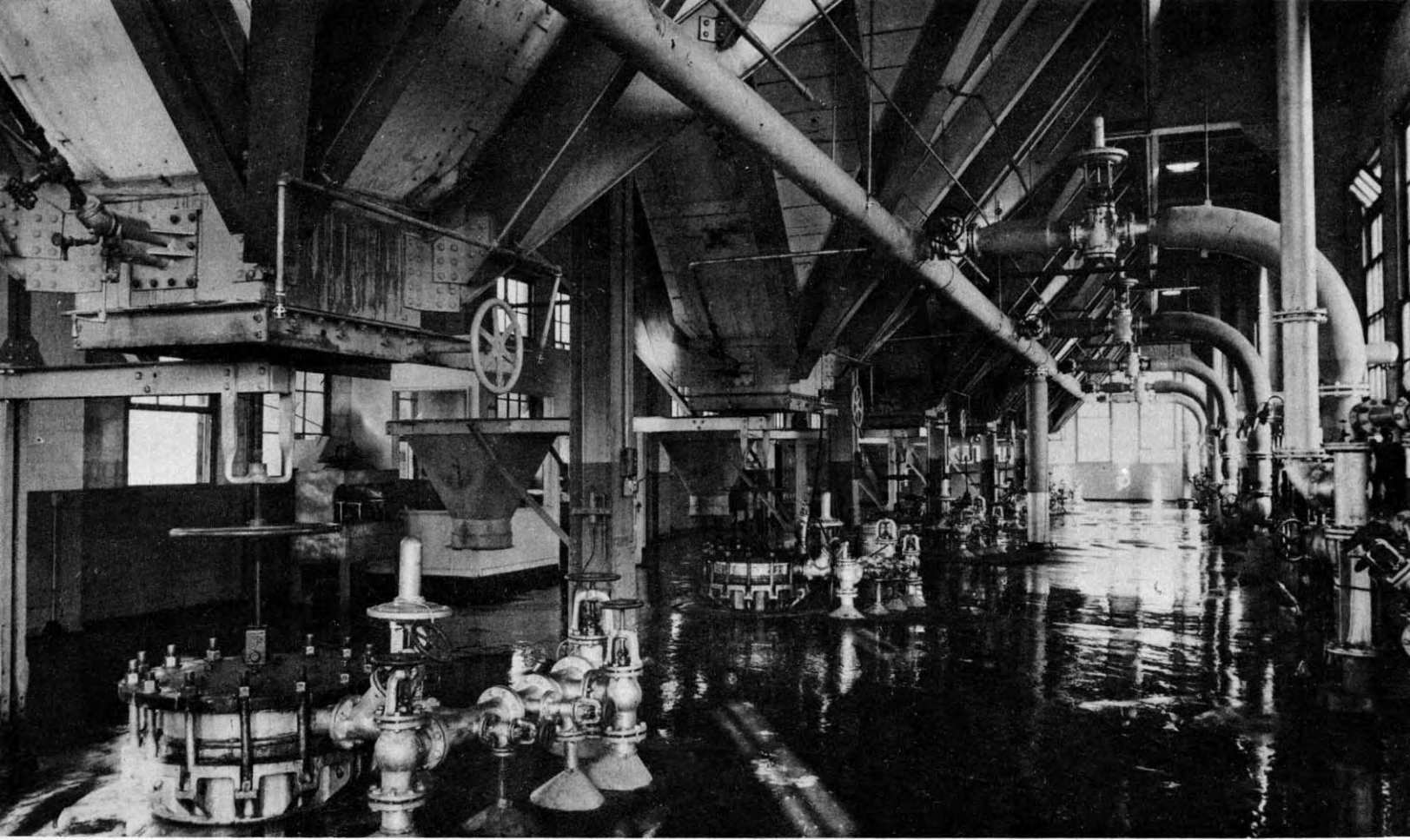
*Sulphur silos and acid towers, limerock pile and sulphur burner room in foreground are framed by the chip conveyor leading to the digester building.*



*Acid for cooking wood is purified in this cooler and settling basin.*



*Sulphur-dioxide gas is produced in these slowly revolving burners.*



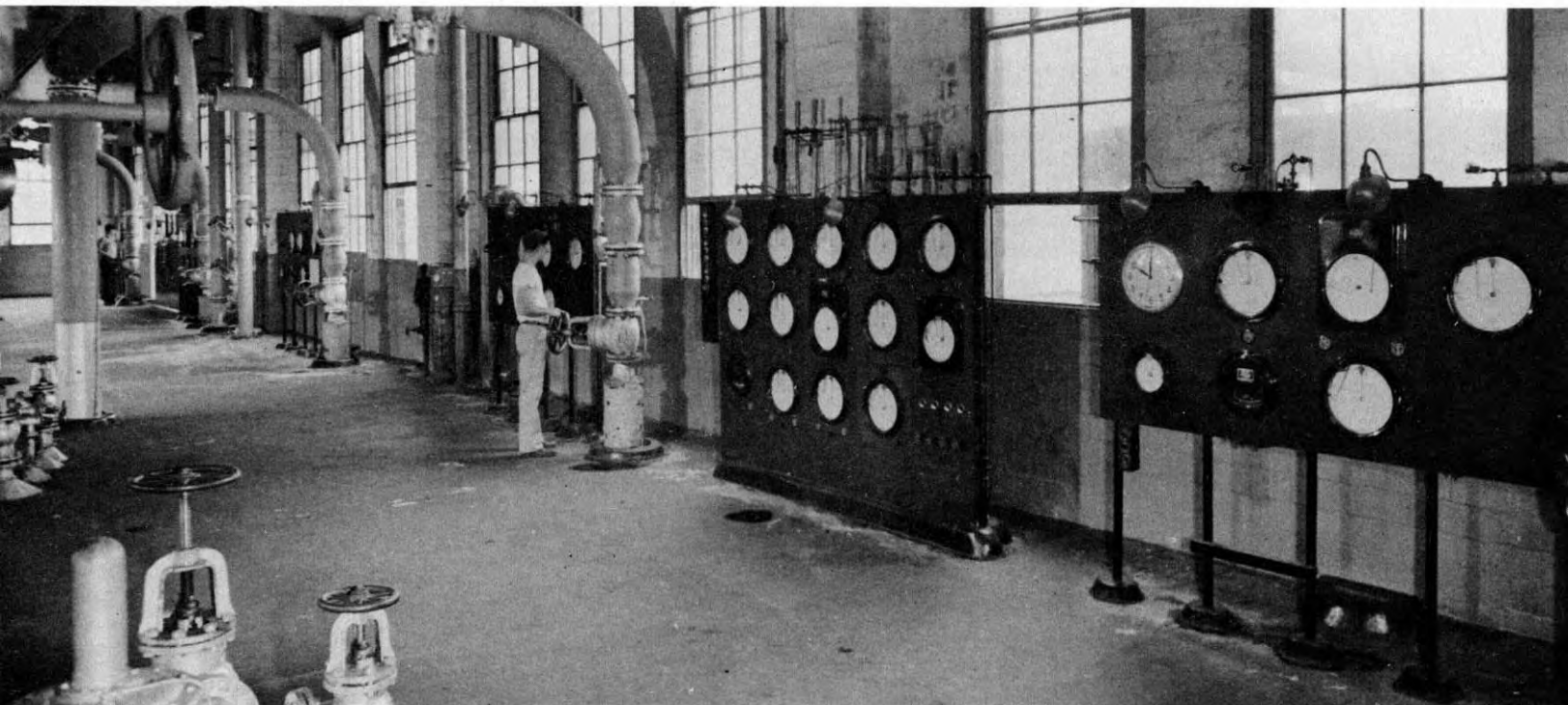
*At 8-hour intervals chips are fed from tapering storage bins through tightly clamped hoppers into digesters where the cooking takes place.*

## **THE HEART OF THE PULPING PROCESS**

Into the digester department flow wood chips, cooking acid and steam. From the digesters flow pulp fibers and residual liquors. The function of this department is to set free the cellulose fibers in the wood by dissolving the substance which holds them together. This pulping process is

