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The Great Northern Paper Company, Chapter 18: Mill No. 1

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C H A P T E R XVIII

MILL NO. 1

It would now seem appropriate to go back to the beginning of things and look at what had happened in the mills during this period of fifty-odd years. We have already discussed what took place at Madison. We have noted the more important developments at the Penobscot mills, going into the details of some of them, but we will now try to cover in a more complete way the changes that were made over the years, the reasons for them, when these can be determined, and the results of them, where these can be ascertained, this chapter dealing essentially with the Millinocket plant. We will shun repetition as far as possible, making reference to material in previous chapters when required, but covering the same ground again may be unavoidable in some places.

Dorothy Bowler Laverty's excellent history "Millinocket, Magic City of Maine's Wilderness" (1973) makes it unnecessary for us to give more than passing attention to the story of the town, and we will include only a little information about some community affairs that may have been of particular interest to the Company, or which may help enliven what might otherwise become a tiresome recital of a long list of equipment installations.

The first years represented a mixed bag of accomplishment, excitement, operating grief and tragedy. We will just plunge into the story, and if other parts of our narrative have been confusing, this part may be even more so.

We did not mention, in connection with the construction of the Millinocket mill, that there was a bad forest fire "from the bog (probably the Ferguson Pond area) to the West Branch" on June 21, 1900. This caused some damage in the town, threatened the Company's office, and burned some "cordwood" in the yard log pond area, which would seem to confirm our earlier statement that some short wood was delivered for use even at the beginning, although this particular wood probably came from the clearing for the canal and the townsite. However, short wood was a small part of the supply, and this brings us to a description of the way the winter's inventory, in 20-foot or 24-foot logs, was put out at this time.

An old photograph, quite probably of the first wood pile, shows the logs piled in rolling tiers across skids starting at the edge of the pond, and running perhaps some 300 feet up the hillside to the west, and toward the town on the north. At the edge of the pond, the logs on each set of skids were cribbed up to a height of six feet or so, the tiers rising to a height of perhaps 40 feet toward the middle, and sloping off again to the far ends. This picture shows fourteen such tiers, and is captioned "MILLINOCKET, ME. LOG PILE OF THE G.N.P. CO. 21 MILLION LOGS". Translated into 21 million feet of logs, a more likely figure, this would be around 42,000 cords, which would be about right. Another reproduction of this picture, made into a postcard, calls it the largest log pile in the world, containing 32 million logs. We are unable to describe the manner in which these piles were made. Four rafts are shown in the pond, each carrying a donkey engine, winch and tripod mast, and some sort of cable arrangement, running to an

anchor at the rear of the pile, may have skidded the logs up sideways. A later picture shows twenty tiers, which seem to be higher, steeper and shorter, and are cribbed up at the water's edge to a considerable height. Reclaiming would have meant simply breaking down the cribs and rolling the logs back into the pond. Pulpwood was piled entirely in this manner for over a decade.

The Millinocket mill did not get into production without troubles, and the mistakes in the selection of equipment began to show up at once, enough being recorded to make it likely that there were more. The electrical system was activated in October, 1900. Garret Schenck started up the mill officially by sawing the first log on November 1st, with one line of grinders running. By November 6th, the groundwood screen room and two lines of grinders were in operation, and on November 9, 1900, at about 9:30 in the morning, the first newsprint was made on No. 7 machine. This had only been in operation a few weeks when the Harrisburg engine tore itself apart. A few days later, No. 8 engine blew up, and the whole mill was shut down on December 30th to make unspecified repairs to the Rodney Hunt water wheels.

The sulphite mill did not get into production until January, 1901, the chippers being started up on January 4th and the first cook made on January 7th. It is said that at this period the cook literally ran his job by the seat of his pants, determining the progress of the cook from the vibration of the digester felt when sitting on the cover. On January 8, 1901, the first fatal accident in manufacturing operations occurred when John Campbell, the back-tender on No. 4 machine, was caught in the reel. In February, No. 7 engine broke again, and just a few days later No. 3 engine also let go.

Some time early in 1900, work had been started by Shine & Curren of Bangor, on contract with the Company, on the Great Northern Hotel, now gone, but for many years a landmark in the town; a big L-shaped frame building, originally with 52 rooms. It was, in the style of the period, all wide porches, fancy railings, bays, dormers and turrets, partly three and partly four stories, its grounds taking up nearly all of Block 17 between Maine Avenue and Highland Avenue on Hill Street. In 1902, it was on the books for \$45,000 "more or less". It was perhaps the first building in town to have electric lights, power being supplied by a line run up from the mill. It was opened in May, 1901, and was leased to a J.P. Randall, who ran it until late in 1902, when it was taken over by Charles Hartwell, who gave it up in September, 1903, and it was leased to a man named Gooch, for an unknown period, but probably for only a few years, after which it was operated by Company managers.

The lobby was in the center of the building, and as one entered, the office and clerk's desk were straight ahead, a stairway going up in a series of flights and landings around a central open well, to the right of it. Passing the foot of the stairs was a short, wide corridor leading to the dining room, which had in it a big fireplace. Off this, to the left, was a men's washroom, and to the right, an archway opened into what was called the "ladies' parlor" which extended out into a bay with large windows at the front of the building. This also had a fireplace. The kitchen was in the ell, behind the dining room, and somewhere back there was a freight elevator. There was a back entrance, to the left of the office. At the left of the main lobby was another

archway into a large room with another huge fireplace, originally probably a lounge and writing room. Back of this there were a billiard room and a bar; the latter an anomaly in view of the Company's policy on liquor; and a sample room. This entire end of the ground floor was remodelled in 1925 into the suite of sitting room and two bedrooms for the use of the brass and special guests, to which we have previously referred, leaving a room, then used as a barber shop, at the extreme rear, next to the back entrance. This room later was used for other purposes, the last being as the Townsite Office, Bryan Seelye locating there after he had retired as Auditor. We have noted that he lived in the hotel, and the hotel managers reported to him as Auditor and as Townsite Manager. Mrs. Seelye acted as head housekeeper for many years.

The Great Northern Hotel was the center of social activity for the upper crust of the town in the early years, the big dining room being used for parties and banquets, and as a ballroom, but this kind of thing gradually petered out, and the hotel became a rather gloomy place. Liquor may have been served in the early years, but when prohibition came along, it was forbidden. Indeed, there was not supposed to be any in the building at all. This rule was so strict that at one point in the prohibition years, when some smart bootlegger decided that it was a good place to hide a few cases of booze, which were discovered and reported to Boston, poor old Ralph Washburn, the manager at that time, almost had a nervous breakdown for fear of losing his job, his terror being so genuine that the writer had to be sent to Millinocket to assure him right from the horse's mouth that he was not held at fault.

It was impossible, of course, to enforce the rule against liquor, and there are some wild tales of what went on in the old hotel at times -- like the one about the young lady who left a party in one of the upstairs rooms just a little unsteady on her feet, fell down the steps and landed all spread out on the lobby floor, where it was plain for all to see that she was dressed in nothing but a fur coat and a pair of shoes. This may or may not be true, but it is a fact that much later a man managed to fall over the railing in some way never explained, and was killed when he dropped down the stairwell all the way from the third floor.

It might be of passing interest to note that there was a fire escape in every bedroom -- a coil of rope, one end secured to the wall, hanging on a hook near a window.

The Great Northern Hotel may have made some money in the early years, although the fact that several lessees gave up after short tenure would not indicate that it was very profitable, costs being very high on account of the large staff required to run it. For the year 1908, for instance, it was reported to the Directors that it had lost \$2,934. The writer became responsible for it in the early 1950's, but although he raised room rates and dining room prices, and cut services all around, it was no better than marginal, often a loser. On September 1, 1960, a year after his retirement, it was closed, the furnishings were sold or given away, and the building was torn down. The grounds were divided, part being donated by the Company to St. Andrews Episcopal Church, and part to the Town of Millinocket, as a location for a new public library, in May, 1962.

The spring of 1901, the year of the "Long Drive", was extremely dry, and probably on that account, the mill went on six-day operation in May for an unknown period. There had been more trouble with the water wheels, the Rodney Hunt man having been at the mill a number of times after they started up. In July, the bursting plate on No. 3 generator wheel let go, shutting down the mill. This was the season for "excursions", and five or six special trains brought people from all over the State during the summer to see the great new plant. Garret Schenck was a frequent visitor all that year, usually bringing a party with him -- Company directors or officials, financial people, and almost always the pervasive A. Ledyard Smith, a man we wish we knew more about, but whose functions as Assistant to the President, while living in Madison, Maine, remain somewhat of a mystery. On July 3d, the "Little Northern" hotel, built in 1900 by Barney Kelly, of Bangor, burned, three people being injured, and in May, Frank Holt, one of Hardy Ferguson's engineers, was drowned while working from a canoe in Shad Pond.

The mill had not much more than started up than plans were made for expansion, a study of a four-machine addition, estimated to cost \$650,000, being completed in July, 1901. As we have seen, it was decided to expand at Madison instead, although as we have also seen, this scheme never got far off the ground, but in anticipation of an eventual enlargement of the Millinocket mill, and because the space was needed anyway, work was started in July on an extension of the finishing room southward, the Directors appropriating \$31,000 "to extend the Millinocket finishing room the equivalent of six additional machines". This extension, some 200 feet long and 100 feet wide, which is shown in some of the original plans, but apparently was scrubbed when the mill was built, was completed

by J.B. Mullen before the end of the year. Another waste-burning boiler was also installed in 1901.

A 17-year old boy was drowned while swimming in the canal, and in July a copper bend in the 14-inch steam main in the machine room basement burst, killing another man. In August, a river driver was killed blasting a jam in the river below Shad Pond, but this man was probably a P.L.D. employee. In September, the bonnet on No. 2 generator wheel broke, shutting the mill down again, and there was a walk-out, of short duration, in the wood room. In October, the first Superintendent of the mill, old John Decker, who had been brought from Rumford by Garret Schenck, resigned, and was replaced by George S. Witham, who we have mentioned in connection with the Madison mill. The latter's salary, by the way, was \$4,500 -- a year, that is. At this same time, George Parks was hired from the International Paper Company and came to Millinocket as "Manager of the Manufacturing Department", according to the minutes of the Board of Directors, but seems to have adopted or to have been given, the title of General Manager. In November, a man and two boys were lost in the woods near Millinocket in a heavy snow-storm, the man coming out by himself, the boys being found the next day, one of them dead from exposure, and in December the heavy rains which caused the flood we have described in connection with the incipient expansion at Madison washed out the railroad, and there were no trains into Millinocket for three days.

The Town of Millinocket was incorporated on March 16, 1901, the first Selectmen being George Stearns, S.J. Gonya and J.M. Holland. Up until this time, we suppose, the community had been

considered an unorganized township. Some time very early, a building called The Union Chapel had been built at the corner of Penobscot Avenue and Cherry Street. This was used by all denominations as a church, and it also served as the schoolhouse. Later, it was moved and became the Armory. A Roman Catholic church, however, had been built late in 1899. In 1901 a school, used for all grades, but called the High School, was built at the corner of Central Street and Katahdin Avenue, on the west side of the latter. George Stearns became Superintendent of Schools. A volunteer fire department was established, under the direction of Fred Gates (1860-1936) who had been city marshall of Old Town, and who, as we have noted, was also Assistant Townsite Manager, a deputy sheriff, and a sort of Company constable. A weekly newspaper, the Millinocket Journal, was started in November, 1901; the writer has Volume 1, No. 3, published on November 23d, the Editor being Andrew Wild, and the Manager C.H. Bowden. From available information, this paper was published, under various ownerships, until World War I, when it was discontinued, but resumed publication in 1939 under another series of new managements. The Post Office, during the very early period was in the old Powers farmhouse, but a new one was built somewhere near the mill gates, where the Company's Administration Building was constructed later, and where a number of the first retail stores were located, some being built before 1901.

While most of the residential building was by private parties, the Company put up, by vote of the Directors in May or June, 1901, a number of "cottages", for rent. While the votes authorized 16

houses, to cost in total not over \$18,000, there are in existence copies of two agreements with Charles J. Rush to build twenty-two, of four different styles, at prices ranging from \$1,120 to \$1,850, without plumbing or heating; and of a contract with Fred M. Peasley for plumbing and furnaces for the first sixteen, at a total cost of \$3,085. This housing project was handled by A. Ledyard Smith, who was making frequent visits to Millinocket. In June, 1903, the President was voted another \$15,000 "to build more houses in Millinocket", but we have no information on the action taken. The Company also built a number of foundations for houses to be constructed by employees.

According to Company records, the Dr. Cody house at the southeast corner of Central Street and Highland Avenue (later a private hospital) was bought as a home for George Parks, but other information is that a new house (later a funeral parlor) was built for him just across Central Street from this location. He may have lived in the Cody house while the other was being built. Both are still there as this is written. Hardy Ferguson had a big house (long known as the Rush house, which later became the Knights of Columbus hall) on Highland Avenue across from the hotel grounds. We have the impression that he built this himself. We do not know where George Witham lived, but when Ingleton Schenck became Superintendent of the mill, a few years later, the Company put up a house for him at the corner of Highland Avenue and Hill Street, across from the hotel. Mrs. Ing Schenck, as we have noted in the story of the Madison mill, was a lady who wanted what she wanted in a house, and this one was built in accordance with her ideas. It became known as the Bowler house, as when Ing Schenck

went back to Madison, Frank Bowler, who had designed it in 1907, moved into it and lived there until his death. This building, as best we can remember, has always been a "Company" house, reserved for local brass.

We may as well say here that we have found no readily available information on the date of the house at the southeast corner of Maine Avenue and Central Street, an architectural anomaly in Millinocket, but it was much later, perhaps along about 1911 or 1912, as it was built for Garret Schenck, Jr. After he went to Boston, it was rented to the incumbent mill Superintendent at a nominal figure, and became known as the "Superintendent's house" or the "Company house". However, in the early 1950's it was entirely remodelled inside, an addition was made to it, and it became the "Guest House".

We have noted, in connection with the construction of the mill, that only four grinder wheel penstocks, those for Nos. 1,2,3 and 4 lines, were installed. By late 1901 No. 4 wheel and grinder line had been put in, and early in 1902 work was started on No. 5 penstock, still called "C" penstock -- it will be recalled that these were originally lettered, starting at the generator room end -- and No. 5 turbine and a line of 12 grinders were installed in that year. The Rodney Hunt wheels having given considerable trouble, at least four other manufacturers of hydraulic turbines were asked to bid on this job, but it was apparently decided finally to stick with Rodney Hunt. This line of grinders started up in May, 1902, and at this time a number of additional wet machines were put in, and it was customary, for the next forty years or more, to maintain an inventory of groundwood lap pulp, and a smaller amount of

sulphite, in big cubical piles, perhaps 30 feet high, outside the mill, as protection against low water or breakdown. The amount of sulphite storage was more or less constant, but the quantity of groundwood on hand varied considerably, being put out when there was extra water, and turned over from time to time to reduce deterioration. Originally, there were six wet machines in the sulphite screen room and six in the groundwood screen room. In this 1902 change, those on groundwood were moved up to the sulphite screen room level, and ten more were added, making a total of 22. In 1907, six of them were taken out and installed at the new Lower Mill. In that year, the paper machines went on six-day operation, and until sufficient slush storage was provided, groundwood was regularly piled out on Sunday to use water that would have been wasted, and was brought in during the week. The original piling ground was at the south end of the mill, where No. 9-10 machine room was built later, and at the time the extra wet machines were added, a system of industrial track, with small push-cars, was installed in the beater room to furnish the beaters with lap pulp. A belt conveyor ran from the screen room the whole length of the beater room building and out at the south end, to carry laps to the piling ground. It was not a simple job to put up a pulp pile, as the laps had to be interlocked to hold it together. While we are on lap pulp, we might say that sulphite was shipped to the Lower Mill, when it started up and for many years thereafter, in this form, an outdoor belt conveyor running from the sulphite screen room to the track west of the sulphur and limerock storage rooms, where the laps were sheared off onto another conveyor on a trestle running north, from which the cars were loaded. When No. 9-10 machine room was built, the piling ground was moved further

south, to where the coating plant was later constructed. At that time a tunnel was run under the mill, all the way from the track west of the trainshed to the beater room basement, a belt conveyor running through this to handle purchased pulp delivered by rail. We know that for some years lap pulp was also piled on the west side of the tracks near the north end of the train shed, the belt conveyor from the screen room being carried out over the roadway and tracks on a wooden trestle, and perhaps this was reclaimed through this same tunnel. Some sales of groundwood were made from time to time, and after World War I, when there was a heavy inventory, a large amount was sold, at a substantial profit.

During an examination of the digesters in March, 1902, a plate in one of them was found to be eaten away to a depth of 7/8 of an inch. This area was patched, and a watch was kept on all the digesters for some time, Garret Schenck himself inspecting this one from inside, a month or two after the repair was made. There was more or less trouble of this kind with all three original digesters, but they were kept in service for quite a number of years notwithstanding. It was dry again in the summer of 1902, and there were a lot of fires. A large part of the town of Houlton burned, and on two different occasions there were bad woods fires around Millinocket. Some experiments were made with rotary pulp screens in this year, and we believe that a few may have been installed. Hardy Ferguson's quarter-turn drive was tried out unsuccessfully on No. 6 machine, but was made to work, after modification, and the first of these drives was permanently installed on the dryer section of No. 3 machine in September, followed closely by a similar installation on No. 6, and over the next few years the drives on all the

machines were changed over to the quarter-turn, eliminating the mortise gears. The first salvage rewinder, a 90" Witham single-drum type, was installed in 1902.

Late in the year, one of the log piles collapsed and slid into the pond, and may have been quite a job to untangle, as the Engineering Department was called upon to study it. It may be that there was a shortage of wood in this year, as a slab barker was installed to make it possible to utilize this kind of waste wood brought in from sawmills, and Frank Bowler recorded in his diary that both logs and four-foot pulpwood were being hauled to the mill on sleds, and that a study of waste in the mill processes was being made. The valve bonnet on No. 1 generator wheel burst, wetting down the generator room and shutting down the plant for nearly 24 hours. A number of lawsuits arising out of the construction, involving among other things disputes over ventilating equipment, concrete floors, the digesters, and water wheel governors, were in progress. Another boarding house, the original building put up by Barney Kelly before he built the Little Northern -- it must have had a name, but we have not taken the trouble to find out what it was -- burned in November. There was more tragedy. Two more backtenders were killed in the reels in 1902 -- we have said that these things were highly dangerous -- another man was badly injured when he fell into the first felt on No. 6 machine; still another lost an arm on a knife barker; the body of an unknown man was discovered in the woods near Millinocket Lake, and the skeleton of another, probably a river driver, far up the West Branch.

As we have noted in another place, there were a slew of boarding houses in Millinocket, mostly going by the names of their owners or operators -- Legassey's and Bossie's for instance. There were also a raft of hotels -- the Little Northern, which we have mentioned, the Windsor, the Brunswick House, the Katahdin House, later called the Eureka, the Mountain View, and perhaps some we have missed. As far as we know, the Company had no connection with any of these except the last, an imposing structure also built by Shine & Curren, located on the east side of Penobscot Avenue at its junction with Katahdin Avenue. It was erected starting some time in 1899, and while it is a guess, as no names are mentioned, it was probably the reason for a vote of the Directors in May, 1900, to "loan to responsible parties to build a hotel or boarding house in Millinocket no more than \$15,000 from money collected from the sale of lots", at 5 percent interest, on a five-year mortgage. The Mountain View was on the Company's books in 1902 for \$8,793. Whether this was just the investment, or whether the mortgage had been foreclosed is not known. However, on October 21, 1909, it was reported to the Directors that it had burned, and that the Company had \$6,000 insurance on it. This does not prove anything either, although this would have been well after the original mortgage had run out, and indicates at least a substantial Company interest. It was rebuilt, under what circumstances is not known, and which it has not seemed worth while to make the kind of search necessary to find out. It was not owned by Great Northern in 1943 when it had become run-down and a nuisance, but it was bought by the Company in that year and was torn down. The land, Lots 6 and 12 in Block 28, was sold to the New England

Telephone & Telegraph Company in February, 1952.