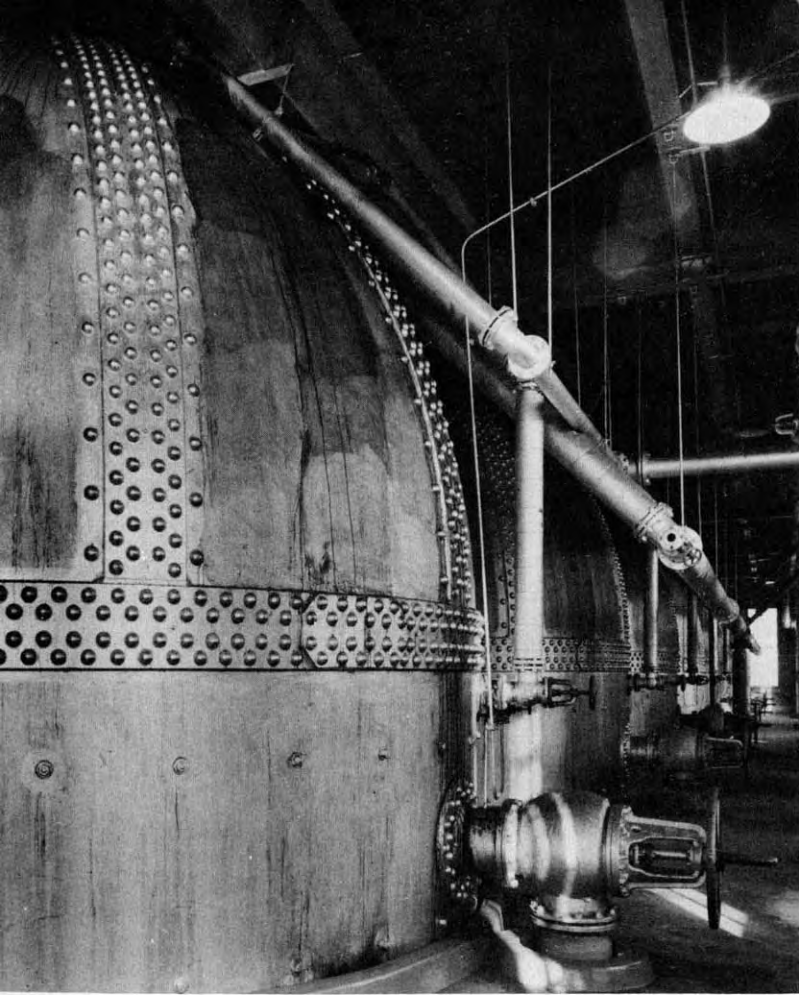
accomplished by cooking the chips at high temperatures and pressures in an acid solution.

The digesters, of which there are six in the Bellingham mill, are tile lined vessels 56 feet high by 18 feet in diameter, each with a capacity of 22 tons of pulp.

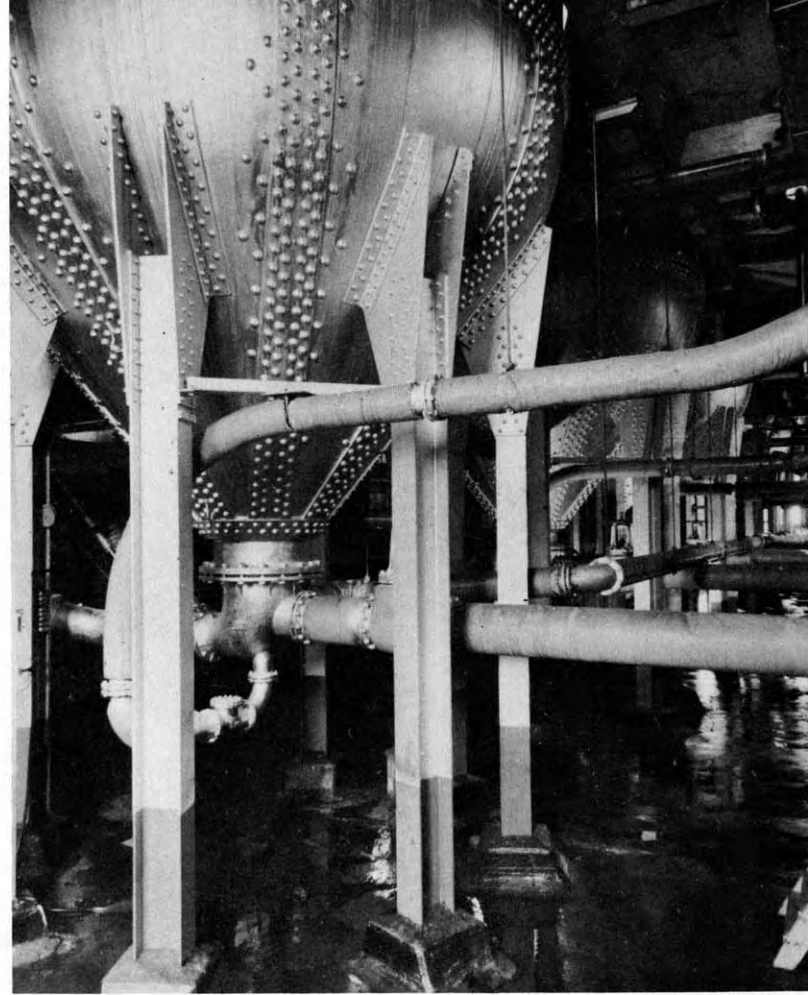


*Production of Puget Pulp is to a large degree automatic. At these panel boards control of operations of the digesters is carefully regulated.*





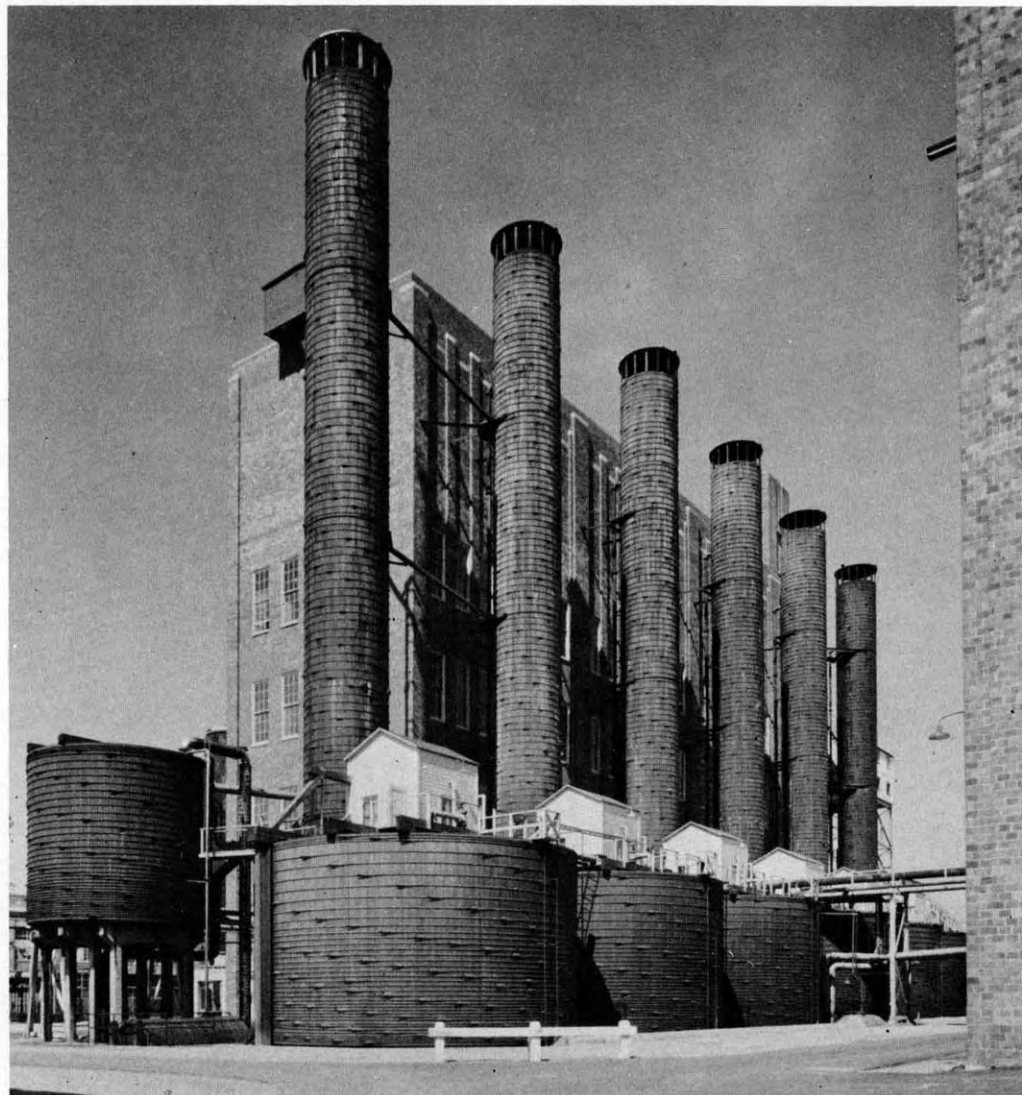
*Top section of the digesters, each of which cooks 22 tons of pulp.*



*Cooked pulp flows to blow pits from this bottom section of digesters.*

The lid of a digester comes off, the hopper swings into place, and the digester receives a charge of chips from the bin above. Sulphurous acid is pumped in, filling all voids. Live steam is admitted at measured rates of flow, and the temperature of the digester contents is raised according to schedule, reaching 135° C. The cooking process goes on for eight hours during which the wood is digested, and resins, lignin and other substances are separated. From the bottom of the digester the resulting pulp is blown into a storage vat, or blow pit, of wood stave construction, 36 feet in diameter by 20 feet high.

In the blow pits the sulphite liquor resulting from the cooking process—formerly a waste material—is drained from the pulp fibers and preserved for alcohol manufacture; the pulp fibers are washed and transferred to the screen room for further processing.



*Pulp fibers are washed and stored, waste liquor withdrawn, in blow pits adjoining digesters.*

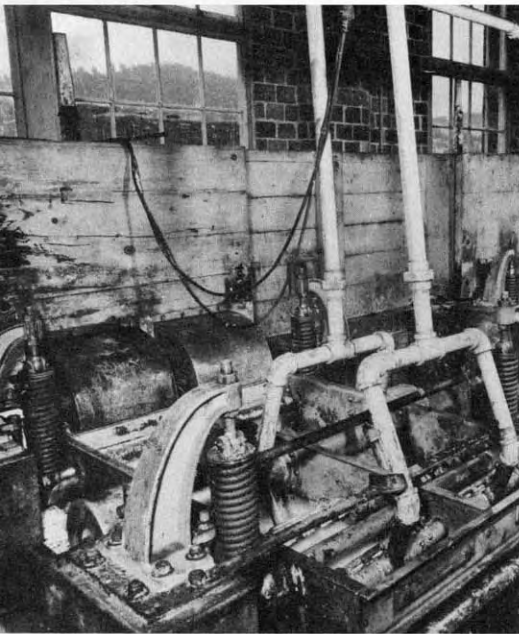


*The pulp screen room, at right in the foreground, is connected by pipeline with the blow pits.*

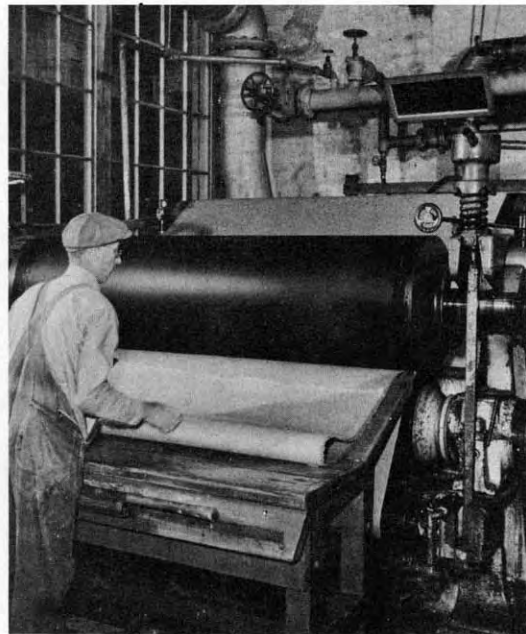
## NEXT A SERIES OF SCREENING AND PURIFYING PROCESSES

Pulp fibers must go through a number of grading and purifying processes before they reach the drying machines. These take place in the screen room, to which pulp flows from the blow pits.

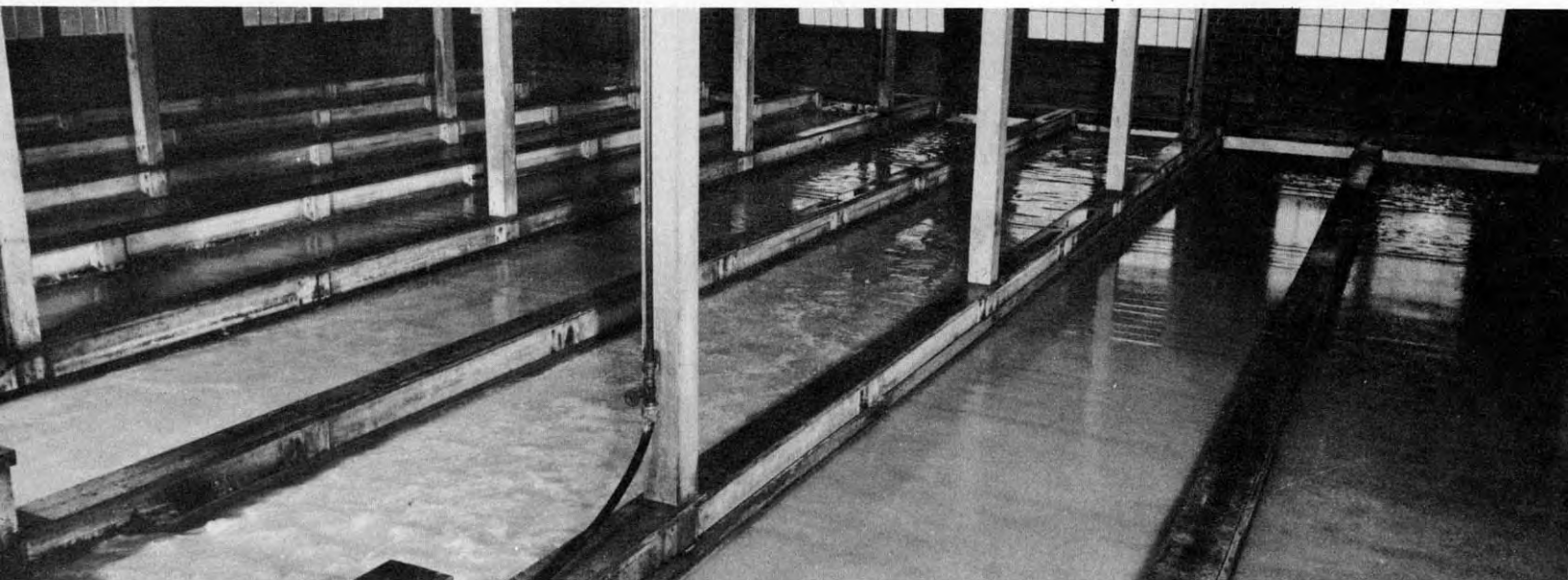
First, the pulp is jostled through knotters, a group of machines which remove any knots and undigested lumps. The pulp then passes through washers which remove any trace of acidity. The washed product is carried in filtered water over riffles where an agitating action removes sand and grit. Next comes the screening process, separating short fibers from long ones. Flowing over pulp screens, the short, acceptable fibers are sucked through slots  $\frac{8}{1000}$  of an inch wide. Oversize fibers and specks of bark are diverted to the tailing machine where they are made into material suitable for manufacture of coarse paper products. Screened pulp, thickened by draining out water on revolving deckers, moves on to the bleaching process.