The original steam plant installation was described as having four batteries of two 375 h.p. coal-fired boilers each, and two batteries of two 250 h.p. wood (waste) fired boilers each, and we have noted that a third wood-fired unit was added early in 1901. Although we have not found the record, two more coal-fired boilers must have been added before 1903, making ten in all, as Nos. 11 and 12 were installed in that year. At this time, Roney stokers were put on all the coal-fired units, which had been hand-fired, and new coal handling equipment, including hopper cars to be run into the boiler house on industrial track was provided. There is no indication of overhead coal bunkers at this time, so the coal must have been shovelled into the stoker hoppers. There were more forest fires "on all sides" in 1903, and it is reported that on one day in early June the smoke was so dense that the Engineering Department's blueprint machine would not function, and lights had to be turned on in the afternoon. A Baptist church and a Congregational church were built in this year, and a band was organized. There was a smallpox scare, eighteen cases being reported, and a lot of people got themselves vaccinated.

Early in 1904 the Company bought from the Town of Millinocket the School Lots; these including the part of Lot 78 on the Little Italy side, and Lots 81, 82 and 85, on the west side of Millinocket Stream, some 800 acres in all, giving in exchange the sewer system which it had built. The Millinocket mill was buying ground-wood in February. The construction work on the North Twin and Chesuncook Dams had probably not been helpful in maintaining stor-

age, but in spite of the fact of the floods in the fall of 1901 and the spring of 1902, this seems to have been in general part of a long dry spell, as Madison was also buying pulp at the same time. The groundwood screening system was "overhauled" in this year, but what was done is not recorded. Starting in this year those killers, the old upright reels, were remodelled so that the full drums could be removed and placed in reel-off stands, and the sheet no longer being rewound from one drum while the other set was being built. Some time before this, single-drum Witham winders, of which there is no description, were installed, replacing the original Farnsworth units, but in 1905 these were rebuilt into a two-drum type designed by the Company, which according to Rice Barton's records may have been the first two-drum winders used in this country. These were called "Twenty-four by fourteen" winders, the 24" drum being taken from the old Witham unit, the 14" drum being added. Both drums, it is interesting to note, had shallow helical grooves, about an inch wide, running from the center of the roll toward the ends. The existing slip-belt drives were used, and indeed this type of drive was used on all the Company's winders until well into the 1920's.

As last notes on the year 1904, there was an earthquake, which apparently did no damage, early in the morning of March 21st. There had been a few cases of typhoid in town during the past couple of years, and in this year there was what was noted in the Directors' minutes as an epidemic, Frank Bowler being one of those affected, but it does not seem to have been severe.

While there is nothing to indicate what troubles, other than those we have mentioned; and these were sufficient; with the 300

h.p. Harrisburg paper machine engines, it was clear that they were just not potent enough, and they were replaced. The engine selected was a heavy duty Corliss sawmill type engine, manufactured by Filer & Stowell, of Milwaukee. These engines had 24" x 42" single cylinders and 15-foot flywheels, grooved for seventeen 1-3/4" ropes. They had a speed range of between 90 and 115 R.P.M., and were rated 600 h.p. at the higher speed. The American system rope drive was used, creating a fancy job of engineering to fit the cobweb of rope and return, transfer and tightener sheaves into the beater room mezzanine over the engines, which as we have noted, had only a skeleton floor, and a number of years were required to complete the changeover. The first new engine and drive started up on No. 1 machine in March, 1905; Nos. 7 and 8 were not converted until 1908; Nos. 3, 4 and 6 in 1909, and No. 5 in 1910. With the exception of changes to increase the power of the engines, these drives remained in use for over 50 years. Somebody finally woke up to the absurdity of moving wood mechanically from the wood room downhill to the grinder room, and in 1905 the chain conveyor originally installed was replaced by a sluice taking water from the mill pond, and discharging directly into the tank that ran along the west wall of the grinder room.

The Superintendent of the mill, George Witham, had gone back to Madison in the summer of 1904, and there is a hiatus in the information as to who, if anyone, was Superintendent from that time until October, 1906, when Ingleton Schenck came back from Madison and took over the mill. There are few official records indicating who was what in the early days. Anyone who was not on the salaried payroll in 1913, when new records were set up after the office fire,

is just a memory, a signature on a document, or a name found by chance in some reference. Indeed, even from the Salary Records which have been kept since that year it is difficult to put a name against a position, although a position can quite easily be attached to a name. The late Bob Hume, who was Superintendent in after years, told the writer that he had a vague feeling that there had been an early Superintendent for a short time whose name he could not recall, but he was not at all sure about it, and nobody else questioned by the writer seems to remember. Anyway, George Parks was there, and it is quite possible that there was no Superintendent during this period.

There was more tragedy and violence, mostly involving the Italian segment of the population. There were still people living on Shack Hill in 1905, and a murder was committed there late in that year. Both killer and victim were Italians. The Dolby flowage was filled late in October, 1907, and very shortly thereafter the embankment of the new railroad at Schoodic slid out under the weight of a train; the engine and ten cars went into the water, and three men were drowned. They were Italians. Two days later Frank Bowler noted: "White man shot dead by Italian in Peluso's yard". Italians were not considered "white men" in those days. We are reaching ahead a little, but this period, during which the East Millinocket mill was built, was a rough one. If, as it was said, Millinocket during the construction was a wild and wooly place, Burnt Land Rips was even wilder and woolier. The writer knows of one knifing, not fatal, and miscellaneous other mayhem. This is not really part of the Great Northern story, but he has been told on excellent authority that at this time some of the foremen went

to work armed with revolvers, and that is. There was labor trouble, including a lockout in 1907 and a strike in 1908, about which we will tell what we can in another place.

There is some information about the next few years -- that is, from 1906 to 1910. The Millinocket Foundry was established in 1906 by the Corrigan Brothers, of Calais. A four-room wooden school building was built on Oxford Street, near the mill gates, in 1907. This was doubled in size in 1919. We do not know when it ceased to be used as a school, but after World War II it was owned by the V.F.W. During the late 1950's and early 1960's it was rented to the Company, and the Engineering Department was located there. No. 4 digester, for which space had been left in the original building, was installed in 1906, at the end toward the wood room.

In May, 1907, the Directors voted funds to build "boarding houses at Dolby and Burnt Land Rips", to cost between \$7,500 and \$10,000 each. This resulted in the construction of the Dolby Hotel, a short distance below the Dolby grinder room, on the river side of the highway, which at that time passed right by the plant, and the Woodland Hotel, at the corner of Maple and Park Streets in East Millinocket, both big, plain frame structures with porches across the front. We have noted the end of the Woodland Hotel in another place. The Dolby facility had become a sort of apartment house by the time the grinder room was converted to a power station in 1930, and it was torn down in 1931.

There was low water again in 1907-1908. In April, 1907, an order was taken for 6,000 tons of hanging paper, which used

more long fibre pulp, and in the fall of that year 5,000 tons of groundwood were shipped to Millinocket from Madison. A small miracle took place on July 30, 1907, when one of the log piles let go and rolled into the pond while seven men were working on it. They all rode it down, two being able to jump into the water unhurt. The other five were caught under the logs, and all were injured, some seriously, but no one was killed. In March, 1908, only enough groundwood could be made to run two machines at the Lower Mill, and by December the natural flow of the West Branch was down to 400 c.f.s. In January, 1908, Improved savealls for white water were bought for both mills, twelve machines in all, to reduce the loss of fine stock to the river. Eight more were added in December. Also in 1908, third presses were added to seven of the paper machines, these being inserted between the first and second presses, the old second press becoming the third press. This allowed these machines to be run at higher speed, and No. 5, the one without the third press, was put on mill wrapper, which heretofore had been purchased or made on one of the machines from time to time as needed. This is no doubt the reason why a third press was not added to No. 5 until 1911, and why it was not necessary to give it a new engine until 1910, in anticipation of the installation of another machine to make wrapper only.

In May, 1908, the Directors appropriated the sum of \$5,000 for "an experimental wood barking plant". This affected later developments at all three Company mills, and perhaps many others. It has always been the writer's understanding that the result of this experiment was the original continuous barking drum, or at least the first successful application of the continuous principle.

Previous barking drums were of the batch type, and the Company had never used them. There is no description of this experimental barking plant, but the writer knows that it was a drum, and that it barked wood in a continuous operation. The drum, judging from other early Company installations, was not very large; was a single section, made of steel plate; was pitched toward the discharge end, which was partly dammed, and probably ran wet. It was Garret Schenck's idea, and it is known that he held patents on a barking drum. Continuous drums came into wide use very shortly, but we have found no record of these patents being licensed. The barking drum itself was not new, so it is possible that the basic principle could not be protected, and that his claims covered improvements which others could find some way around, and we hold to our belief that the first successful continuous barking drum was operated by the Great Northern Paper Company at the Dolby mill in 1908 or 1909.

The Directors voted in February, 1909, to authorize the President to buy "rotary suction box" equipment from Sandusky Foundry & Machine Co., at \$5,000 per machine, the minutes noting: "This invention has as its object the removal of all suction boxes now in use and controls and makes the machine practically automatic as far as the calenders". It was to take two years to make a complete installation. We do not know what this equipment was. Sandusky Foundry & Machine Co. made the Millspaugh suction couch, and the first commercial installation of one of these was made in another mill later in this year. It may have been just what it said -- a rotary suction box, as several kinds of these turned up later. However, to the best of our knowledge, no in-

stallation of suction equipment of any kind was made at this time. In this year, felt dryers are noted for the first time on the Millinocket machines, but they do not seem to have been additional dryers, one top and one bottom dryer being taken out of the nest and relocated.

Up to this time, we have had to write from such bits and pieces of information as we have been able to turn up, and some of the foregoing is trivial. However, in 1910, along with William A. Whitcomb, came the Job Record, and ten years later the Weekly News Letter, and we know a great deal more about what was done in the mills. Even at that, information is sometimes scanty, and sometimes so conflicting that while we can say with some assurance that such and such a job was done, the circumstances surrounding it, and the detail, if any is given, may have to be partly rationalization. The only authentic source of information is often the old drawings, but it would take more lifetime than the writer has left to search them out. Some of the old cloth tracings were masterpieces of detail, but, as we have said, many of them were revised again and again, the original lines being obliterated, so that one can not be sure what was there before. In this chapter, we will leave out some things which have already been covered, and will enlarge upon some others already mentioned.

Sometimes a job was already done before a Job Record was prepared; some jobs ran over several years; there were cases where a Job Record lay around a long time before it was actually approved, and there were many times when failure to get in final figures delayed the closing date, and the job may have been essen-

tially completed long before. Therefore, to be in some manner consistent, we are in general, except where we have other knowledge, using the date the Job Record was prepared, and date of completion may have been in the next year or even later. It is also difficult in some instances to establish physical locations relative to the same sites as they are now, because in history there is no such thing as now, and it may often be necessary to establish location by reference to what was, as we have described it, rather than to what is. While working from a chronological base, it will also be desirable, as we have been doing, to reach ahead in time to show what happened, rather than scatter the job we are discussing all over the place. We will include work which may seem to be routine or inconsequential, but it is all part of the story. Moreover, some of this is of much greater magnitude than is indicated by the bare fact of it, and almost all of it was done without interruption of production, an accomplishment in itself.

Apart from the developments which we have already noted in 1910, four paper dryers were added to each of the machines, the paper warehouse at Stockton Springs was moved and repaired, and there was some excavation in the river bed below the North Twin dam as an aid to the sluicing of logs. This work carried over into 1911. It was also projected at this time to construct the log sluice, some four miles long, from Chesuncook dam down through Ripogonus Gorge and the rapids below, in order to save an estimated three billion cubic feet of water used for sluicing logs each year. The whole job was never done. However, part of the sluice, a section 1850 feet long, from Chesuncook dam into Ripogonus Lake

was built and put into use, the President reporting in September that "work on the Big Sluice as originally authorized has been suspended due to conditions that made it inadvisable to proceed further with the original plans". We do not know what these conditions might have been.

We have noted that some years before the beater room had been equipped with an industrial track system to handle lap pulp, purchased or brought in from the piles. It took a long time to chew up a lap in the ordinary beater, particularly when it was frozen, and late in 1910 a shredder was installed somewhere around the south end of the beater room. An eight-bed hospital was established in this year in the Dr. Cody house at the southeast corner of Highland Avenue and Central Street by Dr. Charles S. Bryant.

We have also noted that in 1910 it had been decided to buy a second-hand paper machine on which to make wrapper, but that actually a new machine was purchased. The order for this was placed with Rice, Barton & Fales in March, 1911. It was an 84" cylinder machine, with four 36" molds in cypress vats. The couch rolls were 16" diameter, and wringer rolls 9" diameter, both of steel pipe covered with soft rubber. There was a suction box and a whipper on the stretch part of the felt over the fourth cylinder. It had two plain presses, the first press having a 24" rubber covered bottom roll and a 24" chilled iron top roll, the second press an 18" gun metal roll and an iron top roll of the same diameter, the felts running straight through. The original machine had only 24 dryers, 48" diameter, all in one section, and one 7-roll calender stack with a 20" bottom roll, a 15" top roll,

and 12" intermediates. The stack had water doctors on the second and third rolls from the top. There was an upright reel, with removable drums, built offset, so that the top drum was nearer the stack, for easier removal of the lower one, and a compensating winder, having no drums, but two 2-1/2" bars, 41" apart, for 3" iron cores. On this type of winder, the paper was slit and the first strip was passed to one winding shaft, the next to the other. If there were more than two strips, they were likewise passed alternately to the first and second shafts, so that the ends of two rolls never came together. The two shafts were driven by a single drive with a unique differential arrangement. A cone pulley and bevel gear drive was used on this machine, and there was no engine, a motor providing power. No one seems to know precisely where this machine was installed, but we know that it was in the new finishing room extension, and the writer's guess is that it was along the machine room side. Just how it was furnished is not known. The machine itself cost \$28,285, and the total cost of the installation amounted to \$83,000, which for once was lower than the estimate of \$100,000.

There was a lot of work in 1911. The experimental wood barking plant at Dolby had been successful, and in this year four continuous plate drums, 7 feet diameter by 44 feet long, with the necessary conveyor system; were installed in the Millinocket wood room. We have no layout, and do not know whether these drums were installed separately or in tandem pairs. Quite a number of the knife barkers would have been removed, but some were left to clean up blocks not completely barked in the drums, as we know that some of the tanks holding the supply of wood for

the knife barkers were left, and were in use. The wood room roof was already decayed, and was replaced, again with wooden plank. The expressed objective of this job -- "to provide a permanent roof" -- rates with famous last words. By 1911, a considerable amount of short wood was being received by rail, and two or more piling conveyors, which seem to have been just single tower stackers, with chain uptakes but no extended trestles, were built just west of the railroad tracks and north of the yard pond, so that excess receipts which could not go directly into the mill could be piled out. Wood was probably reclaimed from this storage by horse hauling, or with portable conveyors to the pond.

There were four narrow doors between the machine room and the finishing room at this time, one between each pair of machines, and the rolls of paper had to be moved by hand trucks from the winders out into the finishing room. These openings were widened and fitted with vertical-lift, counterweighted tin-clad fire doors, with fusible links in the counterweight cables. This allowed the paper to be rolled out of the machine room, and cut down the draft around the winders in cold weather. A new surface was poured over the concrete floor in the finishing room, which, being laid right on the ground was damp and spalling; and hardwood, kinder to the rolls, was laid over this.

As we have said, the heating and ventilation in the mill as built was atrocious, and it is likely that some efforts of which we have no record had been made at improvement before this. However, in this year the steam coils which had been set in the end

walls of the finishing and beater rooms, supposed to heat air drawn through them by the paper room fans, were moved to openings in the machine room basement walls, so that the warmed air would come up around the machines, and in a related job, 16,000 feet of 1" wrought iron steam pipe was hung under the roof over Nos. 5,6,7 and 8 machines. While there were no hoods on the original machines, some covering must have been installed before this time, as part of the intent of this job was to "abolish hoods".

One of the three original chippers in the wood room was replaced with a four-knife 88" Carthage unit, which was standard for a long time. The outdoor lead-lined acid storage tanks had given out, and were replaced with cylindrical, unlined wooden tanks, in the court just south of the sulphite mill. These also were standard for many years. No. 5 seems to have been the utility machine. It had been making hanging paper off and on for some years, although in the production records this grade is counted as newsprint, and at this time something not specified was done to allow of easier speed change to make this heavier grade. The flat screens on the paper machines were worn out, and a program of replacing the six Decker screens on each machine with four Packer units was started, the change being made on four machines in 1911 and on the remaining four in 1912. One of the wood fired boilers was changed over to coal, hand fired, probably because there was now less combustible waste from the wood room. The hot well in the boiler house disintegrated, and a wooden tank was put in to serve until a new cast iron hot well could be obtained.

No. 6 grinder penstock and a 57" Rodney Hunt turbine were installed in 1912, and two grinders were robbed from each of the

other five lines, so that there were now 60 grinders on the six lines. The old groundwood flat screen system was torn out and replaced by twenty new flat screens and 30 centrifugals, probably Baker & Shevlins, as a representative of that company was at the mill a number of times. Something was also done with the lap conveyor system in the sulphite screen room, and the groundwood wet machines were moved down to the groundwood screen room floor to make "space for installation of machine shop in end of sulphite screen room." It will be recalled that the machine shop had been temporarily located at the north end of the grinder room, west of the generator room. A Lannoye pulper, a piece of Belgian equipment sold by Rice Barton, was bought in this year for the Millinocket mill, but we do not know for what purpose, nor where it was installed. The original rotary sulphur burner was replaced with a flat burner, and a bucket elevator was put in for a new melter. The wooden log sluice from Ferguson Pond to the mill yard had decayed beyond repair, and a new one was built in a slightly different location. The original roof on the paper room had by this time also decayed to the point of being dangerous, and the whole thing, over all eight machines, was replaced in white pine plank. In this year also, a new channel was dug for the small brook that ran through the park between Penobscot and Katahdin Avenues, and was dammed to make a little pond there.

By 1913, there were three short wood stackers north of the yard pond, and in this year they were extended westward on wooden trestles; the uptakes were remodelled, the chains being replaced by wire cables with clamp-on "buttons" at intervals of five or six feet, running on big cast iron "sprockets", with recesses for the

buttons. Wood was piled on these conveyors from a new conveyor parallel to the railroad track. This conveyor could also discharge onto a chain running in a tunnel which crossed under the roadway over the tracks north of the log pond, surfacing alongside the original conveyor extending from the northeast corner of the wood room, and discharging to it. This chain was shortly replaced by a cable, and the saw for cutting four-foot sticks in two, provided in the original installation, was relocated, along with its conveyors, so that four-foot wood could be fed to it from the cars.

In this year, the digester building was extended toward the north, and No. 5 digester was installed to furnish pulp for the fourth machine which had been installed at East Millinocket. This was the last extension of the full-height digester building in this direction. The additional digester required more steam, and Nos. 13 and 14 coal-fired boilers were put in. A belt conveyor "at ground level" was installed for carrying sulphur from cars into the storage bin. We do not know how long this may have been used, but it had been removed, and sulphur was being unloaded and run into storage in wheelbarrows as late as the 1940's.