*Uncooked knots are removed by machine.*

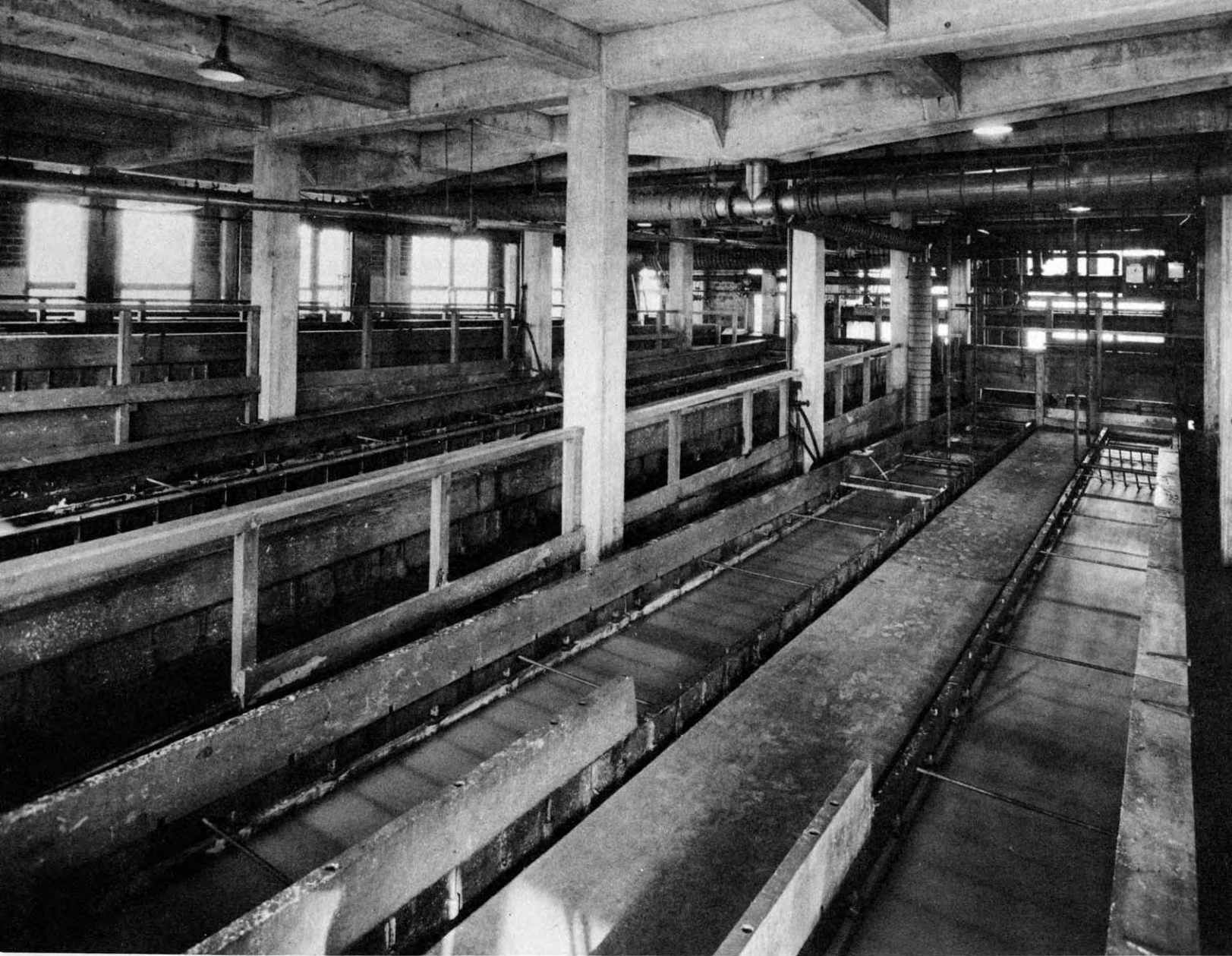


*Rejected fibers are made into usable material.*

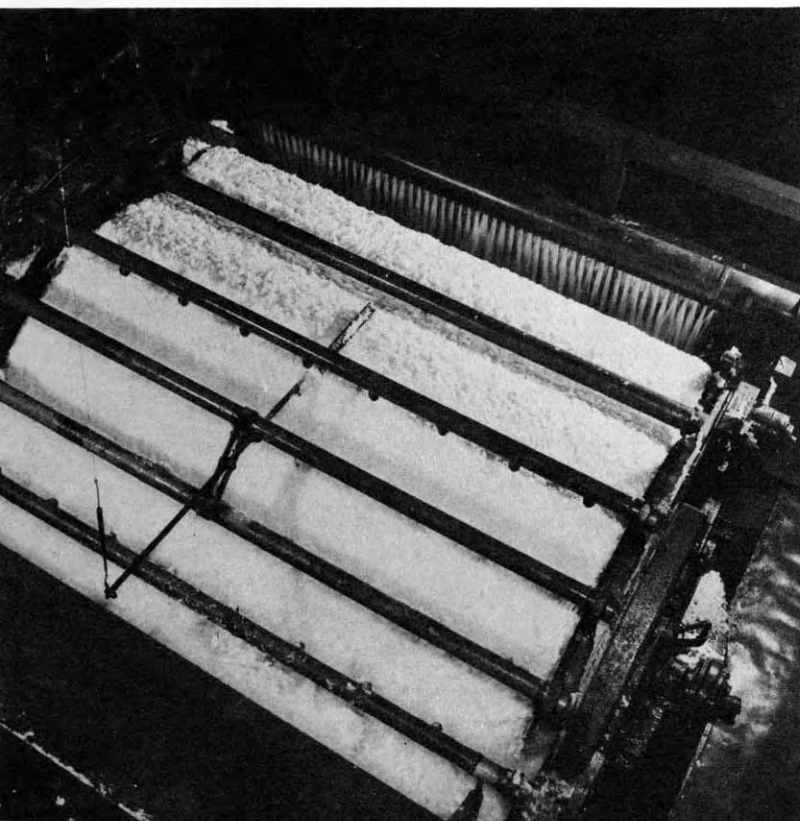


*As one of the many steps in the purifying process, sand, grit and other impurities are removed from Puget Pulp as it flows over the riffles.*

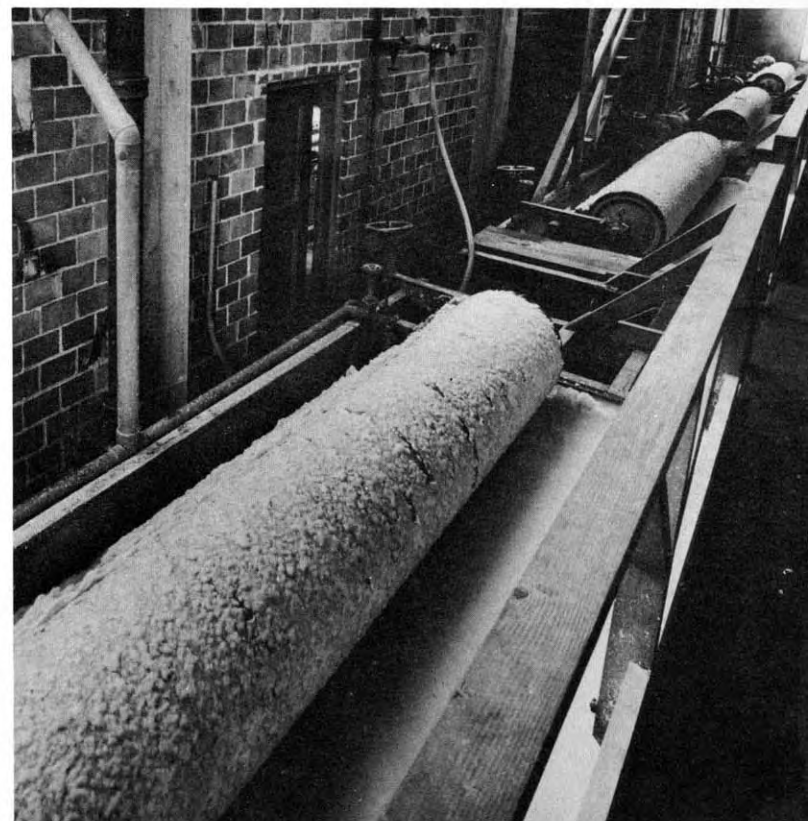




*During the screening operation accepted fibers must squeeze their way through a sieve of slots measuring 8/1000 of an inch in diameter.*

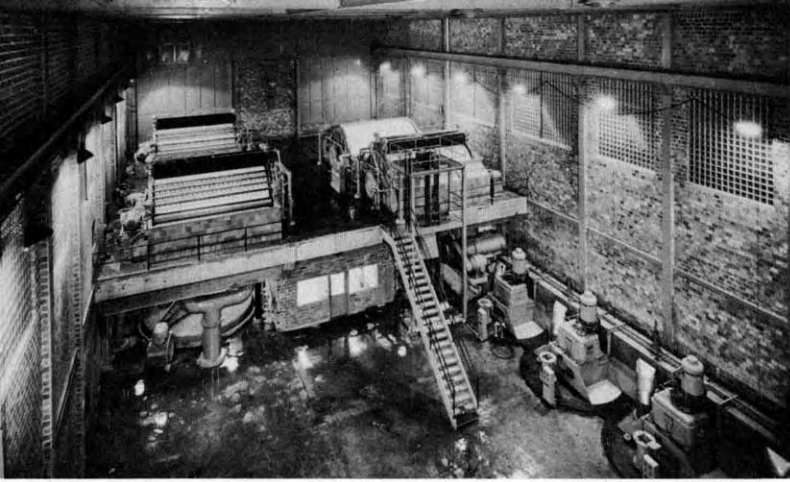


*Washers remove any trace of acidity remaining in screened pulp.*

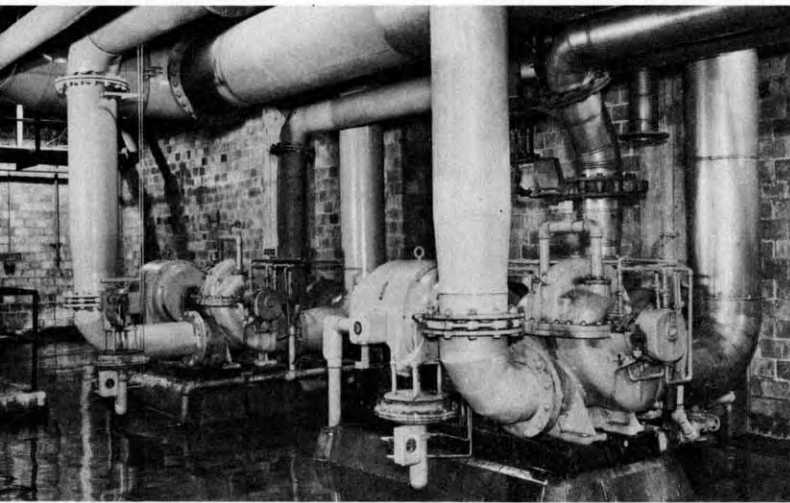


*Screened pulp, thickened on deckers, is ready for the bleaching process.*

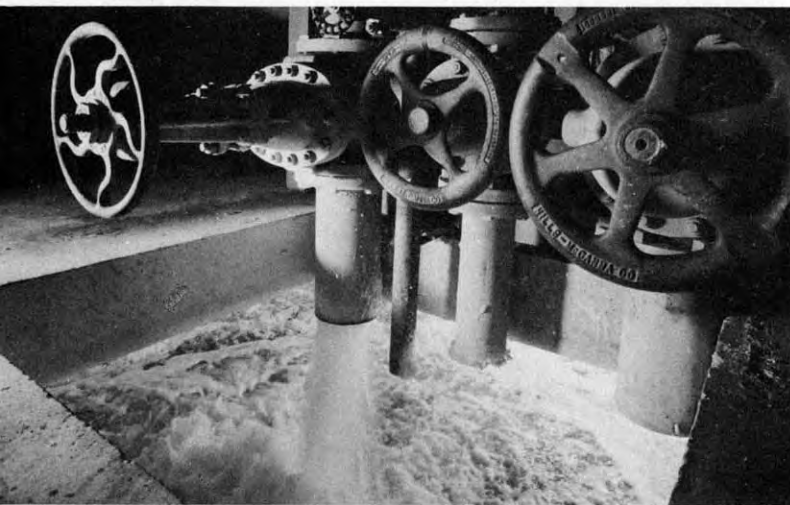
## **FLEXIBLE BLEACHING EQUIPMENT AUTOMATICALLY CONTROLLED**



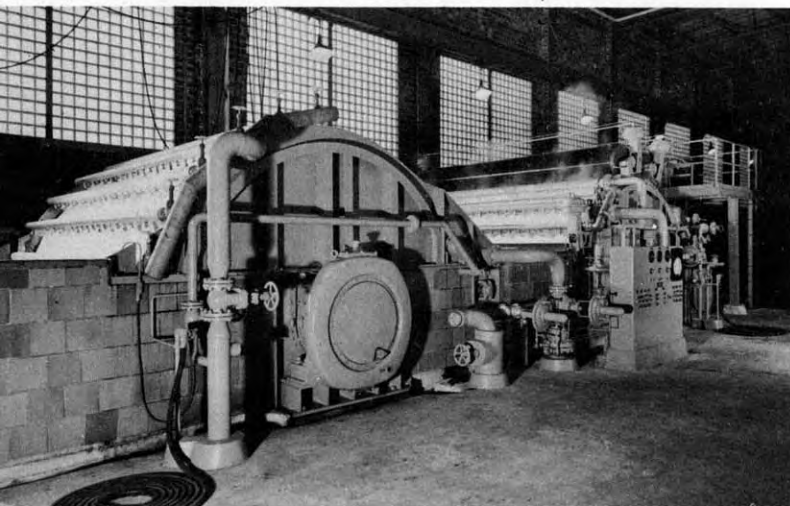
*Bleach plant operating floor; washers on mezzanine, control room below.*



*Typical stainless steel piping and pump installation in the bleach plant.*



*Chlorine bleaching liquor is mixed in vats by rapidly whirling paddles.*



*Hypochlorite and chlorine washers, two of Puget's four such machines.*

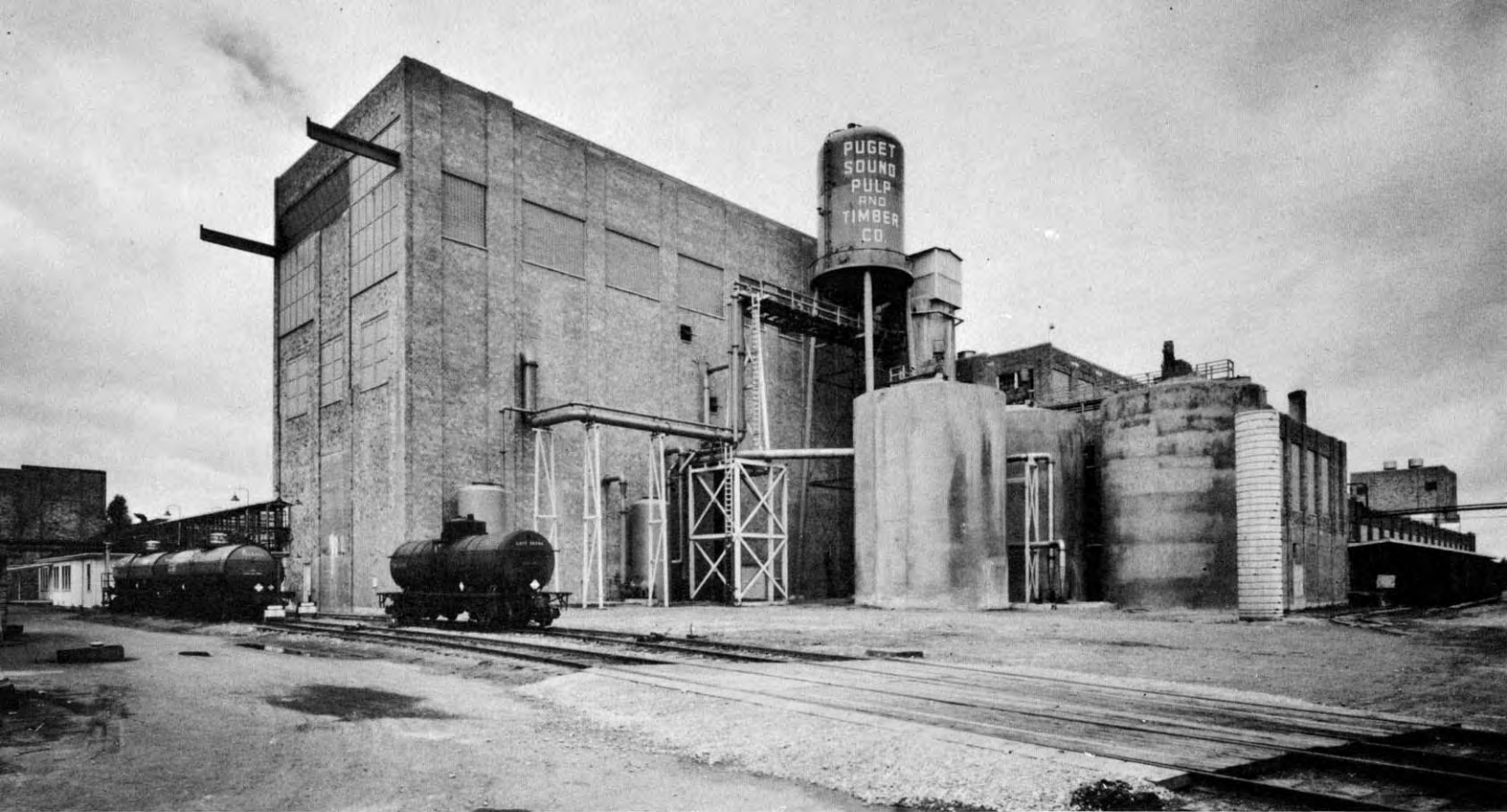
Puget Sound's bleaching facilities have been designed so that either bleached or unbleached sulphite pulp can be produced.