Ventilation in the paper room was still a problem, and in this year the American Blower Company installed a system of fans driven by steam engines, the exhaust going into coils to heat air which was distributed "throughout the room" by galvanized ductwork, but we do not know how this was arranged. Repairs were made around the log sluice at the Stone Dam, timber cribwork under the sluice being replaced with concrete. The fishway was also rebuilt

at this time. The brick gate posts at the entrance to the mill grounds in front of the Administration Building, which had just been constructed, were built in this year, gates were installed; a short stretch of picket fence was erected on each side of these posts, and a wire fence was run down to Millinocket Stream, somewhat south of the line on which it was later located. In later years, the tops of these gate posts had to be rebuilt almost every spring because the frost got into them, and the writer, irate because the mason crew was tied up with this work when it should have been doing something else, asked the Superintendent why in hell he didn't cap the damn things, which nobody had thought of doing. Copper tops were put on them at this time, probably along in the late 1940's, and the annual repair ceased.

We are now coming up to the major expansion at Millinocket, which began with the installation of No. 9 machine. However, there was some other work in that year, 1914, which we will dispose of first. The original Rodney Hunt fire pumps in the boiler house were replaced with new ones of the same make. The old flat sulphite screens -- these must have been the primary screens -- were removed and replaced by five "worm knotters"; outward-flow cylindrical perforated plates with an inside worm working the screenings out the open end. These were in service for a long time. In connection with this job, the whole sulphite screening system and the sulphite wet machines were moved toward the blowpits. The new machine room, to house two machines, was built early in this year. It was originally the same length as the old No.

1-6 room; 240 feet, and approximately 80 feet wide, the beater room being extended toward the south this same distance. Both buildings had plank roofs. The lap conveyor from the groundwood screen room was rearranged to pass out through the southeast corner of the beater room extension just under the roof, and onto a short trestle, from which chutes and portable conveyors carried the laps out onto the piles. Provision was also made to run sulphite laps out on this same conveyor, and an uptake from outside, also entering the beater room at the southeast corner, allowed both groundwood and sulphite to be brought in without trucking. The lap shredder was relocated in the basement of the new beater room extension, just inside the south wall, the shredded pulp being pumped from there back to the screen room. The American Blower system in the old machine room was not effective, and another attempt was made to improve the situation by the installation of a B.F. Sturtevant system of fans and ductwork, which was guaranteed to do the job, but did not.

The beater system of furnishing the machines was discontinued in this year in favor of an installation of stock mixing tanks. These were E.D. Jones vertical cylindrical hard pine tanks, 14 feet diameter and 14 feet high, with a rotating agitator driven from the top through bevel gears and pinions, taking power from pulleys on a line shaft in the mezzanine below. The six tanks were set in a row along the east wall of the beater room building, with their open tops about 3-1/2 feet above the beater room floor.

The Millinocket fire department had at this time a ladder truck and a steam pumper, both horse-drawn, and the Company pre-

sented the town with a modern Knox combination chemical fire truck and pumper, with the provision that it would be kept in repair by the Town, and "that a competent operator would always be on hand". This was the first of a series of fire engines given to both towns on the same basis, and did not represent pure altruism. The idea was to make sure that the towns would always have someone on duty, and a reasonably up-to-date piece of equipment as protection not only for the town but for Company property, in case the populace should not look with favor on requests for money for such purposes come Town Meeting time. This caution was not unwarranted. A contributor to the history of the Town of Millinocket, written at the time of its 50-year celebration, says in his draft: "One of our citizens took exception to this addition to the fire department. He dubbed the machine the 'Red Devil' and said it was 'too dangerous a thing to have running through our streets at twenty-five miles an hour'."

In "The Paper Mill" of January 5, 1916, our old friend Derb wrote:

"Confound that one thousand foot a minute Four-drinier machine anyhow. Sometimes I wish that it would slide to the bottom of the Penobscot River or some other river down East, so that I could draw a good long free breath in the day time without getting a kink in my anatomy or enjoy a good night's sleep without being tormented by a nightmare. This confounded scorcher of a paper machine causes me many sleepless hours at night and nervous hours by day.

Do you know that in my travels among the mills every paper or pulp manufacturer that I call upon in search of good legitimate news.....I am continually confronted and bombarded with questions regarding this paper machine, the builders of which see all kinds of fortunes ahead if it is a success and will make marketable paper at one thousand feet a minute?"

He then went on to say that he had had a second interview with "a paper manufacturer up the State" (Garret Schenck, of course, although he does not mention him or Great Northern by name) "who, I consider, is very well versed on paper machine speed limits under all conditions, and he seemed to know all about this thousand foot machine, how it was built, also its equipment and what progress it was making toward making the record-breaking speed of one thousand feet a minute." He found that the machine was at that time running at 700 f.p.m., which was no great shakes, as newsprint had been made at that speed as early as 1911, and he wrote: "'Tell me', I asked, 'what is your candid opinion regarding this machine? Do you think that you or I will live to see the day when that machine will run one thousand feet of paper a minute that will be accepted and run over these fast printing presses in newspaper establishments?' 'I certainly do', he replied, 'and you won't have to live very long before it comes to pass' ". He then went on with a very accurate description of the fourdrinier part, promising more in another installment.

The machine which he described was not much like No. 9 as it started up late in 1914, and it seems worth while to tell

what we know about that machine in some detail, to explain the original concept of the equipment which was seriously intended to break all records, and what happened to it. While we do not know all about it, what we write will probably be more substantive than anything ever put together before.

Let us begin by saying that the original No. 9, which was the subject of so much curiosity, and about which so little information was divulged, was a far-out experiment, which explains why the Company was so cozy about it in the early stages. It was designed and built by Rice, Barton & Fales, in large part to Elmer Pope's specifications. Such information as we have is largely from their drawings, and from comments made on them by Herman A. Smith, one of their retired engineers, who was himself not familiar with the machine. It is unfortunate that in 1914 this company discontinued its former practice of writing up each machine it built "in a big ledger", and for this reason it is a little difficult to know for sure the exact sequence in which various changes were made, but we do not believe we will be too far off.

There were a number of "firsts" associated with No. 9, some of which were abandoned as unsuccessful, and some of which endured in the original or modified form. The screens were probably of the flat Packer type, and the flow box a standard Great Northern design, built of wood. The slice was of the old-fashioned straight front type. No. 9 was rated as a 158" machine. The fourdrinier wire was 92'9" long, and was pitched, in accordance with Eibel process principles, nominally 24", but actually about 16" from the top of the 24" x 160" breast roll to where it broke

over the automatic guide roll, which was on the top run of the wire, just ahead of the couch. There were 40 six-inch table rolls, spaced on centers only 7" apart, followed by two 10" flat suction boxes; then a section of three spaced-out table rolls, over which was a 16" undriven dandy; then five more 10" flat boxes. These flat boxes had a longitudinal central rib for stiffness, and a U-shaped water passage underneath. Although suction couch rolls had been in use for several years, a plain couch, with a 28" bottom roll and 26" jacketed top roll was used. The top couch roll was mounted on a sort of bell crank at each end, with vertical arms extending down nearly to the sole plates, and could be raised and lowered by hydraulic cylinders acting on these arms. It was weighted by a conventional lever and weight arrangement acting on these same members. The return rolls were all 12" diameter.

The wire did not go around the bottom couch roll in the usual manner, but broke over it and passed around what would now be called a wire drive roll, 20" in diameter, about three feet further on. This roll was on ball bearings, and was driven by the wire. It was arranged so that it could be slid toward the couch, and its purpose was to throw slack into the wire during a change, the only other way to obtain slack being to raise the stretch roll, rigidly mounted on a rack which allowed only vertical movement, and this would not have been enough. There was a Pope air stripper, such as we have previously described, on the top couch roll, and this extended bit of wire also made it easier to get the end over onto the first felt, but this was incidental. This roll, driven, became a common feature in the 1950's, allowing the use of a pick-up felt,

but in 1914 it was unique. There was no shake on this four-drinier. The deckles were of the old endless rubber strap type, the straps, 2-1/2" square in section, running with the wire, through two wash pans on each side, on 28" pulleys, one flanged.

This may sound like a description of a rather ordinary four-drinier, but it was not. This is where the first "firsts" appear. For one thing, in spite of the Company's general aversion to the use of anti-friction bearings in wet places, and while all other rolls except the wire drive roll were in plain bearings, the table rolls were on ball bearings in waterproof housings, and this, according to J. Wallace Tower's paper, "Historical and Other Data Relating to Fourdrinier Paper Making Machines, 1799-1931", was the first large installation of anti-friction bearings on a paper machine. For another, according to both Rice Barton and J. Wallace Tower, it represented the first attempt ever made at a removable fourdrinier.

When changing the wire on the old fixed fourdrinier, every roll and pipe inside the wire, and everything across the machine above the wire which would prevent its being strung over the pit had to be removed, piece by piece, and put back after the wire had been strung on poles, the parts going inside it having to be slid across on boards, or held by the journals in long "cigarette holders". The improvements incorporated in No. 9 fourdrinier, if crude by later standards, were highly ingenious. There is no way of knowing whether the credit should be given to the Company's engineers, or to Rice Barton, but knowing the way the Company did things in those days, the basic scheme was probably a Great Northern idea, with the details worked out by the builder. They are a little difficult to describe.

On a substantial cast iron base, extending from under the breast roll to just ahead of the first flat box, and tapered to produce the desired pitch, were mounted five low stands on each side, those under the breast roll being much heavier and of different construction than the others. Above these were four separate girted frames, carrying the table roll rails, which were in four sections, and the saveall pans. At each corner of each of these frames a leg extended downward to mate with a corresponding pad on the stand below it. These legs were not bolted down, but were held in place by precisely machined dowels. On the side of each leg, near the bottom, was a flanged wheel, 10" in diameter, placed so as to run on a beam across the pit, and in each stand was an open pocket for this beam. The bottom of the pocket was the top plate of a jack which could be raised or lowered a short distance by a cam and lever. On the inside of each stand, on each side of the fourdrinier, was an arm, or bracket, several feet long, with a flanged roller at the end of it, the arm cantilevered from a pivot so that it could either lie flat against the frame along the axis of the machine, or be swung out across the pit.

The remover rails were not in place across the machine while it was in operation, and the brackets were swung back against the frames, out of the way. On a wire change, after the old one had been removed, the brackets were swung out across the pit, and the dowels holding the frames were removed. The five remover beams -- the one at the breast roll was an I-beam, the one at the flat boxes a channel, and the others essentially box sections, were pushed in from the tending side, supported on the rollers on the brackets, and seated in the pockets in the back side stands. The jacks were

then actuated, lifting the beams up into contact with the flanged wheels, one beam picking up both wheels, one on each edge, at the three middle stands, and raising the legs clear of the stands. The four sections, carrying the breast roll, table rolls and savealls were then rolled out into the aisle. It seems to the writer that there were wheels on both the front and back side, which would indicate that originally there may have been extension beams across the aisles, although Rice Barton can find no mention of such equipment. However, when he first saw a wire being changed on one of these fourdriniers, and this was a good many years later, there were no rails in the aisles, and the front side of each section, as it was being removed or replaced, was slung from a chain hoist running on a trolley beam over the aisle. After the wire had been strung, each section was run back into place and lowered onto the frames, the dowels were replaced, and the remover rails were pulled out on the rollers on the swinging brackets, which were then returned to their original position. The deckle rigging and everything beyond the table rolls had to be manhandled out and in, as in the fixed type fourdrinier, but we suppose that more than half the time required to change the wire was saved, and this was a big advance. As Herman Smith commented: "Even if certain essential details seem to be lacking in the light of present-day engineering design, we still must look upon the first removable fourdrinier with deep respect, and its designers no less".

The original machine had only two presses, of the old plain type, of course, with very long felts, and while more or less conventional, they had some unusual features. Although there was a space of forty feet between the fourdrinier and the dryers, the center line of the 26" gun metal first press bottom roll was only seven feet from that of the so-called wire drive roll, and the tail

roll of the first felt sat on the same stand with it. The top roll of the first press was of gumwood, 28" diameter. There was an inside full-sized felt roll -- all the felt rolls were 10" diameter -- on each side of the nip, so that the felt wrapped the top roll slightly, and there was an inside suction box immediately ahead of the roll on the fourdrinier side. An unexplained feature is a curved sheet of metal of fairly heavy gauge, about 16" wide, convex toward the fourdrinier, extending across the machine, the upper edge bearing by its own weight on the up-running side of the bottom press roll about 6" below the nip. It appears to be pivoted on a frame member on each side of the machine, and the bottom edge extends a little beyond this point into what may be a sort of save-all. It was probably intended to skim off some of the water that ran back down the roll from the nip. The top roll was weighted by a conventional weight and lever system, and could be raised and lowered by a hydraulic piston arrangement similar to that on the couch.

After passing the roll beyond the nip, the felt ran horizontally, passed around the head roll, back around a hand stretch, ahead again in a long run to a cone roll in the frame of the second press; this distance being necessary to put a sufficient length of felt ahead of an automatic guide on the return; down over an idler roll to an automatic stretch in the basement, back up over another idler roll, and into the nip between a soft rubber wringer roll and the bottom press roll, over an external suction box, and so back to the tail roll. This wringer roll arrangement we believe was an innovation. Upward pressure on it was provided by hydraulic cylinders, spring cushioned. The second press was identical, except that the top roll was 26" diameter. We do not know what it was made of, except that it was not stone, as the Company did not buy a stone press roll until 1916, and there was no wringer roll.

Each press was fitted with a Pope air stripping device, which at this time was of the slotted box type, with the air blast directed tangentially to the roll, as we have previously described it. There was also an air jet to blow the lead strip from the second felt over the bottom dryer felt tail roll, there being no receiving dryer. All the press bearings were plain.

The design of the fourdrinier we have described was experimental, but there was not much doubt that it would work. While certain elements would have helped to increase speed, its more radical features were intended to reduce down time. Outside the air devices and the wringer roll integral with the first press, the press part had no particularly peculiar characteristics. It is from this point on that the machine becomes most remarkable.

From a basic description of the dryer part, it again would not seem much different from that of any other machine. Its 30 dryers, arranged in the staggered formation in common use, on cast iron frames, were in three sections; each dryer was fitted with a doctor, and there was a top and bottom felt on each section, with the usual hand and automatic stretches and guides. It is the details that made it exotic.

To begin with, the cast iron dryer cylinders were 72 inches in diameter by 160 inch face -- the first six-foot dryers ever to be installed, according to J. Wallace Tower's history. All the Company's old machines had 48" dryers. Most of the newer machines in other mills had 60" dryers, these having been introduced in 1909, for the obvious purpose of getting more heating area without going to an excessive number of cylinders, and be-

cause machines were getting wider -- 184" at that time. More heating area was of course the reason for going to still larger dryers on No. 9 machine, which was to outproduce all others, but it was not a scientific choice. The writer inquired of Bob Hume as to how come these big dryers, and he replied that it was Elmer Pope's idea that if five-foot cylinders were better than four-foot, then naturally six-foot cylinders would be better than five-foot, which conclusion blithely ignored certain manufacturing and operating problems. The six-foot dryer never caught on, although a few were later installed in Canadian mills. These dryers, incidentally, had semi-steel heads, with pressed-in steel journals, which according to Rice Barton, was another first. Plain bearings were used, and while it was usual on dryer bearings to have only a bottom half-liner, the journal being covered by a cap with a recess to contain a block of hard grease, the drawings of this machine show no caps at all, the top of the journal being exposed. An oil reservoir under the housing indicates probable wick oiling. There were no intermediate pinions between the top and bottom dryers, the big spur gears on the two tiers in each section meshing, with the drive pinion on the lower tier.

Rice Barton have been unable to give any explanation for the design of the dryer nest which we will describe, but we believe we can. Its purpose was two-fold. The first Sheahan rope carrier had been put on a machine in another mill the year before, but Elmer Pope was hung up on doing all the handling of paper through the machine by air. He had not yet perfected the couch and press strippers, and had not yet figured out how to get paper through the dryers or into the stack using air, and it seems clear

to the writer that these dryers were not only intended to thread themselves, but to eliminate the problem of getting paper into the calender stack by eliminating the stack.

The upper and lower dryers were set very tightly together, the distance between the faces of any two top and bottom dryers, at the point where the sheet left the bottom cylinder to transfer to the upper one, head-high from the floor, being barely two inches, except between the sections. With a 12-inch felt roll in the openings, clearing the dryer above or below it again by only two inches, the backtender who could pass an end without losing an arm would need to be dextrous indeed. However, just a few inches beyond the point where the paper would draw from the dryer after it was threaded, was the edge of a spring-loaded doctor, which normally would have been placed back on or near the vertical center line. Its blade was about 9" wide, and as the top dryers were so low, the space between the flat of it and the face of the dryer to which the paper was being passed was not over three inches. The back edge of it went into the space between this dryer and the felt roll, to about three inches from the felt. It seems quite clear that it was expected that the doctor would scrape the end, which would not be a single thickness, but a wad, off the face of the dryer, and that it would slide up or down the blade, as the case might be, and striking the moving felt, would be carried around the next dryer above or below, which is why these were set so close together in the first place. By the time the end had got somewhat more than half-way through the nest, it was usually dry and stiff enough to thread itself anyway.

Another feature of this dryer section was more startling. Starting at the end of the middle section toward the presses, a 15-1/2" soft rubber covered roll, running in ball bearings, was located midway of each of the spaces between the dryers in each tier, above the felt roll in the top tier, and below it in the bottom one. These rolls were hung vertically from the frames on arms on each side of the machine, pivoted at the top. At the bottom of each arm was a short section of curved rack, its teeth meshing with those of a pinion on a shaft across the machine and extending a little outside the frames. To each end of the shaft was keyed a vertical lever, two feet long. All of these levers were fastened at the top, by a spring-loaded link, to 1-3/16" diameter steel rods, one for each tier of dryers, running in sliding guides the entire length of the last two sections of dryers, on the tending side. These rods could be moved a short distance lengthwise by double-acting pneumatic cylinders, which, being mounted vertically on the frames at the dry end required another rather complicated arrangement of rack, quadrant and linkage to produce horizontal travel. Endwise movement of these rods, which were independent of each other, would press the soft rubber rolls against the dryer felt on one or the other of the dryers between which it was hung, so that they would all bear on the up-running side or the down-running side, or on the up-running side in one tier and the down-running side in the other.

There was no calender stack at all on this machine, the Pope reel, the first ever installed, being placed right up against the the dryer section. The last top dryer felt roll was well down, but away from the dryer. The felt did not go around this roll,

but, wrapping it slightly, continued on down to and returned around, a 10" roll which was right up close to the spool of the reel in its empty position on top of the drum. The sheet, leaving the last top dryer, was met by a blast of air which blew it under a spring roll and back against the underside of this extended felt, which delivered it to the reel spool.

The machine was driven, like the others, by a Corliss engine, through a basement line-shaft, cone pulleys and Ferguson quarter-turns. The engine was somewhat larger than the others, and the larger pulleys were of the drop-rim type, to withstand the greater peripheral speeds. This, then, was the thing that was going to make newsprint at 1,000 feet per minute.

We do not believe that No. 9 machine, as we have described it, ever made any shipping paper. We have never heard of any great difficulty with the new-fangled fourdrinier, or with the press part, and it was no problem to get the paper into the dryers, although as we have seen, the air strippers on the couch and presses were re-designed. The self-threading system on the dryers apparently also worked, although at some later unknown time the upper tier was raised to open up more space. One way or another, the sheet was put over the machine, but the pressure rolls were a disaster.