Bleached pulp is achieved through a series of four stages; in finishing unbleached sulphite the bleaching process is by-passed entirely. The bleaching installation is designed for complete flexibility. By adjustment of valves, screened pulp is directed through one, two, or all four of the bleaching operations, and from there to storage ready for the dryers. With this arrangement, Puget Pulp can be finished to suit the requirements of various markets as to color (whiteness) and other requirements.

Pulp bleaching equipment consists of a series of washers, pumps, tanks, chemical mixing vats, chemical and pulp storage towers, cells and other units, occupying or adjoining a large building which houses the bleaching operations. Expressed in non-technical terms, which we may possibly carry to the extreme of over-simplification, the bleaching process involves running pulp through a series of chemical washers and intervening towers and cells. Huge revolving drums carry the pulp through the washers, while water and bleaching chemicals (chlorine, caustic and hypochlorite) are sprayed on, forced through and soaked into the pulp fibers. The pulp is an amber color when it enters the first washer, and a clear white when the fourth bleaching stage is finished.

It is about a 10-hour journey for screened pulp fibers to traverse the complete bleaching operation. And yet, thanks to mechanical ingenuity and efficiency, the operation is automatically controlled from beginning to end. The regular staff of the bleach plant consists of one man in the control room during each 8-hour shift, and one additional operator on duty eight hours out of each 24.

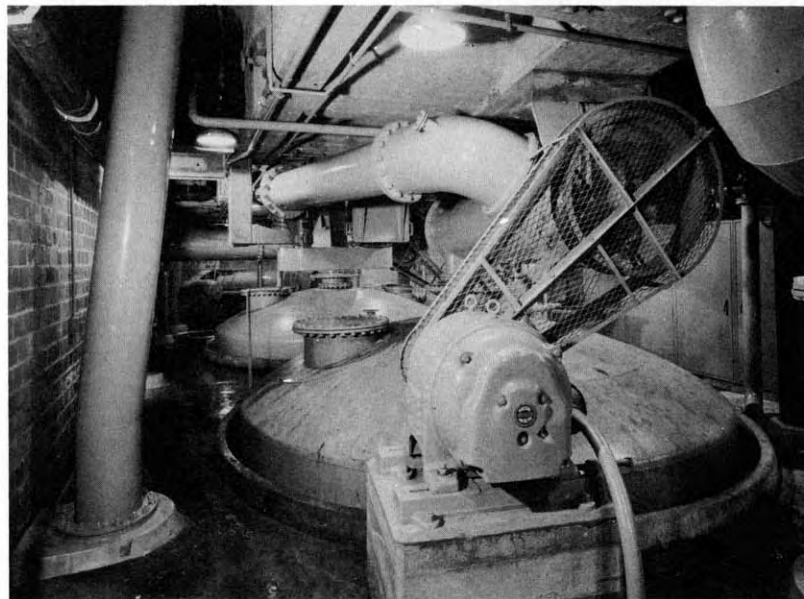




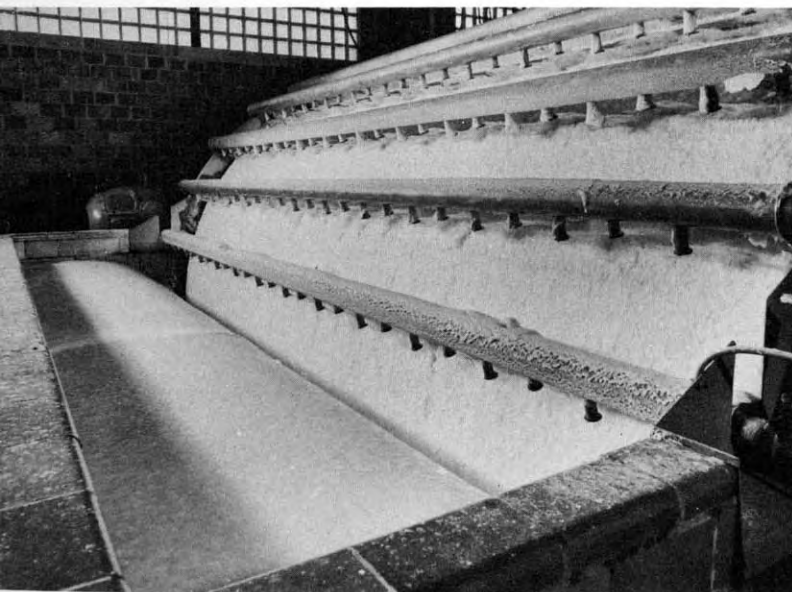
*Viewed left to right: new bleach plant, tanks and towers; recently rebuilt screen room; and, far right, new steam plant addition.*



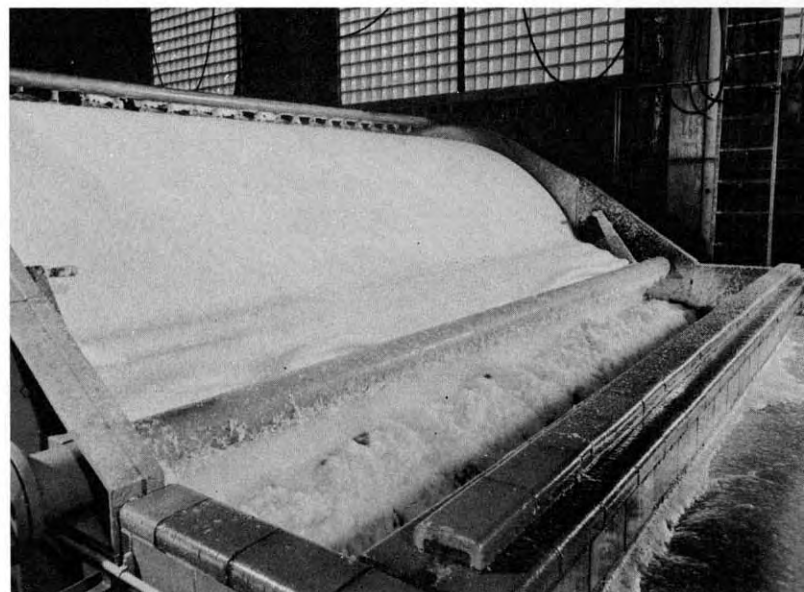
*Battery of six tile-lined bleach cells, each with 7½ tons pulp capacity.*



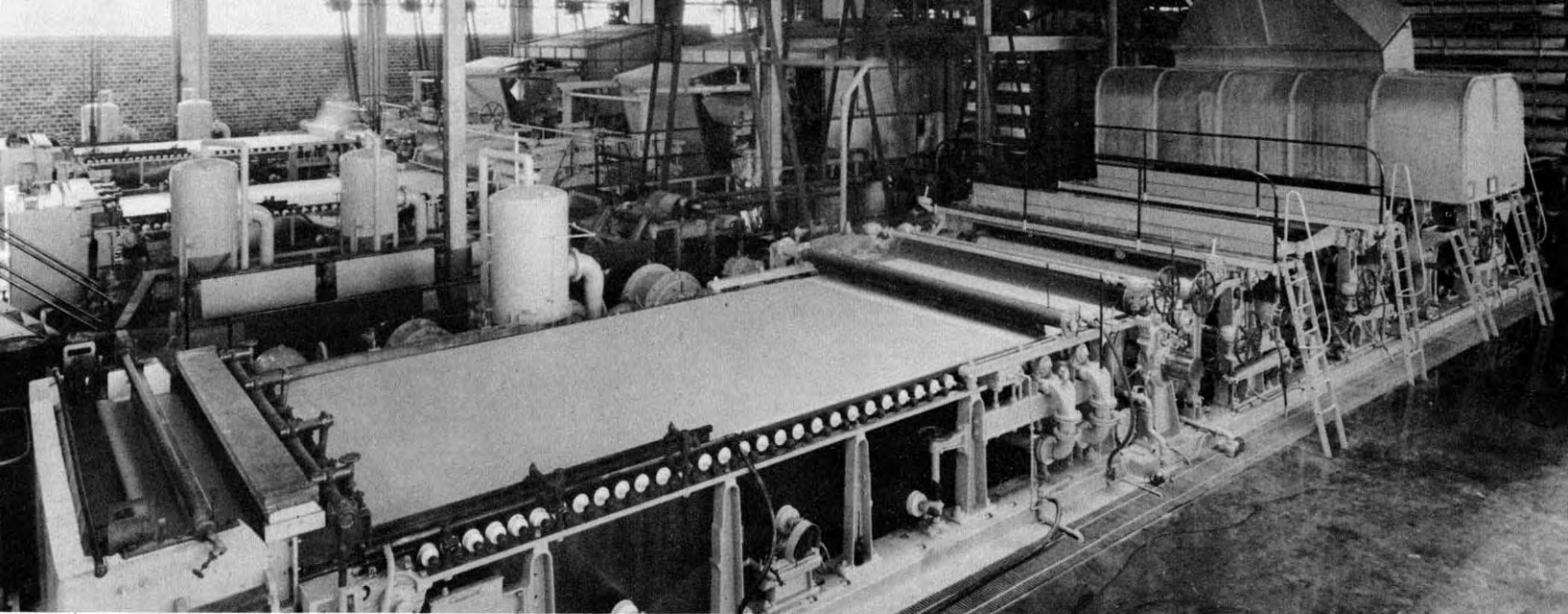
*Top of bleaching towers and feeding lines to caustic and hypo towers.*