The idea, of course, was to press the paper, sandwiched between the felt and the dryer, so hard against the surface of the latter that a finish would be imparted without the use of a calender stack. Alternate sides of the sheet were of course automatically against the dryer surface, one side on the top tier, and the other side on the bottom. The mechanism we have described could

not exert any great pressure, but it would have been much more than the dryer felt alone would produce. Just what was expected to happen at the dryer seam is not known, but at that time the ends of the felt were sewn together, with a long lap, and it must have been the supposition that it would not be troublesome. It did not make any difference, as it turned out. The pressure roll idea would probably not have worked in any event, but some things were overlooked that made their failure inevitable. The most important of these was that where previous dryers had had shells 1 inch thick, these dryers were cast with shells two inches thick. Again according to Bob Hume, this was the result of a top-of-the-head decision by Elmer Pope. It might have been a good enough guess, but these cylinders were neither bored nor balanced. There were thick and thin spots; heat transfer was uneven; the dryers distorted when steam was turned into them, and the pressure rolls, which fitted beautifully when everything was cold, touched only in spots when everything was hot. Attempts were made to overcome this by various means, including removing the felts and "running in" the rolls for several weeks with an emery powder slurry, but nothing ever could be found to produce uniform pressure, and the scheme was abandoned.

This did not end the experimenting. Because of conflict between dates on the drawings, the sequence of things is a little hard to determine, but appears to have been in the following order. A smoothing press was installed early in 1915, but it did not help the finish, and was removed and replaced by a third press, which does not seem to have been of any great assistance either. However, Elmer Pope still seemed to be of the opinion that the way to eliminate the problem of the calender stack at high speed was

to eliminate the stack, and his next experiment was again in the direction of using the dryers as calenders, but in an entirely different way.

After some time spent on design, six chilled iron calender dryers were ordered from Rice Barton in May, 1915, and were installed so soon thereafter that it is likely that work on them was already in progress before the order was placed. These dryers were 72" diameter, 160" face, like the others, but had shells 3-1/2" thick, and weighed 25 tons each. This was an impressive-looking installation. The dryers were set in vertical pairs in frames not unlike the existing dryer frames, to which they were joined. The lower rolls were carried in double-row ball bearings, and the journals were bored for steam and syphon connections. Each was separately driven through a pinion and a spur gear of smaller diameter than the dryer, from the basement main line, by a very complicated arrangement involving a Ferguson quarter-turn, Morse chain and sprockets, and cone pulleys, which we will not attempt to describe. The top rolls had no gears, and were driven by surface contact. They were mounted in plain bearings set in short vertical ways. Under each top bearing housing was a hydraulic lift and a curious cam, lever and spring system, which as best we can determine, was intended to provide a cushion in case of a plug. The top cylinders were not heated.

The top and bottom dryer felts from the existing dryer section were extended to the calender dryers, and were arranged conventionally, with one 60" felt dryer in the top felt, and a rolling stretch of a new type, mounted on a wheeled carriage instead of the usual bars. Since one dryer was directly over

another, the felt rolls inside the frame were all set on the same horizontal center line. The lower rolls were doctored very close to the nip on the wet end side, as in the regular dryer section, but on the upper rolls the doctor blades were almost vertical, and were placed well below the point where the paper left the dryer. This was apparently where Elmer Pope began to use air for threading dryers. From the last top dryer of the regular dryer section, the end was fed downward between the first bottom calendar dryer and the bottom felt by an air blast along a curved metal guide; passed around the roll and through the nip, where it was doctored off, ran up against the top felt, which carried it up around the top roll without any air assistance, and was led onto the bottom felt at the next bottom roll by the same curved guide and air blast arrangement. After passing the three pinches, it was passed directly to the Pope reel. It is not certain whether some paper dryers had been removed to make room for the new section, or whether the reel had been moved toward the finishing room.

No. 9 machine had its own broke beater, located in the basement just about at the dry end of the dryer section, and before the calender dryers were installed, the sheet, when it was going to the beater, dropped freely down into it from the last top dryer through a broke hole. However, with the calender dryer installation, there were, between this new section and the dryers, a pair of horizontal "break rolls", one spring loaded, each roll doctored under the nip; and the sheet going to the beater came down from the last top paper dryer and through these rolls on its way to the beater. The purpose of this pair of rolls is uncertain. Perhaps they had something to do with the handling of the paper after a break in the

calender dryers, or, if some of the paper dryers had been removed, the relation of this point to the broke beater might have been changed, and maybe they had something to do with that.

The calender dryers did not work, either. We have not been able to develop any information as to what the troubles may have been, and we do not know whether or not they were used in conjunction with the pressure rolls. They were probably not, as a 1915 drawing does not show the latter. It is likely that the same problem of distortion precluded even pressure across the sheet. Anyway, they did not play with them very long, as they were removed some time in the summer of 1915; a 9-roll calender stack, which would appear to have already been built, was installed, and No. 9 got down to the business of making paper, but not at 1,000 feet.

As we have noted, Elmer Pope did not give up on the calender dryer concept, installing a modified but equally unsuccessful version on No. 1 machine at Madison in the early 1920's; and believe it or not, long after he was gone, the Company tried it one more time at Millinocket in the 1960's. This too was a failure.

Other changes in the mill were made in 1915, most of which do not require much explanation. In the wood room, the old wooden log saw deck was replaced in steel and concrete, and a Lombard chip crusher replaced the original Carthage unit. Four-foot wood was beginning to arrive in the river drive, and in this year a three-saw slasher, such as we have described, discharging two-foot blocks into the sluice to the mill pond, was built on the dyke at Ferguson Pond. The original J.C. Penney groundwood deckers were replaced by "Schenck" thickeners, which as far as we know

were not greatly different, being of the old gravity type, but probably of larger capacity and containing more iron. In connection with this installation, the decker chest was enlarged, creating a problem which persisted for a very long time, the rectangular chest, later L-shaped, being almost impossible to agitate by any means, allowing the stock to channel on the one hand and thicken in the corners on the other, some of this breaking loose every so often to produce slime-holes in the paper and other grief. If we have not described the old wet machine, or wet press, to which we have so often referred, this was usually no more than a gravity decker, with a single coarse endless woolen felt running around the couch roll on the cylinder, picking up the film of pulp and carrying it through the press -- a wooden top roll, around which it returned, and an iron bottom roll to which the pulp transferred itself. Here it was allowed to build up until it was perhaps 3/8" thick, when it was removed by a man driving a pointed hardwood "pin", about two feet long, under its edge and pushing it quickly across the face of the roll, which was about six feet wide, allowing the broken length of pulp to run off onto a shelf, where it was folded into a "lap". This was not a particularly safe operation. At this time what was called a "roll skinner", a weighted blade, mounted across the frames so that it could be pulled down against the bottom roll to break the sheet, was installed on each of the wet presses, although some of the men did not like them, and continued to use the pin.

In this year also, the digester house was extended southward to make room for two additional digesters to take care of the additional production from No. 9 machine and the upcoming No. 10. The

blowpit room was of course extended at the same time. Apparently there was some doubt at this point about the desirability of continuing to supply sulphite pulp and wrapping paper to the Lower Mill from Millinocket, and an estimate was made of the cost of enlarging the steam plant, installing a wrapper machine and building a sulphite pulp mill at East Millinocket. As a matter of fact, a contract was made in February with J.A. Greenleaf & Sons for the construction of the sulphite mill, but this was cancelled in May in favor of the expansion at Millinocket which we have just noted, and no further action was taken.

In March, 1915, a consulting engineer by the name of Carl Bach-Wiig was hired and located at Millinocket to experiment with a sulphite pulp process using salt, perhaps a precursor of the sodium base process used much later, which he had patented in Canada, and on which he had filed a patent application in the United States. When he was engaged, an agreement was made with him that his term of employment would be for not less than one year, and that the Company could use his system, if it proved to be successful, without any royalty. It does not seem to have been successful, as we have found no record of it being used at that time, nor indeed any record of what experiments he may have made, and he departed Great Northern on December 1, 1916. It is possible, however, that he had something to do with the decisions made in connection with the existing and projected sulphite mills.

An oil house, with three 10,000 gallon underground tanks for lubricating oil and kerosene were provided; a new boiler feed pump replaced the original unit, which was repaired and held as a spare;

the partial wooden mezzanine floor in the beater room was replaced with concrete. No. 9-10 machine room, which was separated from the old No. 1-8 room by the original south wall of the latter, had two monitors nearly the length of the roof, instead of the old skylights. Late in the year, three 60-inch exhaust fans were installed in the monitor over No. 9 machine, and along with these, a large multivane fan, driven by a steam engine, was set in the basement, drawing outside air through coils placed in a wall opening and heated by the exhaust of the engine, in an effort to improve the ventilation in this room.

The events of the next year, 1916, were of much greater scope and importance. The two new digesters, built by the Portland Company, were installed in the building extension completed the year before, and at this time the seven digester units were renumbered, the two new units becoming Nos. 1 and 2. Two more flat sulphur burners, with combustion chambers, were added, and the wooden floors in the digester building were replaced with concrete on steel. Apparently at some time a wooden coal bunker, with a conveyor on a wooden trestle to supply it, had been built in the boiler house. These were replaced in steel and concrete. The old groundwood flat screens were removed and replaced by Improved centrifugal knotters -- probably only a partial installation. The Rodney Hunt wheels on the grinder lines were now inadequate. Four of them were removed and replaced with 5,250 h.p. I.P. Morris units in steel scroll cases. As this is written, these are still in service. At this same time, the first outside storage for slush groundwood; three vertical steel tanks, 42 feet in diameter and 38 feet high, with the necessary pumps and piping; was installed on concrete foundations just outside the Millinocket Stream side of the screen

room. This permitted running the grinder room on Sunday, to use water, which would otherwise have been wasted, to make pulp, without having to take it off on wet machines, pile it out and bring it back in again during the week, as had been the practice.

There were now four short wood stackers north of the yard log pond, and a wooden trestle 565 feet long, was built "from the head of the fourth pulpwood elevator", presumably the one next to the pond, with a cable conveyor out along it, to provide increased storage of four-foot wood received by rail. All the short wood piles had water lines laid out to them. These had been connected not to the mill, but to the town system, which was beginning to be overtaxed by the use of water for wetting down these piles, and at this time an 8 inch line was laid to connect with the mill fire pumps, and town water, while still connected into the system, was no longer needed, at least not for the purpose of wetting down piles.

The big job of 1916 was the installation of No. 10 paper machine. By early in this year No. 9 was running as a conventional machine at about 700 feet per minute. Elmer Pope had his air devices at the wet end and at the calenders improved, probably had air on the dryer doctors on No. 9, although the sheet could be carried through by hand at this speed, and a method had been worked out for stacking the paper. According to one of the old papermakers, the idea of blowing the end from the last top dryer up a metal chute to the nip of the stack was not Elmer Pope's. At this speed, a good man could stack the sheet full width, and he

had worked out a mechanical man by setting the last top dryer felt roll back and running a woolen felt against the exposed face of this dryer on a system of rolls, the sheet being doctored off the dryer, blown up under this felt and carried by it up into the nip of the stack, in about the same way as the reel had been fed directly from the dryers in the experimental installation. The story is that this felt tore off one night, and rather than shut down to replace it, the night piper devised a sheet metal guide, and an end was blown up under this with an air hose, this working so well that Elmer Pope refined it into the arrangement of a metal guide, with fixed air jets in the top dryer doctor, which is credited to him.

Be this as it may, the Company was now ready to go ahead with No. 10. Unfortunately, we do not have much detail on this machine as it was installed, but perhaps enough to make some reasonable assumptions. We know that the fourdrinier was the same as that on No. 9. There were probably four plain presses and a nine-roll calender stack, and we know that there was a Pope reel. There was a difference in the dryer section. In spite of its thirty six-foot dryers, No. 9, probably because of poor water removal from these, does not seem to have had sufficient drying capacity for higher speed, and as nearly as we can determine, No. 10 had 36 dryers. These were not staggered as usual, but the top dryer was set directly over the one below. There has been a lot of conjecture about the reason for this arrangement, which was used on three of the machines installed in Great Northern mills. Rice Barton has no answer. However, the writer's theory is that

it was an outgrowth of the calender dryers and Elmer Pope's method of threading these by air, and we are told that on No. 10 the paper was definitely carried through the dryers by air.

In January, 1916, the wrapper machine and the cutter equipment that went with it was moved into the northeast corner of the beater room, where space had been made available by the removal of beaters with the installation of the mixing system, some beaters, however, having been left to furnish the wrapper machine. An American Ball two-cylinder steam engine, replaced the motor which had driven this machine. As the reason for this job is given as "space for finishing paper from No. 9-10 news machines and increased production of wrapper", it may be that additional dryers were added; a process that was to be repeated many times in later years until the machine stretched almost the entire length of the beater room. It also may indicate that originally No. 10 machine was intended to be the same length as No. 9. At this time, the wrapper machine, which had been No. 10, became No. 11, and that remained its designation for the next 56 years.

The decision to put more dryers on No. 10 presented a new problem. No. 9-10 machine room was not long enough, coming only to the east wall of the finishing room extension, which by this time, outside the space being taken up by the wrapper machine, had been made into the machine shop. Accordingly, in the summer of 1916, No. 9-10 machine room and basement were extended 100 feet westward -- that is, right across the whole width of the finishing room -- making room to install the new No. 10, and to later extend No. 9, it having already been decided to do this, as it is men-

tioned in the description of the job. No. 10 machine was then installed, probably starting up late in 1916, but we do not have a date. Apart from the extension of the machine room, which cost \$85,000, there was a terrific over-run on the installation of this machine, due probably to war-time conditions. The machine and drive, estimated to cost \$150,000, actually came to \$265,000, and the whole job, estimated at \$205,000, cost \$340,000.

With the two new paper machines in operation, the inadequacies in the pulp mills began to show up. In 1917, twelve more ground-wood thickeners were put in. A second 88-inch Carthage chipper was added, and new chip screens and conveyors were installed. The sulphur burner building was enlarged, four new rotary burners were installed, the old flat burners being used as combustion chambers, and a new lead gas cooler, to supplement the existing equipment, was added. The mixing system was not large enough for ten machines, and a steel tank, to hold an additional supply of sulphite, which could be added to the furnish separately, was installed on the beater room roof.

As the amount of four-foot wood in the drive was now substantial, two 10-foot diameter steel plate barking drums were installed on the dyke at Ferguson Pond, and a second wooden sluice was built to connect these with the piling conveyors, in which some changes were made to allow wood from the drums to be either piled or sent to the chippers, the object at this time being to bark and pile the winter's supply of wood for the sulphite mill in four-foot lengths. At the same time, a seven-saw slasher was also built at Ferguson Pond, to cut long logs into four-foot lengths for the drums at such times as the short wood in the drive should be in-

sufficient for the sulphite mill. Later in the year, the two seven-foot drums in the wood room were replaced by new eight-foot drums of heavier construction. The power system began to be inadequate, and as a makeshift measure some improvement was made in the coal handling system for the wood burner which had been converted, and a small addition was built on the south side of the boiler house to hold a 400 h.p. Corliss engine and a generator made out of an old 300 h.p. synchronous motor, to supply power to the new barking facilities. The insulation on the original power wiring through the generator room, grinder room and screen room was beginning to deteriorate. This was all hung from the roof planking, which had begun to rot, making a very unsafe condition, and all this wiring was renewed and hung on steel independent of the roof deck. A wooden floor still left somewhere in the old digester building was replaced with concrete. Pope reels were installed on the eight old paper machines. The ventilation problem in the machine rooms had not been solved -- and by ventilation we do not mean the creation of more comfortable working conditions, but the elimination of condensation and drip from the roof. During the winter it practically rained all over the place, and in spite of dryer canvas strung up overhead, drops of water fell on the wires, punching holes in the wet sheet, and even on the finished paper at the winders. In this year, five big steam-driven heating units, blowing hot air into the machine room, were set up on the beater room roof, and a sixth over the shipping platform at the west end of No. 9-10 machine room.

According to the records, Joe Nevins, the Superintendent of the East Millinocket mill, was transferred to Millinocket, and took over from Ingleton Schenck in April, 1917. This results in

another confusion of dates, as Ingleton Schenck, again according to the records, did not go to Madison until February of the following year, nor did Charlie Burr, then Superintendent at Madison, leave that mill until 1918. However, there it is, and we have no explanation. It is possible that one of the Salary Record dates is erroneous, as these were some of the ones made up after the office fire in 1913. If not, either both men were at Millinocket for nearly a year, or Ingleton Schenck had a leave of absence.

Joseph H. Nevins (1873 - 1928) was an old-time paper maker, born in Franklin, N.H., where he went to work in the local mill as a fifth hand and rose to the position of foreman of the paper room. From Franklin, he had gone to the International Paper Company at Corinth, N.Y., as Superintendent; from there to its Fort Edward mill in the same capacity, and was Superintendent of the I.P. mill at Ticonderoga, N.Y. when he was hired by Great Northern in 1913 to take over the East Millinocket plant. The writer knew him only slightly. To the best of his information, he was an able administrator, very popular in the community and active in its social life. He was not quite 55 years old at the time of his death, and had been in failing health for some time before that. As the writer recalls, he reached a point in 1926 where his mind was not good, and he could not perform his duties, which were taken over by his assistant, Robert M. Hume; and in 1927 he moved to Bangor for treatment, but remained on the payroll until he died in the following year.

Joe Nevins who, had he been a taller man, might have been described as "portly", was a cheerful individual, who enjoyed life.

He was particularly interested in sports, and is given special credit for Millinocket's fine contemporary baseball teams. This might be the place to note the baseball fever which raged for a number of years starting just after the end of World War I. Almost every town in Maine and the Maritimes, perhaps in other parts of the country as well, had a baseball club, made up of local athletes, and rivalry became so intense that in many places the teams became semi-professional, the towns going outside for talent, mostly college players, who were given sinecure summer jobs by civic-minded employers like Great Northern. At one time in the early 1920's East Millinocket had a team made up almost entirely of Georgetown University stars, and at least one man who later became a big-league celebrity played for Millinocket. Local baseball was of course nothing new, and we still have it, but the bug was especially virulent at the time of which we write. Incidentally, having nothing to do with baseball, but in the same spirit, the Company, for a very many years, provided jobs for imported band leaders, but these were always bona-fide employees, with experience and skill in some other field than music.

It would seem from some of the foregoing that the accelerated end to the driving of pulpwood as logs had not been wholly foreseen, as all the work done on the handling of four-foot wood from the river was in connection with the supply for the sulphite mill, and logs were still being piled and sawed in the wood room for groundwood. Although other factors contributed to the shift to four-foot wood, the disappearance of men for long log driving was the main one and by 1918 it was pretty much a fact. So was four-

foot wood for both sulphite and groundwood, and it had become necessary to provide for greatly increased winter storage of short wood. The result was the construction in 1918 of No. 1 piling conveyor, west of the yard pond, and running in a north-south direction, referred to in the Job Record as the "Pulpwood Storage Conveyor for Groundwood". This was the first suspended cable piling conveyor, and it was William A. Whitcomb's idea. Most of the piling conveyors in use at that time were of the trestle type, from which it was difficult to reclaim, on account of the numerous supporting bents. The suspended cable conveyor was a radical departure, which is worth some notice. There were some very small differences in later units, but we will describe this No. 1 conveyor as well as we may.

Two structural steel towers, 90 feet high, were erected about 400 feet apart, on a more or less level piling ground, the south tower opposite the north end of the wood room, or thereabouts. At the top and bottom of each tower was a cast iron "sprocket", with pockets in its rim, such as we have described. At the north tower was an uptake, with supporting steel on concrete piers, at the foot of which was another sprocket. In the ground between the two towers was an open, steel-lined concrete "tunnel". The path of the 1-1/8" steel cable, fitted with buttons, was up this uptake and over the sprocket at the top of what was called the "A" tower, from which point it hung free to the sprocket at the top of the other tower, passing over this and down inside the structure, under the wheel at the bottom, and, in a continuation of the tunnel, to a drive house, where it went around the drive sprocket and a stretch idler, and returned through the tunnel to

the foot of the uptake, the section of this return from the "A" tower to the tail sprocket being above ground, in a wooden plank enclosure. The drive was arranged so that the direction of travel of the cable could be reversed. At the top of each tower, an extension supported a fixed cable, running from one to the other, and provided with a traveler, by means of which a new cable could be pulled across when needed. Barked wood going to this pile came down the sluice from Ferguson Pond into the yard pond, and was loaded from the water onto the uptake by a crew of wood polers, assisted by some sort of spiked roll device, of which we have no description. The barked wood went up the incline, was discharged over the top of the sprocket and dropped to the ground, gradually building up in a cone around the tower, which was straight-sided, not tapered, so that the wood did not strike against it on the way down, and was sheathed with plank.

When the top of the cone was up to the top of the tower, men climbed up on it and tiered up sticks of wood to support a short section of wooden trough under the cable, which carried the wood out a little further toward the other tower, additional sections of trough being added as the pile grew, until it had reached the far tower, when they were removed. While the calculated capacity of this conveyer was 40,000 cords, actually about 38,000 cords could be piled under the cable with the wood at normal angle of repose, this varying somewhat, depending upon how long the wood had been in the water and other factors. By raking down, however, something over 46,000 cords was put out in later years.

We have been told that two-foot blocks were piled on this conveyer, but we are not at all sure of this. If it was done at all,

it must have been for a very short time. Originally, there was a permanent trestle conveyor from a pocket under the tunnel just beyond the south, or B tower, to the northwest corner of the wood room. This was intended for reclaiming wood by running the cable backwards; uncovering the "tunnel" -- which we forgot to explain was covered by having plank or four-foot sticks laid across it before piling started -- and putting the wood into it with portable conveyors, starting from the south end, but we know that this was not used for very long, except perhaps for wood from near the tower. It was at most a year or two before the wood was being dragged off the pile into the yard log pond by steel rakes on cables from two-drum hoists on the east side of the pond, driven by steam engines with donkey boilers; one cable, which passed over the top of the pile to a sheave on a guyed wooden back-mast, rigged in different locations along the pile, and back over the pile to the hoist, dragging the rake up, the other pulling it down into the pond, bringing wood with it. Dynamite had to be used regularly to loosen the frozen wood, men climbing up on the pile with small charges lashed to sticks that could be pushed down into the crevices. We know that before 1922 a slasher had been installed on the uptake from the pond to the wood room, which would indicate that the wood was piled in four-foot lengths on No. 1 conveyor as well as on the stackers north of the pond. All wood was run through the wood room drums during the winter to knock off ice and frozen dirt, and these drums were used for full barking during the summer season, but we are not quite clear as to whether two-foot and four-foot sticks were ever barked together during the period that both lengths were used. This is not very satisfactory, but we can find no more exact information.

The suspended cable conveyor was used at the two Penobscot mills of the Company, and by the St. Lawrence Paper Company at Three Rivers, P.Q. If there were other installations, we do not know about them. This does not mean that there may not have been more, but we are sure there were never many, because about this time the cantilevered travelling stacker, which was a better system, made its appearance, and as old piling conveyors were replaced, or new mills were built, this type of equipment was widely used.

Very little other capital work was done in 1918. As we have noted, the new No. 9-10 machine room had cut through the repair shop, and in this year what was described as an extension of the machine shop, essentially an addition to the south end of what had been called the finishing room, was built, the only job of importance other than the new piling conveyor.

The next year, 1919, was much more active. The mill was now 20 years old, and a lot of the wooden construction was rotting. The old "overland" log sluice from the end of the canal to Millinocket Stream, still in use for down-river logs, had become badly decayed, and its 2,300 foot length was rebuilt in two separate jobs, again in wood lined with steel strapping, on timber bents and mud sills. The wooden sluice from the yard pond to Millinocket Stream, which took the overflow from the pond, and was used for sluicing ice and four-foot wood for the Lower Mill, was badly deteriorated, and this also was replaced with a new wooden one. The two vomit stacks from the blowpits built before 1916 were rotted so badly as to be dangerous, and these were replaced, also in wood. The plank roof on the boiler house

was gone, and this was replaced with gypsum slab on additional steel. The old Roney stockers on twelve of the boilers were replaced with Taylor equipment for better efficiency, at which time it was found that the foundations under the boilers were poor, and had to be repaired by driving piling, shoring them up, and pouring concrete under them.

A two-tower Jenssen acid system was installed for the sulphite mill in this year, replacing the old Burgess installation. The insurance people were not happy about the fire protection on the wood piles, and a lot of new pipe was laid, connected to hydrants in houses provided with hoses and nozzles, and sprinkler pipes were run out along the trestle conveyors north of the pond. A larger cylinder was put on No. 10 paper machine engine to permit increased speed, and an asbestos hood was built over the dryers on No. 9, the first mention of a real hood, although we believe that others had already been installed. The expected results were "longer life of dryer canvas and better paper, free from streaks", indicating that No. 9 dryers were not doing so well. This job cost all of \$1,400. The wrapper machine would not dry enough paper to keep up with increased news production, and a "vapor absorption system", which apparently consisted of a heater, a fan, and ductwork to blow heated air up under the dryers, was installed.

In this year 1919, we also find the first mention of wash-rooms and individual lockers, a brick building, provided with toilets, showers and lockers, being built in the yard between the mill and the Administration Building. There is no indication

of which men this was for, but it was most likely for the yard crew, as it was later. At the same time, a washroom of cement plaster on steel lath, also with toilets, showers and lockers, was built at the south end of the beater room for the paper machine crews. This was a pretty crude affair by later standards -- we have given some of the details of similar facilities in another place -- but it was a beginning. This type of construction was used for washrooms for a long time.

During all the time of which we are writing, there were innumerable experiments in connection with the manufacturing operations, some resulting in permanent improvements, some being flops. Many of these are covered in the so-called "Test Reports", of which some 18,000, not very well indexed, are on file, but so many of these cover mere routine, and so many are not particularly informative, that we have made no great use of them. Of some experiments we find only bare mention; a for instance being an attempt to dry paper electrically by passing a current through the sheet from side to side from electrodes along the edges; but there was one on No. 10 machine in 1919 which is of some interest.

Wire life has always been one of the major items of concern in the cost of operating a fourdrinier machine, particularly when only bronze wires were available, and the flat suction boxes were one of the main causes of wear. At this time of natural sandstones, grit, carried along with the stock and embedded in the maple suction box covers was a problem -- the writer has seen times when so much of it was pinched out of the sheet at the stack that it showed footprints on the floor. The experiment of which

we speak was carried out with a piece of equipment made by Rice Barton, with which a short endless woolen felt was run under the wire over the flat boxes and around the bottom couch roll. This felt had a stretch, a guide and a drive roll, probably taking power from the couch intake. It was not successful -- most likely the felt tended to fill up -- but its interest lies in the fact that more than forty years later a device employing the same principle, but using a woven plastic auxilliary wire instead of the woolen felt, came on the market under the name "Powerfab".

By the next year, the wiring in the grinder room had all been replaced, clear of the roof, and the old deck was torn off and replaced with an entirely new typtsum slab deck, insulated, on the reinforced trusses, the job including new ventilators and sky-lights. The use of gypsum under the conditions -- all the vapor from the grinders discharged into the room, was a mistake, but this form of roof was very popular at this point. Also starting in 1920 the old flat screens on the paper machines were removed and replaced with Bird inward-flow rotating screens, in vibrating copper vats, the standard paper machine screen in almost all news mills for a long time. This job was not completed until well into the next year.

Some kind of experimental continuous mixing system was installed for the paper machines -- we have noted that the mixing tanks, which were batch affairs, were not adequate -- was installed in 1920, and this was probably the prototype of the Trimbey proportioning system, designed by E.J. Trimbey, Superintendent of the Bureau, which was put in later in the year. This was a pretty

simple device; a wooden box with constant level overflow compartments for groundwood, sulphite and color, which were released to the stock pump in proportioned amounts, through rotating locks, the proportions being determined roughly by the size of these, and closely by the head on them, governed by gates in the overflow boxes. This system, installed in the middle of the beater room floor, was preceded by by-pass consistency regulators in other parts of the mill and some of these were also designed by E.J. Trimbey. The mixing tank system was left in place, but was removed in 1921. The Trimbey Mixer, as it came to be called, was very successful, and with refinements and improvements, was used almost universally in newsprint mills for many years. While it was expected, it was not obligatory at this time for an employee to assign patents on equipment worked out in Company operations to the Company, and E.J. Trimbey shortly left and went into the business of manufacturing and selling this device. It is possible that there was some arrangement about this, as he and the Company maintained excellent relations, and the latter had preferred treatment on the purchase of his equipment.

It may seem strange, but as late as 1920 gasoline was bought locally, in small quantities. In this year, a 12,000 gallon underground tank was installed, allowing of purchase in tank car quantities. In this year also a brick storehouse for parts and metal supplies was built just south of the machine shop. There were minor changes in the steam plant. The new Taylor stokers were not coming up to expectations, the trouble being that they would not handle the coal just as it came from the pile, and a 30" x 30" single roll crusher,

with the necessary conveyors, was installed to break up the lumps, some of which, as they came, were almost as much as a man could lift, though there were not many as big as this, of course. This job required an extension to the existing coal conveyor house. A new turbine-driven boiler feed pump and a feed-water tank for additional storage of hot water were also installed. More sophisticated instrumentation was proposed for the steam plant at this time, but it was never provided.

The fabulous "1000 feet per minute fourdrinier", No. 9, had not come up to expectations either. Its sister machine, No. 10, was doing well, but a challenge for the 1000 foot record had arisen in a machine installed in the mill of the Laurentide Paper Company, at Grand Mere, P.Q., of which Jock Chahoon, William A. Whitcomb's old friend, was President, and it was coming up fast. In view of all the publicity of a few years before about Great Northern's high speed effort, William A. Whitcomb was not about to be outdone if he could help it. The Company still pinned its hopes on No. 9, and in 1920 it was remodelled "to allow running this machine at 900-1000 feet per min." A plain fourth press was added; new Ferguson quarter-turn drives were installed, and while it is not mentioned, a new cylinder was probably put on the engine. A concrete machine chest, with agitation, was provided; three Bird paper machine screens replaced the old flat units; a new Pope reel was put in, and according to the record, eight dryers were added -- there is some question about the actual number, which we will note later. All this cost something like \$200,000 and it was probably late in the year before the changes were completed.

Machine production was again outrunning the back-up facilities. In 1921, the remaining two old Rodney Hunt water wheels, on Nos. 5 and 6 grinder lines, were replaced with 5,250 h.p. I.P. Morris turbines, and another grinder was put on each line. We believe that six grinders had already been added some time after 1912, when No. 6 line was installed, so that there were now 72 stones in operation. At the same time, two of the three old generating units were removed and replaced by 5,500 h.p. I.P. Morris turbines similar to those on the grinder lines, direct connected to 4,000 KW General Electric 600 volt generators. The third old unit was never used again, as far as we know, and was later removed, the two new turbines being a little more than the penstock could handle. We continue to use the designation "I.P. Morris" for turbines of their manufacture, although this company changed hands a number of times, and the name plates differ. At this point, the I.P. Morris Co. was a division of Wm. Cramp & Sons. The switchboard was rebuilt and enlarged, a new roof was put on the generator room, a 30-ton overhead crane was added, and an additional fire pump was installed in the generator room and hooked into the system.

By this time the old steam plant was becoming obsolete, and a start was made on a new one. This job was done in several steps over a number of years, and we will take them as they come. In 1921, the boiler house was extended to the east of the existing structure, it being necessary to drive a lot of piling under the foundations, probably because a lot of this area had been filled during the original construction. Four 755 h.p., 200-lb. Babcock & Wilcox stoker fired boilers, new Nos. 1,2,3 and 4, were installed,

with a new overhead steel coal bunker, draft fans and other auxilliary equipment. The ash handling system was remodelled, and a second brick chimney, since removed, an Alphons Custodis job, a little east of and removed from the building, was added. A smoke flue led from the furnaces to this stack, which was the same height as the other, but a little larger in diameter. This boiler house job, which was done by the Foundation Company, also involved moving the coal pile and building a second coal trestle and retaining walls around the coal piling area.

With No. 3 machine rebuilt, the effort to reach the 1000 foot mark had been renewed, and on April 15, 1921, for the first time in history, newsprint was made at 1000 feet per minute. There was considerable controversy for some time as to whether Laurentide or Great Northern got there first, and we have found no special record of the achievement in Company record. Our authority, therefore, is J. Wallace Tower's 1931 compilation of historical data on paper machines, which says:

"1921 - On April 15th, the first commercial newsprint paper to be made at a speed of 1,000 feet per minute was run in the Millinocket Mill of the Great Northern Paper Company on a Rice Barton and Fales Machine having a wire 158" wide by 95 feet long, sloping 54", a 30" straight slice, regular couch, four regular presses, 36 - 72" diameter dryers, Pope reel and a two-drum winder. Pope air devices were used for handling the sheet, beginning with the couch and ending with the reel. The machine was operated by a back line shaft driven with ropes

from a Corliss type steam engine. The several intake shafts were run by belted quarter turns known as the Ferguson drive."

This does not say that the machine was No. 9, but all informants among the older employees of the Company say that it was. Nothing is known about what may have been done in detail after the rebuild to obtain this result, except that the pitch of the wire had been increased to 54 inches. We might note that a short time after this, the wire on No. 10 was raised to a pitch of 72 inches, but at this height the stock over-ran the speed of the wire, destroying formation, and the fourdrinier was lowered again. This did not end the experimenting with pitch. Later fourdriniers were all pitched to some degree, the amount of slope being determined empirically. Later still they were built with the pitch adjustable, as we will see. The mention of 36 dryers is what raises the question as to whether eight dryers were actually added, as there were 30 originally. The figure of 36 may be in error, or it may be that two had been removed at the time of the calender dryer trial. The other parts of the description of the machine tally with what we know about No. 9 as it was at that time. Incidentally, Laurentide was not far behind. From the same source, this company made newsprint at that speed, for the first time in Canada, on a 166" Dominion machine with a 103 foot wire, a suction couch, a suction first press, two regular presses and forty 72" dryers, all driven by a Harland sectional electric drive, with automatic speed control and draw regulation, in August of this same year. This machine, it will be noted, was much more modern and sophisticated than No. 9 or any other Great Northern unit.

There were several other developments of more or less importance in this year. A new first aid room was built in what had been the pipe shop, an extension on the north end of the sulphur storage building. In this connection, we have told about the Medical Director, Dr. E.B. Sanger, and mentioned that he was responsible for the mill doctors. The Company from the beginning always had a doctor unofficially known as the "mill doctor", although he was free to handle private practice as well. He was on salary, part of which was paid, at least in the writer's time, by Great Northern, and part by Employers' Liability. This might be as good a time as any to mention such names as we can be fairly sure of, and the periods during which they served, which will be approximate. There were not many. The first was Dr. Charles S. Bryant, a man particularly popular in the town, who came to Millinocket in 1900, and who, except for a short hitch in the Army during World War I, when he was relieved by Dr. E.B. Mansfield, took care of Company accident cases until his death in 1937. He was succeeded by Dr. Ernest Young, transferred from East Millinocket, who held the position until his death, which occurred in the early 1950's, and he was followed by a partnership, Drs. Desjardin and Gilman -- which is as far as we need to go for the purposes of this chapter.

Three of the old wooden penstock head gates, Nos. 5,6 and 7, were replaced in steel. The fire pumps which had replaced the original installation took their supply from Millinocket Stream, and while town water was no longer used for wetting down the wood piles, there was still a cross-connection which evoked the possibility of pumping contaminated water into the town system. Accordingly, an intake was built at Ferguson Pond, and an independent

18" cast iron supply line, 2,300 feet long, was laid from this to the fire pumps. The connection remained, but the Town was also taking its water from the West Branch. Additional pipe was run around the new No. 1 piling ground, and a number of ground-level monitor nozzles were located on this at intervals. There was still trouble with drip from the roof in the machine room, there being a bad condition even at the dry end, because of cold air being drawn in from the finishing room, and it was proposed to build hoods from the last dryer out over the winders on all machines. As far as we can tell, however, only one was built, this on No. 9 machine. In this year, changes similar to those made on No. 9, including a higher pitch on the wire and improved Ferguson drives, were made on No. 10. Some kind of shake was also put on No. 10 fourdrinier, but there is no information on it, and we do not believe it was used for any extended period. Both barking drums in the wood room had been driven by one motor through counter-shafts and belts, and in this year changes were made to improve this drive, each drum being provided with its own motor. The largest job of this year was the replacement of the old Nos. 3,4,5 and 6 digesters; the original Nos. 1,2,3 and 4; which were single butt-strapped, with new double butt-strapped units. We have noted that these old digesters had given more or less trouble, and had been patched often, but their replacement was hastened by the explosion of a digester of the single butt-strap type at the mill of the Brown Company in Berlin, N.H., which wrecked the sulphite mill, and this digester was just about the same age as the older vessels at Millinocket.

Although the management was stuck with the "spend no more than depreciation" limitation, capital improvements had generated more

depreciation dollars, and the 1920's were a busy time. In 1922, the roll grinders, which all this time had been in the finishing room, were moved into the north end of the repair shop, and a third one was added. A few more sulphite thickeners were installed, and the sulphite decker chest enlarged. The installation of steel gates and new trash racks at the entrances to the penstocks was completed. The hoists for these gates had up to this time been on an open deck, and had been operated by hand, but in this year the gate house, a steel-framed building with cement plaster walls on steel reinforcing, was built over them, and they were arranged to be power driven. Hardy Ferguson had designed a worm gear drive for dryers -- this was not the sectional drive, but a worm and pinion mechanism to replace the arrangement of large spur gears on each dryer, those on the upper tier of dryers being driven directly from those of the lower tier, without intermediate pinions, universally used on Great Northern machines. The first trial installation of this equipment was made on four dryers of one of the Millinocket machines, new dryers, complete with the drive, being furnished by Rice Barton. While several complete installations were made later on Canadian machines, this system was for some reason never widely used, and was never adopted by the Company. There was always a lot of waste of pulp when cleaning up the outside piles, as there was no surface under them, and some 33,000 square feet of concrete slab was laid on the groundwood pulp piling ground. A lot of work was done in this year on pulpwood storage and handling. The four old wooden conveyors north of the yard pond -- we have specifically mentioned only one of these original stackers being extended on trestles, but they had all been built out in this manner -- were removed and replaced by No. 2 suspended cable piling conveyor, essentially identical with No. 1

except for the arrangement of the drive, which was on the uptake end to the east, this conveyor running in an east-west direction north of the pond, at an angle of maybe 110 degrees from the center line of No. 1. Its towers, however, were sheathed to the top with concrete. It was intended to pile either from the drums at Ferguson Pond or from cars, and wood could be reclaimed from it through its tunnel, on the return of the cable, which discharged into the existing underground conveyor to the wood room. In connection with this job, a sort of arm or extension of the yard pond was excavated at its north end, running westerly more or less parallel to the new conveyor for a distance of about 250 feet. This was finished with timber cribwork on both sides, and was intended to provide additional storage ahead of the conveyors for wood sluiced down to be piled, but much of the wood from No. 2 pile could also be dragged down into this extension by the rakes. The uptake of the new conveyor was loaded from the water originally by the same method as used on No. 1, but there is no mention, in the description of its construction, of any method of getting wood onto it from the railroad conveyor.