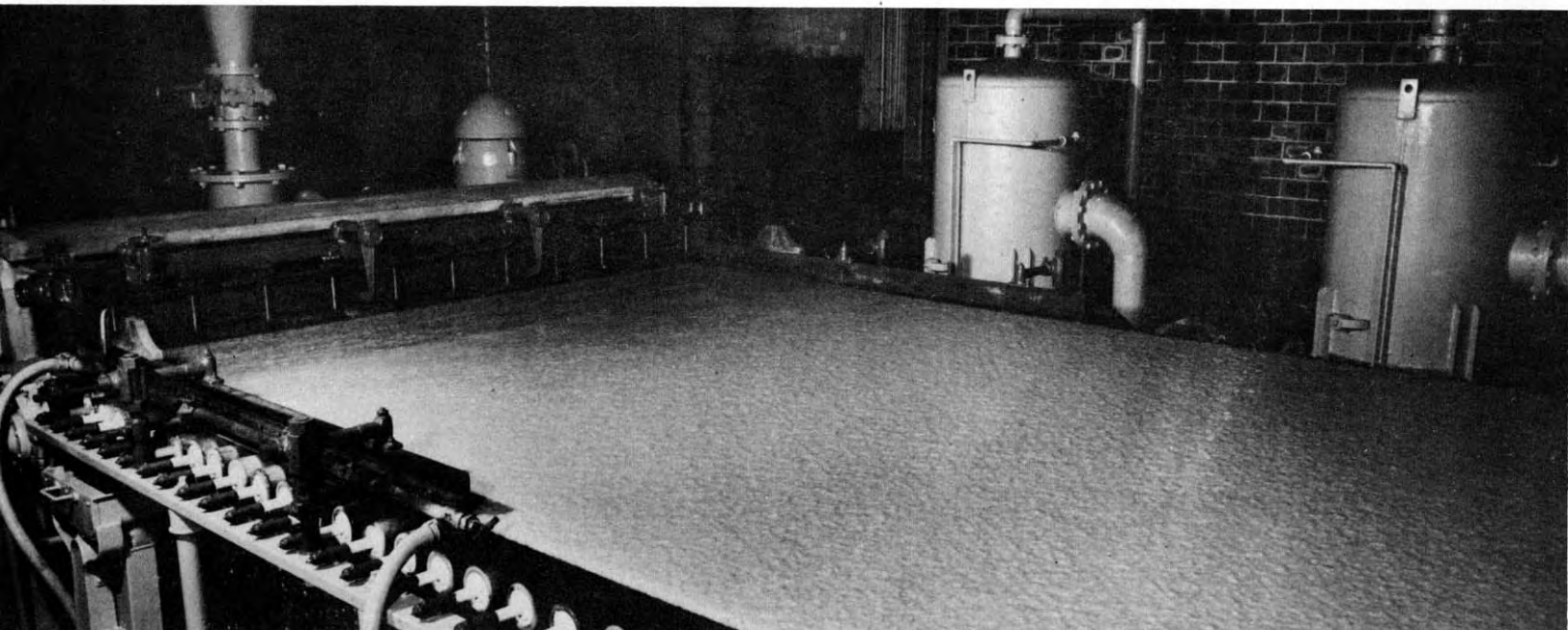
*Puget Pulp receives its final wash on a 16-foot drum after bleaching.*



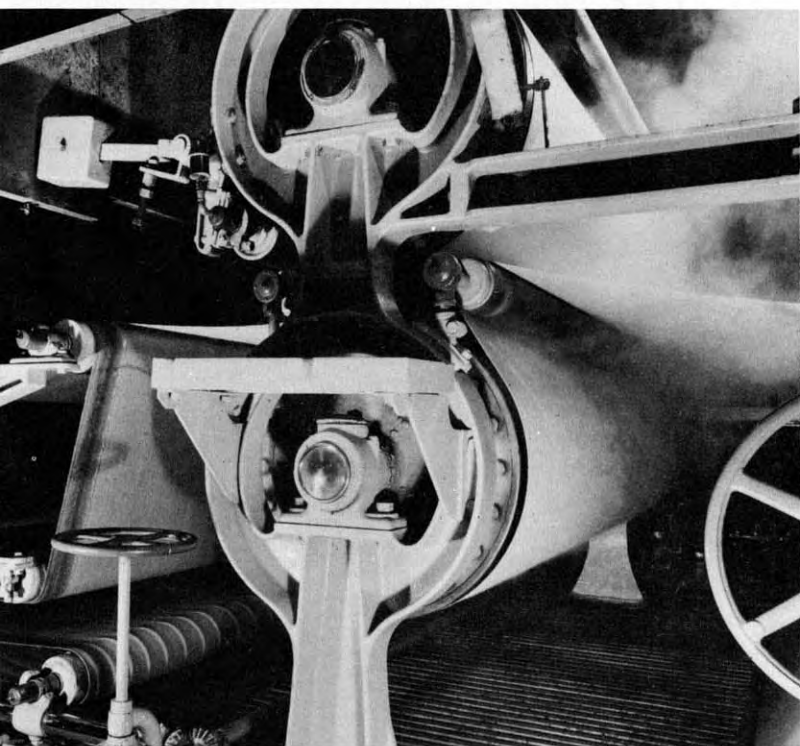
*After final wash, bleached Puget Pulp is ready for the drying machines.*



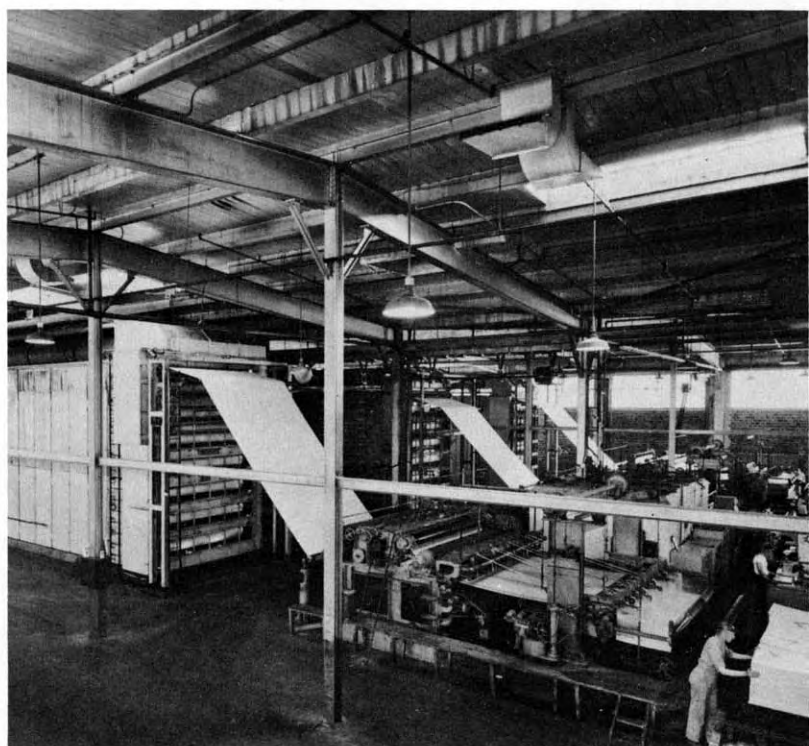
*Pulp is finished in an assembly of three machines through which it progresses from liquid to dry form. Here is the wet end of a pulp machine.*



*In the first stage of the drying process, slush pulp travels on a Fourdrenier wire belt while water is drained and the pulp sheet begins to form.*