An underground cast iron water main was laid around the area of No. 2 pile, with twelve monitor nozzles at ground level, and a few hydrant houses. At the same time, a new loop of similar pipe was laid around No. 1 pile, and more monitors were installed on this. More things were now being built with steel and concrete rather than wood, and the 1912 wooden sluice from Ferguson Pond, which now discharged into the new arm of the yard pond, was torn out and replaced with a steel one, on concrete piers. These jobs taken together over-ran tremendously, as a lot of unexpected

ledge was encountered at the west end of the log pond extension, and the concrete work was done during the winter of 1922-1923, winter concrete being much more expensive then.

The experimental paper machine mentioned earlier in our story was installed in 1922. This was a little Rice Barton machine, trimming, as we recall, about 22 inches. We believe it was originally a cylinder machine, with a couple of presses and perhaps eight dryers, with a vertical reel and a small winder, but the cylinder was replaced by a fourdrinier and a plain couch in 1925, and the machine was rebuilt so many times over later years that it became almost unrecognizable. It was installed in a cement plastered room built for it on the mezzanine floor of the beater room, on the foundations of the mixing tanks which had been removed. Some experimental pulp making equipment was installed here also at that time. This machine was for the use of the Bureau, but whether any specific program of experimentation was in mind is unknown. Many experiments were carried out on it in later years, and it actually made some shipping paper shortly after it was installed, for which reason it was carried on the Daily Production Report for a long time as No. 12 machine.

Four more 755 h.p. Babcock & Wilcox boilers were installed in the new boiler house in this year, these being Nos. 5,6,7 and 8; and, as the last significant event, the Town of Millinocket started construction of a new high school at the corner between Central Street and Maine Avenue. This was at that time perhaps the most advanced school building in the State. The Company contributed \$50,000 toward its cost, and as we have noted in another place,

it was named in honor of George W. Stearns.

Work on the wood piling system was continued in 1923. The planking was removed from the No. 1 conveyor towers, and they were sheathed with reinforced concrete. At the same time, the wooden housing over the return cable at the uptake was removed and replaced by an extension of the tunnel itself. At this time, both the new sluice from Ferguson Pond and the 1917 wood sluice from the drums there discharged into the extension of the yard pond, and loading wood from this onto the conveyor uptakes was an expensive operation. In 1923, changes were made to reduce this expense. These are a little hard to follow, but as nearly as we can tell the lower part of the 1917 wooden sluice from the Ferguson Pond drums was replaced with a steel section, which, as it approached the yard pond extension was elevated and divided, one side discharging into the pond, the other onto the uptake of No. 1 conveyor. Steel switch gates sent the wood one way or the other. At the No. 1 uptake, which had to be rearranged, the water dropped through a grating into the pond, and the wood slid down a chute onto the uptake cable. Beyond this point, a continuation of the sluice, built of wood on trestles, curved around toward the north, and west, reversing its direction, and discharged, again over a grating, onto No. 2 uptake. Water going through the grating was caught in a trough which led it into the pond. By another switch arrangement, wood could thus be put out on either pile, and even could be piled on both conveyors at the same time. Work on this job ran well into 1924. The arrangement, as we recall, was workable, but there were problems on No. 2, and there was a lot of experimenting with the curve and discharge during the next year.

We do not mean to make any point of recording fatal accidents, and have not made any effort to keep track of them. But that they happened is part of our story, and occasionally something that we write, or something unusual about the circumstances, presents an opportunity to mention one or another. What we have often thought of as the fatal against perhaps the greatest odds of any in the Company's history is one such, and it occurred on No. 1 conveyor some years after this time, when four-foot wood was being piled with the arrangement we have just described.

It was necessary to keep a man at the foot of No. 1 incline, where the cable picked up the wood from the grating, to watch for plugs. As it started up the incline, the wood, at the time of which we are speaking, went under a piece of dryer canvas which had been hung up in the cable trough, we believe to keep the splash from the sluice discharge out of it. Piling had been nearly completed when a two-foot length cut from the end of a boom-log came down the sluice and went onto No. 1 conveyor incline. Just before it reached the top, almost 90 feet above the ground, it upended, turned crosswise the trough, and rolled down, reaching the canvas at the precise moment when the young man tending the conveyor leaned over and lifted it to look up the incline; a normal action. He was killed instantly. Of the nearly 40,000 cords, some four million sticks, supposed to be spruce and fir, which had gone up the incline, this stick was pine. Had it been four feet long, as the wood going to the pile should have been, it could not have rolled, and the writer has always called this the "4,000,000 to 1 fatal". It was nobody's fault, and one of the very few fatal accidents that it is hard to say could have been prevented.

The three outside ground storage tanks were raised, on new foundations, to allow for the installation of a common 48 inch header, and a fourth identical tank was installed. Up to this time, fresh water had been used on the various paper machine sprays, resulting in a lot of overflow and loss of stock to the river, and in this year a tank was installed in the basement, and excess paper machine white water was collected and piped to the showers and sprays on Nos. 1 - 8 machines to reduce this loss. Ten dryers and a second calender stack were also added to the wrapper machine at this time.

In anticipation of additional capacity in the new steam plant, the boiler feed pumps and hot water tanks were replaced again in 1924. The old Nos. 13 through 18 boilers in what had become the "upper" boiler house had been removed late in 1923, and in 1924 the old coal bunker was removed, and a second floor was built in the north-east corner of the old boiler house to make an electrical repair shop. A steel and concrete bridge at this new level connected it with the roadway between the boiler house and the wood room, and an office for the Electrical Engineer was provided. The old main floor was arranged for storage of stoker and furnace parts, and a washroom and locker room was added. The 1899 dam at Quakish Lake -- the Stone Dam -- had begun to come unstuck; some of the flat-topped upper part of it at the south end having broken loose at a laitence joint and moved downstream as much as 10 inches; and 300 feet of the top was replaced with new concrete, with a rounded spillway-type crest to the height of the flashboards, which were eliminated in this section. Two Ford trucks from the Madison mill were used to haul supplies for this job, the first

mention we have found of trucks being used on construction, although they were in service around the mill yards. Most of the wood for the Lower Mill was being either sluiced into the yard pond from Ferguson Pond, or dumped into it from cars, there being no facilities at East Millinocket for unloading railroad wood. This all had to be poled into the sluice to Millinocket Stream, which took more water than the normal overflow would provide, and caused some waste. To take care of this situation, the track west of the trainshed was extended southward about 3,000 feet to the bank of Millinocket Stream near a point called the "Cape", and was run out onto a 700-foot trestle on wooden piles, from which rough wood from cars could be unloaded for storage in Dolby Pond. All the movement of earth and materials on this job was done with horsedrawn vehicles.

The first Sheahan rope carrier for passing paper through the dryers had been installed in a West Coast mill in 1913, and had become quite common in the industry. Great Northern had never adopted it, depending upon Elmer Pope's developments. However, as far as we know, no machines except Nos. 9 and 10 at Millinocket were ever equipped with air systems on the dryers -- we do not count the experimental installation on No. 1 at Madison -- and paper was still being taken through the dryers by hand. However, Elmer Pope had died in 1922, before his air system on the dryers, which does not seem to have been entirely reliable, was perfected, assuming that it could have been perfected, and the Sheahan Carrier was very efficient. In 1924, then, one of these rope systems was installed on No. 10 machine, the groove for the ropes being made by bolting a rabbetted ring to the dryer head. Before any more

rope carriers were installed, and in line with the Great Northern concept that it could improve on almost anything, the idea was conceived that the carrier ropes could be made to last longer if they did not run continuously, and Hervey Cram, who had assisted Elmer Pope, worked out, we believe with the help of Roy Weldon, a system involving grooved sheaves, driven by friction against the end of the dryer, which could be moved in or out a fraction of an inch mechanically, so that contact could be broken and the ropes stopped when not needed. This device was tried out on No. 2 machine at East Millinocket in 1926, but was abandoned as being unnecessarily complicated, although it worked well. Later in the year, what is believed to have been the first installation of suction rolls by the Company, except for the one on the experimental cylinder machine at Madison, was made on No. 10 machine -- a suction couch, 30 inches diameter, and a suction first press, probably 28 inches diameter, both of the Millspaugh type. A Connorsville vacuum pump, we believe, was used on the couch, and a Nash pump on the press. This Connorsville pump gave trouble, and no more were used until the 1950's. At this same time, the fixed section of the fourdrinier was replaced by a new section that allowed all the flat boxes to be run out together, like the table rolls. The suction boxes in this new section were arranged to be oscillated.

A rather comprehensive change in the wood room, planned for this year, was put off until 1926, but improvements in the wood handling system were continued, the wooden part of the sluice to the uptake of No. 2 conveyor being rebuilt in steel, after considerable experimentation with the curve and transfer.

Although there is no mention of capital expenditure for the purpose, all the machines seem to by this time been equipped with hoods, which ran all the way from the calender stacks back over the dryers. Since there were no cranes in the machine room, the exhaust fans could be connected directly to these. In 1925, sprinkler systems were installed in all the hoods. Rolls of paper were still being trucked from the finishing room to the cars with stevedore trucks, and the rolls had to be up-ended by strong backs. In this year, a system for upending rolls by power, which we have mentioned elsewhere, was installed in the finishing room. A steel trolley rail was fastened to the under side of the trusses, crosswise the room, which was still 100 feet wide at this time. A trolley with two loose sheaves ran on this, and could be moved across the room by a cable from a winch on an elevated platform on the trainshed side. A second cable, anchored to the machine room wall, ran down over one of the sheaves on the trolley, and up over the other; the loop supporting a third loose sheave, to which was fastened a wooden plug that could be inserted in the core of the roll; and on to a second winch on the platform. With the plug in one end of the core, the cable, when tightened, would lift the end of the roll until it tipped into an upright position. We believe there were three of these rigs in the Millinocket finishing room.

It will have been seen from other parts of our story that at this time all electrical power was being generated right at the mills, and before 1925 there was no interconnection between the electrical systems at Millinocket and East Millinocket. In this year, additional generating capacity was being installed at

Dolby, and a 33,000 volt transmission line; copper conductors on wooden poles; with steel structures at the two river crossings, one at the Dolby Dam, the other near Jerry Brook, was built from Dolby to Millinocket. This line lay to the west of Dolby Pond, and after crossing the West Branch, ran up the east side of Millinocket Stream, to a 5,000 KVA transformer station in Little Italy, across from the mill. To make room for this, a number of houses which had been built along the bank of the stream were moved back to other lots laid out by the Company. Part of this line was laid out to run across land owned by the Webber interests, who, at the time the job was started in May, had not given permission to build on it. It was decided to go ahead anyway, and the whole transmission line was cut, but it seems to have been around the middle of August before the matter was cleared up and it was possible to erect the poles and one of the crossing towers on Webber land. The line was put into service late in November, but almost immediately the cables between the 5,000 KVA step-up transformers at Dolby and the mid-river tower broke, having become overloaded with ice formed by spray from the waste gates below them, open because two of the wheels were shut down. This section of copper conductor was replaced with three strands of 5/8 inch steel cable found around the mills, having sufficient strength and conductance, the electrical crew improvising connections, and the line was back in use by the middle of December.

About this time, the Company began to use, in many cases, what was, relatively at least, more modern equipment, or equipment which was not mere improvement on old designs. This is a generalization, as some previous replacements had been the best available, but we believe what we mean will become clear as we proceed.

As best we can recall, the first Van de Carr curved front adjustable slice had been tried out in 1924, and by the end of 1926 we think that all the machines had been equipped with these. By this time too, the old deckle straps, which were on all the machines when the writer joined the Company in 1924 had been replaced with so-called "edge rulers" -- fixed deckles which extended down the wire only to the point where the sheet had drained sufficiently so that it did not tend to run over the edge, and all the clumsy apparatus of the old-fashioned deckles had been removed. This was one of the intermittent times when special attention was paid to formation, and there was a lot of experimenting with table rolls with various types of surfaces, and the first deflectors mounted between the table rolls to reduce the amount of water thrown up against the under side of the wire were installed. It is also known that some experiments were conducted with all the table rolls removed, and nothing but forming boards and suction boxes under the wire, and this may have been around this time, but the date is uncertain. If not at this time it would have been within the next ten years, and is of interest in view of later developments in this area. Just as a matter of record, we might note that there was another earthquake on February 28, 1925, which was felt all over the state, but did no damage.

There was a good deal of important work in 1926, particularly on the paper machines. No. 9 machine was improved in the same manner as No. 10, by the installation of a suction couch and first press, with Nash pumps, and a removable suction box section. Some time in the past, of which we have no record, but apparently quite a number of years before, all the old rebuilt Rice Barton winders

had been replaced with Warren two-drum units, and while these were an improvement, they were getting old, and the Company was plagued with complaints of poor winding, mostly manifesting itself in soft spots and in rolls tight on one end and loose on the other; which was not necessarily the fault of the winders; slipped cores and slitter dust in the rolls. In 1926, new Cameron Type 19 winders were installed on Nos. 9 and 10 machines. These were direct driven by D.C. motors, powered from individual motor-generator sets. Dry end broke was at this time going down into bins in the basement through holes in the floor, and from these bins it was being dragged by hand to the broke beater, long-handled two-pronged rakes being used to pull the pile of paper down. Some kind of conveyor to carry broke from the holes under the last dryer and the stack back to the broke beater was tried at this time on one of these two machines, but it did not work well, and this year saw the first automatic broke beater installation; a big Shartle cast iron tub breaker beater being installed in the basement between Nos. 9 and 10 machines, dry broke being directed into it from these machines by chutes, and the winder trim ribbon blown directly to it through sheet metal ducts -- a vast improvement.

The big paper machine job of the year was the replacement of the first of the original machines, No. 8, with a new machine. This job, unlike some of the later replacements, involved an entirely new unit. Again, unfortunately, we do not have an adequate description, but only partial information. It was of course another Rice Barton fourdrinier, rated 156". Possibly the Van de Carr slice from the old machine was utilized, but not much else. New Bird screens were provided, and a new flow

box and head box were built at the mill. The fourdrinier had a fixed moderate pitch, and was removable in sections, like Nos. 9 and 10, but in this case we have no doubt about saying that these ran out on removable rails which could be placed across the aisle. It is our recollection that the original wire was only 60 feet long. This machine had the usual table rolls and flat boxes, a 30 inch suction couch and a 25 inch suction first press, both Millspaugh type, two plain presses, and we believe 36 five-foot diameter dryers in plain bearings, no advantage having been found in the six-foot dryer. For some reason still unknown, although the writer has been told that some believed that there was better air circulation on the machines that had this arrangement, the dryers were placed vertically, one above the other, as on No. 10 and the same open spur gearing was used. We believe that a Sheahan rope carrier came on these dryers, and of course the presses and stack were equipped with Pope air devices. The stack and Pope reel were new, and this machine had a Cameron winder. The frames were box section castings, a departure from the old ribbed type, but the big departure from old custom was in the General Electric sectional drive, a turbo-generator set in the engine room replacing the Corliss engine.

Work on this job was started in January, 1926. The old machine room was again not long enough, and it was intended to replace No. 7 also, the entire No. 7-8 bay was excavated and extended 16 feet into the finishing room, the walls ending temporarily at the roof steel. The entire roof truss system was reinforced, and trolley beams were put in -- all Sunday work, as the old machine was kept in operation. All the new steel in the

basement that could be put in with the old machine running was erected, and with early spring weather, the roof of the extension was put up above the part of the finishing room roof involved, and that was removed late in March. While the last parts of the machine were coming in, the steel machine chest was erected.

The old No. 8 machine was shut down on May 2d; was removed and the parts were marked and loaded on cars, along with the engine and drive, as it had been sold, the whole works being out, loaded and ready to ship in exactly one week. We are not sure where this machine went, but it is our impression that it was sold to a dealer and wound up in South America. On June 12th, six weeks later, with the Company's own maintenance crew, assisted by the paper makers who were idled and a small crew from the Foundation Company doing the rigging, on a two-shift, 24-hour basis, the new No. 8 was in production and making shipping paper. This was quite an accomplishment, but it was nothing to what was done on later installations. There were of course some odds and ends of the job to complete, notably the ventilating system, but these were all finished early in July.

While the new machine got into production quickly, it ran into immediate trouble, which took a long time to straighten out. Electric sectional drives had been in use for a considerable time, but General Electric had decided to use a slow speed motor system, and the dryer units were promptly overloaded. This was only partly the fault of the drive, although the turbine rotor was found to be out of balance. The trouble was poor condensate removal from dryers, but it took quite a while to find this out. Doctors, felts and steam joints were loosened and tightened, and some syphon pipes installed upside down were changed, to no avail.

Under test conditions intended to produce the worst results, one dryer was found to be half full of water, and many of the others had anywhere from one to six inches in them. A Penberthy ejection system was installed, and the 3/4 inch syphon pipes were changed to 1-1/4 inch, but the load was still excessive. The machine was run without dryer felts to see if dryer temperature had anything to do with it. Negative. The drive itself was gone over by General Electric experts, who found some trouble in the dryer section speed regulator, but this was not the answer. Bearings and gears were checked and adjusted; a single dryer was set up on trunnions in a test area and hooked up so that its performance could be observed, but this did not prove anything. These dryers for some reason just took too much power for the two motors and in March of the following year a third one was added, which eliminated the problem by overpowering it. Our dim recollection is that this third motor was installed as a helper on the first section, but we have no specific information on this point.

In this year, Carrick combustion controls were installed in the steam plant, for all eight boilers. About 2/3 of the beater room roof was replaced with new plank, and skylights replaced a monitor. As parts of the old roof were being removed, it was found to be so badly rotted that the Engineer reported, in all seriousness: "There are places where the waterproofing has evidently been holding the plank up." The old screen room roof was also replaced, with wood. The 1900 fishway at the Stone Dam had gone to pieces, and upon complaint from the Fish & Game Commission, it was replaced with one which it approved. There was considerable rearrangement of the wood room, three new Carthage chippers, with

individual belted motor drives, being installed in a new location in the northeast corner, and new Carthage chip screens, with new crushers, were located where the chippers had been, this involving changing the whole conveyor arrangement for both wood and chips, which necessitated a large amount of temporary conveyor equipment to keep the wood room going. A new steel water conveyor, to carry wood from the wood room to the grinder room was included in this job.

About this time, Cameron (Ingersoll-Rand) pumps began to be used as pumps were replaced. In the original installation the old-fashioned Triplex plunger pumps had largely been used for stock, and a variety of belt-driven centrifugal types, mostly Baker or Morse, for water. When stock pumps began to be replaced, the Fairbanks-Morse "trash pump" was favored, and continued to be used on a number of applications, but an installation of Cameron grinder pressure pumps had been made some years before this time, and these were found to be so reliable that in 1926 a Cameron 16-inch stock pump was tried out on groundwood, and this type became pretty much standard. We have not previously mentioned the air compressor system. This had been added to a number of times, at least one steam-driven unit always being included for safety, and in this year the compressor room was enlarged, and another Ingersoll-Rand motor driven compressor of large capacity was installed.

A major job of 1926 was the complete rebuilding, again, of the groundwood screening system. All the flat screens had been replaced some years before with Baker & Shevlin vertical rotary screens, belt-driven from horizontal counter-shafting by twisted

belts. These were now replaced with what was originally called the Haug screen, designed by Anton J. Haug, who had worked in the Company's Engineering Department for a short time in 1912-1913, and had become an independent pump mill machinery inventor and designer. However, they were built by the Bird Machine Company, and became known as the Bird Pulp Screen. This job involved re-location of the knotters and completely new supply and discharge spouts, piping and pumps, and was very complicated. The sixteen new screens were driven by individual 75 h.p. motors, and had to be supplied with stock under a controlled head, and the new system, completely different from the old one, had to be fitted in, piece by piece, without interruption of production. This job ran through the entire year, and when it was done, it was an extremely efficient-looking installation. Its performance did not equal its appearance. This screen, it turned out, was just not built for groundwood, and while it was there and had to be used, and was in service for a long time, the mill and technical people fought with it almost continuously.