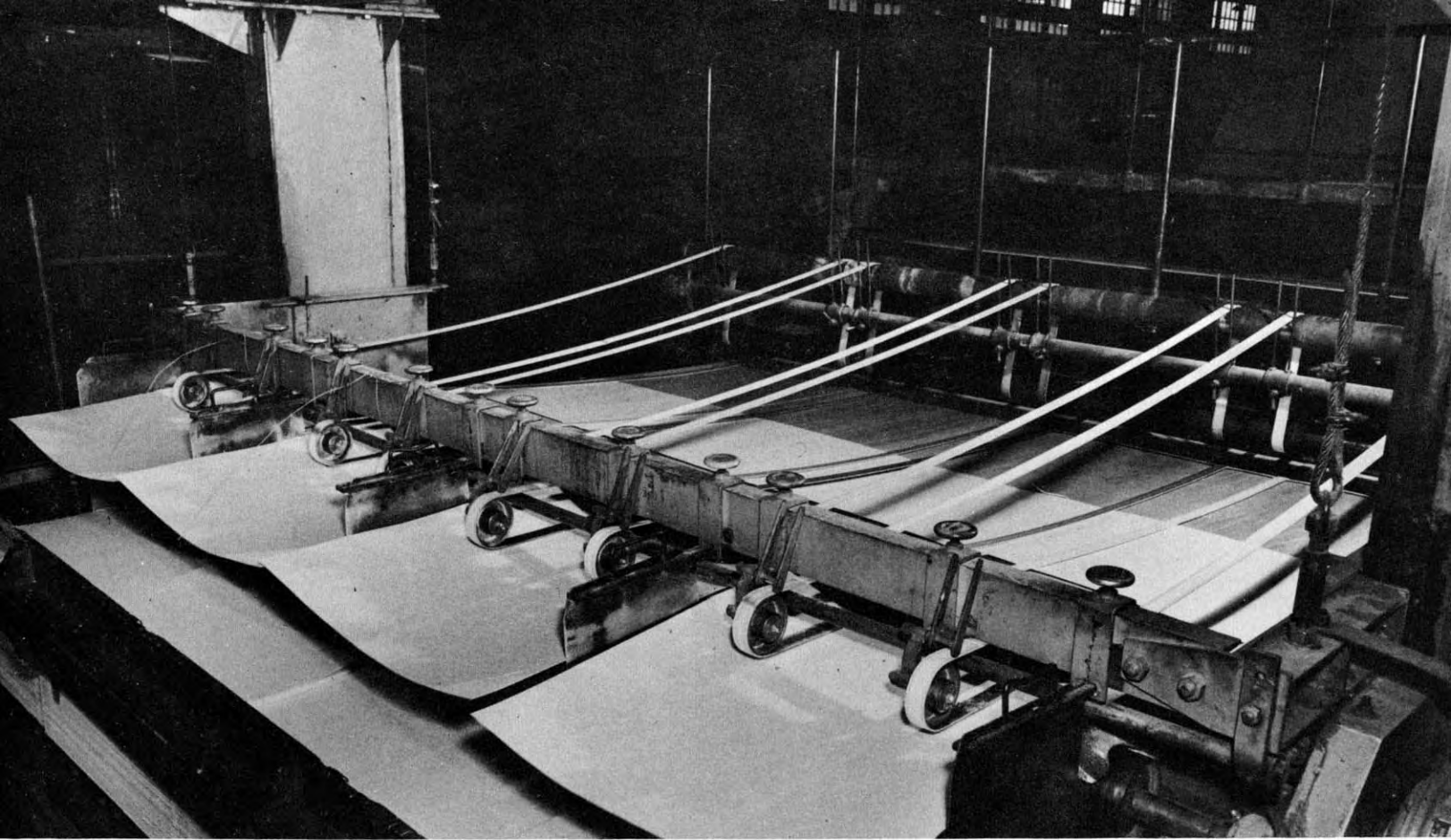


*The newly formed sheet of pulp is preheated before it enters the drier.*



*Finished pulp rolls from each drier at the rate of 120 feet a minute.*





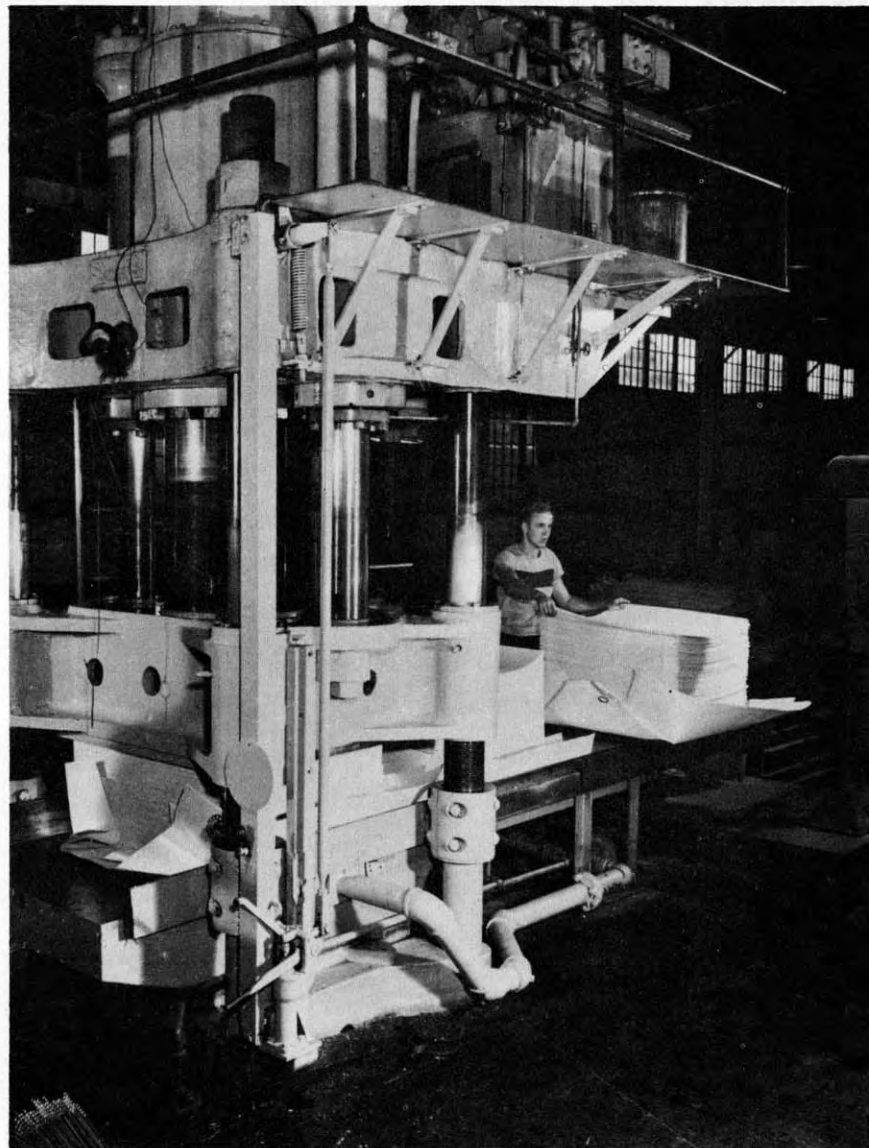
*Having completed its third-of-a-mile journey through the machines, Puget Pulp emerges from the drier where it is cut into sheets for baling.*

## **FINAL PROCESS IN THE PULP PRODUCTION LINE**

We are now in the machine room where a battery of three driers—huge assemblies weighing 400 tons each—complete the process of making Puget Pulp by extracting moisture from the mass pulp and forming it into sheets for convenience in handling.

Processed pulp is received at the wet end of the machine, where it passes over an endless belt of Four-drinier wire which allows the water to drain freely. The pulp then enters the hot water section, where fine sprays are shot through it to pre-heat the sheet before drying. In the drier, a large enclosed section, the sheet travels back and forth over a multiplicity of rolls, from end to end and from bottom to top. By fanning the heated air under pressure, the pulp is thoroughly dried, the sheet is formed, and the finished product comes out the dry end, having traversed more than a third of a mile since entering the wet end of the assembly.

Leaving the drier, the continuous strip of pulp 130 inches wide is cut into sheets for baling. Stacks of sheets slide over ball bearings to scales and baling press. A few quick flips fasten the bale with wire and 400 pounds of Puget Pulp move on to the customer.



*Scales and baling press terminate the pulp production line.*