The mill had for some little time been buying chips from a chipping plant near Van Buren, operated by Edouard Lacroix. These were received in box cars, which even at this point in time were unloaded by hand and hauled in a horse-drawn vehicle to the wood room, it taking six to eight hours to unload a car, using nine men and a team of horses. Late in 1926, a Holly penumatic system was installed at the southwest corner of the wood room -- a standard vacuum system, with a flexible hose that could reach all corners of a car set on the track west of the wood room, and a receiver discharging to the chip screens. This equipment could unload a

car in an hour and a half, with three men. The last jobs of this year to be noted were the rebuilding of the top of the water tower near the filter house, and the replacement of the original wooden tank with a steel one, sheathed in wood; and the installation, late in the year, of nine steel gates in the North Twin Dam, the old wooden ones being inoperable. Nine gates were about a third of the total. We might also note another minor earthquake in 1926, which did no damage.

The changes made in the wood room in 1926 did not work out well. The Carthage chip screens and crushers had been unsatisfactory from the start, and beginning early in 1927 this job had to be done all over again. Lombard crushers, built by Waterville Iron Works, were installed, involving new foundations. New rotary chip screens, designed by the Engineering Department and also built by Waterville Iron Works, were put in and all the Carthage equipment was returned to the manufacturer.

Early in 1927, Robert M. Hume (1893 - 1966) was made Superintendent of the Millinocket mill, and held this position for 25 years; longer than any other man but one. He was born in New Haven, Conn., graduated from Yale in 1913 at the age of 20, and came to Great Northern as a chemist in 1914. It was he who had been set to watch over Elmer Pope. In 1916, he was Superintendent of the Madison sulphite mill, and the following year returned to Millinocket as Assistant Superintendent. In 1919, after service in World I, he became Night Superintendent, but in 1920 was given the title of Assistant to the Superintendent (Joe Nevins). This was one of the rare cases where "Assistant to" meant more than

Assistant. As we have noted, by 1926 Joe Nevins was in poor health, and his assistant had been running the mill, to all intents and purposes for a year before he was made Superintendent.

We find it difficult to write about Bob Hume. Physically, he was a tall, raw-boned man, with a craggy face, bushy eyebrows, a hawk nose and a wide mouth. He was the epitome of the "dour Scot"; and in the dialect, "dour" does not mean gloomy or sullen, as some think, but hard, stern and obstinate. Technically proficient, he was a diligent worker and a capable and foresighted administrator. He was a leader in civic affairs; President of the Chamber of Commerce, President of the Board of Trustees of the new Millinocket Community Hospital, which he was active in promoting, and a member of the school board, and he not only led, but worked with his hands in many local projects. However, he was opinionated and argumentive, and inclined to take over himself when things did not go to his satisfaction. Disciplinarian toward his organization, he did not take kindly to discipline. He was exasperating in his negative attitudes. His usual first reaction to almost any proposal was that it could not be done, but he then generally proceeded to prove himself wrong by doing it. He always felt that he was not fairly compensated, and irritated the management, who did not think as highly of him as he did of himself, by repeatedly pointing this out, but he was not always fair to those under him. Nevertheless, if not loved, he was respected; and if he was not popular, neither was he disliked. The writer does not mean to be unduly critical of Bob Hume. They worked well together, always on friendly terms; but he was a good man who could have been great, and he was his own worst enemy. He resigned

in 1952, under circumstances which we will note later, and which what we have written about him will help to explain.

The position of Assistant to the Superintendent was filled for a short time in an acting capacity by Angus McLean (1898 -) a native of Shelton, Conn., who had joined the Company as an apprentice in 1921, and at this time was Night Foreman in the groundwood mill. However, late in the year he took over the job of Night Superintendent, a position which, except for a short interlude, he held until 1958. Angus McLean was one of the most dedicated and hard-working supervisors the Company has ever had. No man was ever more popular with the work force or with his associates. The management recognized his ability, and made several offers to move him up, but while Night Superintendents came and went in the other mills, Angus McLean really preferred to work nights, and stayed on that job. Some time in the 1940's he was prevailed upon to try out in the Sales Department, accepting the assignment reluctantly, and after a few months asking to go back to his old job. In 1958, however, he was made Staff Assistant in the changing Manufacturing Department organization, and held this position until his retirement in 1962.

Shortly after Angus McLean went on as Night Superintendent, Charles M. Carrier, then Superintendent of the Bureau, became Assistant Superintendent, holding this title until 1939, when in recognition of his outstanding service he was made Associate Superintendent, with certain specific responsibilities formerly reserved to the Superintendent, which was not particularly pleasing to Bob Hume. In 1947, Charles Carrier took over the East Millinocket mill, and we will pick up his story again later.

By 1927, the remaining old boilers were unsafe, and so was the old "upper" boiler house. Starting in January of that year, twelve old boiler units were removed, and the building was completely rebuilt. Pipe piles were placed -- they could not be driven, and holes had to be dug for them -- and these were capped with concrete to make a new footing under the old foundations on the north and west sides. On this latter side there was so much water seepage, apparently from the yard pond, that cut-off sheeting had to be driven around the excavation. The same condition was found under the building where new concrete air ducts and another ash tunnel were to go, and all this excavation had to be coffered. Steel piling was necessary around the footings for new columns inside the building. The roof was taken off, the old steel was removed, all the walls were torn down, and all this was replaced with new steel and brick, and a poured concrete roof. The plaster wall put up between the old and new fire rooms when the latter was constructed was removed, making the two rooms into one. Four more Babcock & Wilcox 755 h.p. boilers, Nos. 9, 10, 11 and 12, with Taylor stokers, which, like the previous ones were arranged to be driven either by motors or by steam engines, were installed in the rebuilt old boiler house area, along with new steam mains, new draft fans, a second ash haul, a second winch house for the ash drag, at the north end of the building, and other necessary auxiliary equipment. This job, much more extensive and complicated than this over-simplified account might indicate, was, except for pipe covering and the like, finished in December, and completed the planned steam plant expansion.

Removal of piping and a relocation of the smoke flue from the wood burning boilers allowed of an extension of the electrical repair shop to the west wall of the rebuilt boiler house building,

and the washroom on the lower floor, which had been torn out during the construction, was replaced. The Corliss engine and auxilliary generator were removed, making the room built for this equipment, south of the shavings burners, available for other purposes which we will take up later.

The old bull screens in the grinder room, which we have said were probably of the inclined plate type, had now been outgrown, and were replaced. If the original installation, which was about on the pier between Nos. 1 and 2 tailrace flumes, was not of the inclined plate and chain scraper type, the new one was. However, it was moved further south, over No. 1 tailrace flume arch, part of this being removed and steel supports put in to make a deeper pit, impossible in the original location over the pier. Along with this job, three new 14-inch Cameron groundwood pumps, with individual motors, were installed. A section of the groundwood stock chest at the north end of the screen room basement was partitioned off to make a groundwood white water tank, and all the pumps and piping in this area were changed to make them more accessible and to do something in the direction of opening up what had become known as the "swamp"; the word being used in the old sense of thick woods.

The trainshed was extended 217 feet southward, seventeen remodelled trusses from the old boiler house, plus a few new ones, being used in the construction. This provided trackage to set ten more cars. At this time Kinnear hand operated roll-type doors were put on each end of the trainshed, previously open to the weather. The ground-level monitor nozzles around the wood

piles would not put much water up to the top at the angle from which they had to throw, and in this year nine 60-foot and two 40-foot steel towers were erected at strategic points around the piles, and 2,000 gal. nozzles, which could be operated from U-shaped concrete heat shields at ground level were placed on them. The miscellany of four old belt-driven pumps put in to supply spray water to the paper machine screens were replaced with a direct-connected motor driven unit providing 125 lbs. pressure, requiring new piping. Type 19 Cameron winders replaced the seven remaining old Warren winders. A suction first press, made from the roll which had been on the experimental No. 1 machine at Madison, was installed on the wrapper machine, replacing the original plain press.

Up to this time, wet broke from the press doctors had been pulled off onto the floor, and shoveled down through holes into wooden carts placed under them in the basement. These had to be pushed up to the broke beaters at the other end of the basement and unloaded into them by hand. In this year wet broke disintegrators -- long, narrow steel troughs, with showers and agitators, were suspended from the basement ceiling under the broke holes along the tending sides of Nos. 9 and 10 machines, and gravity piping was run from them to the Shartle beater. A Shartle broke beater was also installed for Nos. 7-8 machines in this year, and we believe that this installation included similar disintegrators.

This last comment anticipates the installation of the new No. 7 machine in this year. This machine was essentially a duplicate of No. 8, except that the 36 dryers were arranged in the

conventional staggered pattern, and had steel gears and drive pinions instead of the usual cast iron. There was no great push for production at this time, and little preliminary work was done before the old machine was shut down on or about August 1st. It had been sold to the Nashua River Paper Company, of Pepperell, Mass., and was removed intact, with its drive, engine and auxilliary equipment, the last of 27 carloads of parts being shipped on October 10th. In the meantime, starting when the old machine went down, work was begun on removal of the old drive piers, piping and the like, and on the installation of the new machine chest and basement steel, the building of the new calender foundations and other necessary remodelling, but in no such rush as on No. 8. As a matter of fact, while work had been started on a two 12-hour shift basis, William A. Whitcomb ordered the night shift taken off as soon as the old machine was out of the building. Installation of the new equipment began on October 17th, and the machine started up on November 28th, making shipping rolls by 9:30 A.M. The electric drive on this machine, very similar to that on No. 8, caused some difficulty, and this was not brought under control until late in November. All the odds and ends, including two additional exhaust fans, were cleaned up before Christmas, at which time the machine was running steadily at 850 f.p.m. The drive, however, gave more trouble later.

There are some miscellaneous items worthy of mention in this year, which seems to have seen quite a lot of experimenting. A single Bird pulp screen was installed for trial on sulphite. Equipment for wrapping rolls was designed and built in the shop, and after several months of experimenting, it was installed, along with a heading machine which had been being tried out at East Millinocket, in front of No. 9 machine. It was not a success, although

some paper wrapped by it was shipped. The Lower Mill by this time had been furnished with Elwell-Parker electric trucks for moving rolls from the finishing room into the cars, and one of these was brought up to be tried out in connection with the finishing machine. A home-made arrangement for pre-heating sulphite liquor with relief gas was put into operation on No. 7 digester in July, and seems to have worked fairly well, reducing experimental cooks from eleven to seven or eight hours. Ten "Bacco" dehumidifiers, of which we have no description, were installed in the trusses over No. 8 machine in September, but were ineffective, even after No. 7-8 room had been sealed off from the rest of the building by a canvas partition. They were shortly removed and tried out in the grinder room, but were evidently no more successful there, as there is no more mention of them. In the meantime another effort was being made to improve conditions in the grinder room, six exhaust fans being installed in the monitor. This, we believe, was the first mechanical exhaust system in this room. Anton J. Haug had been experimenting at East Millinocket for the past year with his centrifugal-roll type groundwood screenings refiner, with reasonable success, and one of these, a small "No. 1" unit, was installed at Millinocket late in 1927.

In this year we find the only mention in the construction records, of the period of which we are writing, of any trouble between the mill maintenance crew and the non-union contractor's people, an unsuccessful effort being made in October to organize the latter. The use of non-union labor on construction did make problems later, but we will take that up in another place.

There was a long program of work in 1928, but no really large projects. Starting late in the previous year, the old auxilliary generator room was made into what was called an experimental grinder room, really a pilot plant, for the specific purpose of testing the procedure of grinding wood after cooking the sticks with steam in a pressure chamber, the object being to produce longer fibre with less power. This was more of a job than it might seem. The two pressure vessels were not located in the room itself, but in space adjoining it, behind the wood-burning boilers. Their installation required extensive excavation and foundation work. A heavy sliding door spearated the tank room from the grinder room, which contained a full-sized 2-foot grinder, driven by a 600 h.p. motor, a bull screen, a Bird fine screen and a wet machine, with the necessary pressure pumps, stock pumps, piping, electrical equipment and wood trucks -- a complete little groundwood mill. Along in April, before the grinder had been installed, it was necessary to remove the screen and set it up in a separate location in the main groundwood screen room, so that Anton Haug could experiment with it in an effort to overcome the troubles being experienced with the groundwood screening system, and it was the middle of July before the room was ready for operation. This pilot plant, and the purpose for which it was built, are of interest in view of the developments of the 1950's, but definite information on the extent and results of any experiments that may have been conducted is lacking. The equipment was not in use very long, as the whole works was cleaned out within two years, and the room was made into the paint shop.

With increased production, the original sand filters had become overloaded, and raw water was being bypassed into the mill system, so in this year a 5,000,000 gallon North filter was installed in available space in the filter house. The feed from the elevated coal bunker to the stoker hoppers was through a series of cylindrical spouts, which tended to plug when the coal was wet, and Negus-Tiffany "agitators", really exterior vibrating devices, were placed on the spouts to all twelve stokers.

Much more attention was being paid to stock loss in screenings and white water. The groundwood thickening system was rebuilt again, thirty-four old 30" x 70" deckers being removed and replaced with the same number of 36" x 110" Bird units, still of the gravity type, but driven through gear units and chains by individual motors. This installation resulted in some reduction of stock loss, as they were more efficient, and there was less fibre in the white water from them. The new Bird groundwood screen installation, which was set up as a first screen and second screen system, was producing too many tailings, and two Improved Machinery Co. units were added as third screens. Each of the paper machines was provided with one old flat screen, to which the rejections from the Bird screens were run for re-screening, but they were continually plugged up. In this year, a Bird inclined plate scraper type auxiliary screen was installed on No. 9 machine, and the same change was made progressively across the whole machine room, over the next year or two.

Two additional Haug refiners were installed on groundwood screenings, making a battery of three, including the original unit.

These handled only rejections from the fine screens, bull screen tailings still going right into the river. As few of these refiners are in use at this time, a non-technical description may be in order. The Haug refiner was in effect a sophisticated, high-speed version of the rod mills used for crushing mineral ore and similar hard materials. The mechanism consisted of a rotating horizontal shaft, through a cylindrical casing, the shaft having attached to it, in the early models, three steel rolls, their axes parallel to that of the main shaft, mounted on arms in such a way that they were thrown out by centrifugal force against the inside of the casing. We do not recall exactly how the screenings were fed in, but they worked outward and were mashed between the rotating rolls and the fixed casing, producing a very fine but usable filler groundwood. These first No. 1 size units were of very small capacity. In the early installations, the screenings were furnished to them at low consistency, resulting in a lot of unrefined stock washing through, and Anton Haug had to devise a "drainer"; a worm type arrangement inside a perforated cylinder, through which the screenings were passed on the way to the refiner. This gave little trouble, and improved the efficiency of the refiner, but the latter was full of mechanical bugs, which in spite of rebuild after rebuild took a long time to cure. Indeed, they required so much attention that they were more often down than running, and the mill people took them out of operation at different times until reports of high stock loss, traced back to this, brought an order from Boston to get them back into service. Nevertheless, there did not seem to be anything better at the time, and the Company made a number of installations.

A 675 foot section of the badly rotted 1917 wood sluice from the Ferguson Pond drums was replaced with steel, this leaving about 575 feet of the original wooden sluice to be replaced later. At this time the wood room was put on two shifts instead of three, and it was necessary to replace the 24" belt leading to the chip loft with one 36" wide, on new idlers, so that chips for 24 hours could be conveyed to the bins in 16. By late in the year, the barking drums in the wood room were worn out, and were replaced with new ones of the same size, on the same foundations. An electric hoist replaced one of the old donkey engine winches on the wood pile rake. One of the 24-foot diameter outdoor cypress acid tanks, which had lasted 21 years, and had been moved twice, gave out, and was replaced with another of the same size and construction. A steel tank that would hold 27 tons of sulphur, and an elevator from this to the melter were installed, the purpose being labor saving, but we do not know just how this was supposed to help.

An effort was made in this year to eliminate lap shipments of sulphite pulp to East Millinocket by the trial installation of a Voith Screw Press, a sort of glorified meat grinder that squeezed slush pulp to around 50% air dry and forced it out in little "noodles". This machine worked all right, except that it formed "fisheyes"; little hard lumps, which went right through the sulphite beater. There was no sulphite screening system at the Lower Mill, of course, and some of these always got by the paper machine screens, causing no end of trouble in the dryers and at the stack. As nothing could be done to the press to make it stop producing these things, it was sent back to whence it came.

After thirty years, the way from Millinocket to the North Twin Dam was little more than a cart track following the old tote road, and in this year it was graded a little and surfaced with cinders from the boiler house, making quite a passable road. At the same time, Ward's Dam, over which the road passed, was raised two feet by a rock and earth fill. This had no connection with the construction of the road, and the reason for raising it was probably to prevent variations in the level of Ferguson Pond spilling water down the Little Smith Brook gully.

On March 3, 1928, the connecting rod slipped off the crank pin on No. 10 paper machine engine, driving the piston out through the cylinder head, wrecking the valve mechanism, tearing the steam chest loose from the piping and cracking the flywheel. The Falls stop instantly cut off the steam, so that no one was injured. This was on a Saturday. By Thursday afternoon the machine was running again at around 750 f.p.m., driven by a 300 h.p. motor belted to the main line shaft. With new pulleys, made by the Millinocket Foundry, it was up to 900 f.p.m. by the next week, with some of the load transferred to other motors. A new engine had been received and was installed before the end of May. Later in the year, a new frame, bearings, crank, crosshead and shaft were installed on No. 9 engine to forestall any such accident there.

A lot of work was done on the paper machines in this year for increased production -- things were picking up. Wet broke disintegrators were added to all of the machines. Early in the year the sheave and pulley ratios on No. 3 machine were changed, and some of the auxilliary load, mostly pumps around the wet end,

the screens and such, which had been driven from a constant speed line taking power from the paper machine engine were belted to motors, and the Ferguson quarter turn on the couch was replaced by a Rice Barton spiral bevel gear unit, running in oil, in an effort to get the speed up from something in the vicinity of 650 f.p.m. to around 730 f.p.m. However, at about 700 feet the dryer frames began to weave, and the felt roll bearings heated, so between April and June new heavier frames and bearings were installed, and the machine got up to somewhere over 700 f.p.m. Immediately after this, the dryer frames, felt roll bearings and couch drives on Nos. 1, 2 and 4 machines were similarly replaced; larger cylinders were provided for Nos. 1 and 2 engines, the drive ratios on these machines were changed, and they were brought up to the same speed. A bigger job was the replacement of No. 7-8 machine room roof, which was in bad condition, and the installation of asbestos hoods and Briner Economizers on these two machines. This job was started in June by the Foundation Company. The new roof, of poured concrete, with cork insulation, on new trusses, was built above the old one, the deck being five feet higher than the original, which was removed in sections as the new deck was completed. The old steel columns were reinforced and extended, some requiring new footings, and Nos. 7-8 machines were separated from the others by a tile wall behind No. 6. All this was done with the machines in operation, but the hoods, new trolley steel, and much of the economizer installation was Sunday work, with as big a crew as could be used. This was a slow job, and was not finished until the last week in the year. The economizer equipment was the first of its kind installed by the Company. We have noted the various attempts at drying up

the machine room by blowing hot air out of it, into it and under it, and this equipment did not do anything different, but for the first time the air was heated by the vapor from the dryers, not by exhaust steam. The hood and economizer job was intended to make the room more comfortable to work in, and between the insulation -- this was the first insulated machine room roof -- and the economizers, working conditions in No. 7-8 room were better, relatively, although both it and No. 9-10 room were now much more noisy, the high-pitched screaming of the suction rolls being added to the familiar heavy rumble and grind of the older machines. It was about this time that someone had the idea that the problem of drip from the monitors on No. 9-10 room could be solved by hanging a false glass ceiling under them. Steel was accordingly put up to support corrugated glass panels, which were quite efficient in catching water, but they also caught vast amounts of dust, bits of broke, and oil drip from the fans, and were not such a good idea.

A number of Fairbanks-Morse trash pumps were installed in this year, replacing the antediluvian Triplex pumps, which, except for one or two on the wrapper machine, were all taken out of service in the next few years. A spiral bevel gear unit was tried out on No. 4 calender stack, the hardest spot for the Ferguson drive, and we believe that a little later on all the stacks were equipped with this drive, although it was not really rugged enough for this service. A Bahr (not Bauer) refiner was also installed for wrapper machine stock in this year. Improved dryer felt stretches were put on the old machines, and the felt dryers were lowered and geared to be driven from the dryer gear train, rather than through the felt.

In preparation for the moving of the Spruce Wood Department's accounting operation from Bangor to Millinocket, changes were made in the Administration Building, starting late in 1928. Part of the large room at the center of the ground floor, which we have said was used by the accounting departments, was partitioned off to make an office for the Bureau. The laboratory equipment from the second floor of the east wing was moved into the basement, space being partitioned off there; the old laboratory was made into office space, and the Spruce Wood people moved into it in October. This was one of the times when a great deal of work ran into the following year or longer.

We have already covered in some detail in other places some of the important 1929 jobs - - notably the start of the rebuilding of Nos. 1-6 machine room for four 234-inch machines, and the installation of the two 1,000 K.W. turbo-generator units in the northwest corner of the boiler house -- but there was a lot more. We have said that No. 2 piling conveyor was originally intended to take wood either from the river from cars, but if any provision for the latter was made, it must have been temporary. In this year, an inclined conveyor was built from the car wood unloading conveyor near the Administration Building to the uptake of No. 2 pile, discharging above the point where the wood from the sluice came onto it, so that peeled wood, which was beginning to be a good part of the supply, could be put out directly from the cars. Another electric hoist replaced the second donkey engine on the wood pile rakes, this change eliminating a fire hazard and a team of horses hauling coal. The wood unloading trestle at the

Cape had begun to sag, and new piling was driven to strengthen this up. A third Jenssen tower, arranged so that it could be used in combination with either of the other two, was added, so that two towers could always be kept in service. The foundation for this was built by the H.J. Deutschbein Co., this being their first job following the split in the Foundation Company, Great Northern's account being one of those taken with him by Harry Deutschbein. The Foundation Company still had contracts for work going on, and both organizations were employed until June 13, 1929, when the Company notified the Foundation Company that it desired to sever all business connection with it, and to clear all accounts as of the 15th of that month. The H.J. Deutschbein resident Superintendent at that time was William Lowitz. This incidentally was about the time that the writer began to be used as the contact between the management in Boston and the Engineering Department.

A fifth steel outside groundwood storage tank was added in this year, and a grinder that would take a stone with a 36-inch face replaced one of the standard 30-inch units, at the end of No. 4 line, to take the occasional sticks too long to go into the regular grinder, eliminating the necessity of accumulating these at the end of one of the block tanks and sawing off the ends with a bucksaw. An attempt was made to improve the miserably cold conditions in the screen room by installing a heating system built out of one of the old American blowers, driven by a steam engine, with several of the old Sturtevant heaters using the exhaust.

Verigraph moisture controls were installed on three machines, after a trial made the year before, and were a little later put

on all or most of the machines. This equipment was in the early stages of development, and was not particularly efficient, but it did give some measure of control, and, next to the Trimbey mixer, was about the first attempt made by the Company to substitute instrumentation for plain human judgment in the paper-making process. The four exhaust fans furnished by J.O. Ross Engineering Corp. for Nos. 7-8 machines were inadequate, and they replaced them, at their own expense, with eight smaller ones having greater total capacity and allowing better placement. These fans, like so much of the other equipment being installed at this time, were driven through V-belts from individual motors. The steel gears and pinions on No. 7 machine dryers already showed wear, and had become very noisy. They were replaced with cast iron gears and bronze pinions. At the same time, two Modine heaters were placed, one on each side of No. 1-6 room, at the winders, in an effort to warm up this part of the room, always cold because of the draft from the finishing room in spite of the various things already done, like the doors on the trainshed, to cut this down.

In lesser jobs of the year, the steam line from the boiler house to the Administration Building was dug up and replaced with welded pipe, as it had become a nuisance, never having been properly insulated and requiring constant repair. A new heavy-duty four-foot radial drill was bought for the machine shop to replace the obsolete 30-inch gang drill, part of the original equipment. In this year, before decision had been made to build the new No. 1-6 machine room, the trusses and some of the columns in this room had been found to be badly deteriorated, and a substantial job of reinforcing these was carried out. The old roof was also water-proofed. The main beater room floor had begun to break up, and a

section of it behind Nos. 6 and 7 machines was replaced in concrete. The roof over the electrical repair shop, which had been part of the original boiler house, was going to pieces, and was removed in sections and replaced with poured concrete. While heading machines and electric scoop trucks were in use at East Millinocket, the Millinocket mill was still upending rolls in the finishing room, putting on top heads with the wooden weights which we have described elsewhere, and trucking by hand with stevedore trucks. This process, particularly the heading operation, was getting too slow, and in this year steel was hung for a small bridge crane for a trolley to carry an electrically heated top head weight was installed in the finishing room. In May, the skylight on the nice new roof over the wet end of No. 7 machine collapsed. This was salvaged, patched up and replaced; the others on No. 7-8 room roof were strengthened, and every skylight in both mills was inspected and reinforced, replaced or removed where any weakness was found. During the afternoon of November 11, 1929, there was an earth tremor lasting over a minute, which shook the Administration building quite badly, but we do not recall any damage there or in the mill.

Things began to slow down in 1930. The biggest job was the installation of a Chemipulp acid recovery and heating system for the sulphite mill, or more properly, part of such a system. Most mills were using hot acid, and the trial made on one digester a short while before had indicated its benefits, but there had been considerable reluctance on the part of the management, in view of the high cost of the system, doubts about its efficacy and the demand for funds for other jobs, to spend any money in the sulphite mill. However, the capacity of the plant was badly stretched, and it was finally agreed to go at least part way, so what was installed

was not a full system, but really only the two accumulator tanks, of 50,000 gallons capacity each, and their auxilliary pumps and piping, so that a considerable volume of acid could be kept fortified and heated directly with the relief acid and gas which had to be let out of the digesters as temperature and pressure rose. Work on this job did not get started until June. The remains of the ancient Barker reclaiming tanks were removed; an addition was built at the southwest corner of the lime storage building, in which some remodelling was also done; the two new tanks, more or less like truncated digesters, were installed, tested and lined, a new acid pump was installed, and piping was changed over. This was not really a major job, but it took nearly a year. Not being a full system, with the proper heat exchangers, only partial benefits were realized at this time, but it did help to shorten up the cooks and increase the capacity of the plant. Incidentally, lead and bronze piping was used on this job, as it had been in the sulphite mill from the beginning. The Company had not yet accepted stainless steel.

The new No. 1-6 machine room building was completed in this year, as previously noted, and the trusses and plank roof of the old building were removed. Sixteen 48-inch dryers were added to the wrapper machine, which was now beginning to be really stretched out. The skylights on the grinder room roof, while not very old, had been found to be in dangerous condition during the inspection, and were all replaced with new ones, in copper frames, double glazed. The first Bathurst boom used by the Millinocket Mill was placed in Ferguson Pond in this year. This type of boom was used extensively around the holding grounds later, but as the first installation was at the Lower Mill, we will describe it when we dis-

cuss that plant. Another steam driven air compressor; an additional unit; was installed. Frank Partsch, the J.O. Ross engineer, who had been handling the Company's account for a long time, had been trying to sell their Grewin system for ventilating the dryers on the paper machines. This system involved blowers and a duct system putting heated air into the space between the dryers to sweep out the vapor. He did a good job of selling the advantages of this process, but the management could not see paying the royalty, and the mill people felt that the same thing could be done with blasts of compressed air from small nozzles, which they tried, found that it worked, and proceeded to pipe up all the machines, hence the extra air compressor. Frank Partsch, who was a good friend of the Company, made good-natured noises about suing for infringement on the Grewin patent, but this drew only a horse-laugh.

We have said that there was a lot of trouble with the new Bird groundwood screens. In this year, after much study and experimentation, it was decided to tear out all the original supply and discharge spouts and put in an entirely new spout system, to increase the head on the screens. All the 75 h.p. motors were taken off and rewound to bring them to a rating of 100 h.p., and pumps and piping were relocated. This made an improvement, but again, one of the screens was separated from the system and set up independently for further experiments by A.J. Haug.

Both the brick stacks were pointed up, and the cement water tables were replaced. We have noted that these chimneys were of the same height -- 235 feet -- but that the 1921 stack was slightly larger in diameter. As a matter of record, the flue in this was

15 feet in diameter, three feet larger than that of the 1899 one. The original barking drums in the wood room had been supported on steel columns, from footings under the basement, and the heavier drums later installed had been set on the same steel. This now had begun to settle. The drums were removed, new footings and reinforced concrete piers were built, and the drums were replaced on these. The trusses in the digester house had begun to go to pieces, and these, with some wooden timbers, were replaced; a mean job in this particular location.

In the spring of this year, chlorinating equipment was installed for the first time at the filter house. This was supposed to help prevent the formation of slime, but it did not seem to have much effect, and the system was used only spasmodically. The old spur track just west of the wood room was moved closer to the building, and a second track was run into the mill yard from the main line, which was double-tracked all the way out to the station. The new track ran down into the yard, with cross-overs to the old one, and crossed the yard pond, requiring that the bridge at that point be rebuilt. Some of these things we are mentioning are trivial, but we note them to point out the fantastic performance of the pygmy Engineering Department, because a big job was going on at the Lower Mill at the same time, and the fact that for some time considerable time and money had been going into the replacement of old construction which had reached the end of its life. To emphasize this last point, on July 8, 1930, the overland log sluice, from the canal to Millinocket Stream, which had been rebuilt in 1919 and was now used only for sluicing dri-ki, collapsed. The writer was sent up to inspect it, and found more

than half of this big trough, nearly a quarter of a mile long and eight or nine feet across the top, lying flat on the ground like a split fish. It was decided just to clean up the mess and not rebuild, and to find some other way to take care of the dri-ki.

Anyone who had been around Maine backwoods ponds and lakes knows about dri-ki. The flowages of the old driving dams, even the shores of such large bodies of water as Chesuncook Lake, had never been cut, except perhaps for a channel through which to drive the logs, creating a drowned forest of all species of trees, which stood for an amazingly long time, particularly where there was no current, as can be seen in the Partridge Brook arm of Dolby Pond, which dates from 1907. However, ice action and the rise and fall of the pond levels loosened some of these old stumps and trunks every year, and set them afloat, and they hung up on the banks, gathered in the coves, or came down in the drive, along with roots, fallen trees and branches, old boom logs, fence rails, the remains of old piers and bridges, and miscellaneous junk, in all stages of decay. The volume of it decreased imperceptibly year by year, and at this time there was still a lot of it. In a dead-end place like Ferguson Pond, it accumulated until something had to be done with it. Hitherto, to the best of our knowledge, it had been sluiced to Dolby, which sluiced it to East Millinocket, which sluiced it to Rockabema, and so on down the river until it reached the sea, causing expense and inconvenience all along the way. With the big sluice gone, it became impossible to do this any longer, since trying to put it through the yard pond and so out into Millinocket Stream would have fouled things up royally.

For the rest of this year, dri-ki was hauled to the boiler house and burned, some of it having to be cut up for transportation, but it contained fibre, and experiments made during the winter showed that a lot of it could be cooked into pulp, which, while of low quality, could be used to make wrappers. The writer believes that the production of such pulp began in the spring of 1931. A derrick was used to make a small pile on the dyke near the Ferguson Pond gate house; stuff that could be cooked was sorted out, sawed up, hauled to the wood room, and chipped along with culled wood. This was the time, it may be recalled, when a lot of old wood began to come to the mills from the large inventory that had been built up around the producing areas, and receipts had to be culled quite heavily for partly rotted sticks, to keep the pulp reasonably clean. Most of this culled wood was already being cooked for wrapper stock, a bin for it being partitioned off in the chip loft over one of the digesters. What could not be chipped was hauled to the boiler house and burned. Incidentally, this operation was the cause of another fatal accident, a man being struck by a sling-load of dri-ki going onto the pile at Ferguson Pond.

The culled wood and dri-ki pulp, mixed with sulphite screenings, worked out quite well, but the stock system was not adequate for the increased amount of this pulp produced. In the summer of 1931, a corner of the basement groundwood decker chest was boxed off to make a chest for this stock, and six of the old Schenck thickeners were taken from the dump, repaired, and installed in the blowpit room. As it is recalled, these did not have enough capacity, and an old-fashioned slide wire was added. The Triplex

stock pumps for the wrapper machine were replaced with centrifugal pumps from the new chest to the wrapper beaters, the first vertical pump units ever used by the Company to our knowledge. Dri-ki was used in this fashion for more than ten years. There will be more mention of it later.

The depression years afforded opportunity for a lot of miscellaneous work at Millinocket. In 1931, the seemingly endless program of rebuilding the Haug refiners installed in 1928 was started, these being removed one at a time and sent to Improved Paper Machinery Company for alterations. The last section of the 1917 wooden sluice from the Ferguson Pond drums was replaced in steel. Five Williams & Wilson heading machines, built by the Montague Machine Co., together with new Toledo paper scales, were installed near the trainshed wall of the finishing room, one outfit in front of Nos. 9-10 machines -- this of course was in the end of the machine room -- one in front of Nos. 7-8, and the other three spaced out along Nos. 1-6. A sunken track was built in the finishing room floor and through the doorway into No. 9-10 room in front of them, carrying little shuttle cars with a web member coming up through a narrow slot in the cover plate, carrying a slightly concave cradle, close to the floor, onto which the paper wrapped in any part of the finishing room, or in front of Nos. 9-10 machines could be rolled, moved to the heading machines and weighed, and then rolled back onto the floor for trucking. This was all done with the rolls on the bilge, and at this same time three Elwell-Parker electric trucks were purchased for trucking the paper. For those unfamiliar with this truck, it was equipped, instead of forks, with a sort of scoop, partly closed at one end.

This could be raised or lowered, and could be turned to either a horizontal or a vertical position. This scoop could pick up a roll lying on its side, raise it and turn it nearly upright, resting on the chisel -- the partly closed end -- in which position it was trucked into the car, turned so that it was vertical, and set in place. It could also of course pick up a roll standing on end, the chisel being slid under it. There was a little difficulty with this truck, in that withdrawal of the chisel often moved the roll that had been set in the car a little, making it necessary to use a "do-funny" to jam it back into place, but it was a good piece of equipment, and together with the heading machines -- heated metal plates, one fixed, one movable, which pressed glued paper heads against each end of the roll, after the wrapper and bands had been put on as it lay on two metal rollers in the floor between them, and the wrapper crimped by hand -- did away with all the overhead clutter for upending and heading. However, as soon as these trucks began to be used, even before all the heading equipment and track was in, the old hardwood floor in the finishing room, put down on concrete laid right on the ground, developed humps and hollows like a country road. Starting in July, the west half of the floor was stripped, the old concrete was broken out, the sub-base was dug out and re-graded, a new 4-inch concrete slab was poured, and on this was laid a "Blox-on-end" floor, made of small, interlocking pieces of end-of-grain wood. This work had to be done in small sections, and was not finished until the end of December. The Blox-on-end also heaved some later, and much of it was eventually covered with non-slip steel plates.

A sanitary sewer was laid by the Company in Little Italy in 1931, and the Millinocket Water Company's filter house was extended and two filters and chlorinating equipment were added in this year. During the following year, a 440,000-gallon stand-pipe was erected near the filter house. This work was also done by Great Northern and paid for by Water Company stock -- of course just taking money out of one pocket and putting it into another -- to avoid the necessity of outside financing by the Water Company. Another job, which did not directly concern the Millinocket mill, but was carried out under the direction of the Engineering Department might be mentioned in connection with 1931 work. An examination of the Ripogenus Dam disclosed that the ribbed cast iron plates lining the deep gate passages were tearing out, and the concrete under them was being water-cut. In this year, starting in April, stop-logs were put in two gateways at a time, the cast iron plates were removed, the old concrete was chipped out, and gunite linings were blown in Nos. 2,3, and 4 passages. No plates were gone from No. 1, and these were pressure grouted. A new steel gate was provided for No. 3; the other gates were repaired, and some deterioration in the concrete on the face of the dam was gunited.

It will be remembered that suction couches and first presses had been installed on Nos. 9 and 10 machines a few years before. In 1931, a suction second press was put on each of these machines. These had the first Beloit type rolls bought by the Company, which had previously stuck with the trunnion-mounted Millspaugh type, controversial for some time and becoming obsolete. As a digression at this point, the first suction couch at Millinocket as we have

noted had been equipped with a Connorsville vacuum pump, and at the time this Beloit roll was put in, the manufacturer recommended a Connorsville pump, but William A. Whitcomb would not have it. It would appear that the earlier unit had blown up. We have no record of this, but recall his talking about it, and we are quite sure that he had not had any experience with vacuum pumps before this one. However, before making decision, he, as always, carefully studied the drawings showing the principle upon which it worked as compared with the Nash pump. Without making any attempt at a technical description of what became the Rootes-Connorsville pump, it basically consisted of a casing, within which two rotating lobes, roughly figure-eight shaped, form pockets which contract and expand as they turn, alternately drawing in air and expelling it. In the course of discussion with the writer, William A. Whitcomb came up out of nowhere with the thought that this mechanism could be made into an internal combustion engine by adding valves and fuel injection and ignition systems. This might just have worked if the clearance between the ends of the rotor lobes and the casing; about .01", could be closed, but consultation with a metallurgist indicated that it would be practically impossible to operate with even this much clearance under high temperature conditions. The interest lies in the fact that this concept of producing direct rotary action by burning fuel in this particular manner is not too far from that which produced the Wankel engine, which 40 years later is achieving a certain amount of success.

The writer is in some doubt as to what the press part arrangement was on Nos. 9 and 10 machines after the suction

second presses were installed. There were at one time four plain presses on these machines, and the record of what was removed at this time is contradictory. He is inclined to believe that there were now just the two suction presses. At any rate, the result was a very long horizontal run of felt, on which the sheet tended to float and wrinkle. This condition was mitigated on No. 10 late in the year by moving the whole wet end -- flow box, head box, slice, fourdrinier and press part-12-1/2 feet toward the dryers. The screens were left behind, and the screen collector box was connected to the flow box by a long, elevated spout, built of cypress. Although this was quite a job -- all the drives, piping and overhead trolleys had to be moved, the old drive piers torn out and the floors patched, the machine was down less than six working days. The same change was made shortly thereafter on No. 9.

This was the year when the experimental McDonnell roll that shook out the windows was tried on No. 10. Actually, the trial did not end as abruptly as we indicated in the previous mention of it. There was considerable experimenting with the wrap of the wire over the roll at low shake speed, which was variable through a P.I.V. drive, and it was not until a larger motor was put on and an attempt was made to speed it up that it caused such tremendous vibration.

A fire in No. 7 economizer on January 12th of this year; a rather terrifying experience, resulted in the design and installation of thermostatically controlled "flap doors" and deluge valves in the ductwork. Similar protection was added

to No. 8 economizer the following year. On January 15th, the crosshead slipped off of No. 1 engine, breaking both cylinder heads. The main line was promptly belted to two motors, and the machine was running again in just over 24 hours. These engines were being pushed pretty hard, with the speed of the machines up to around 900 f.p.m., to a point where at times they hesitated near the end of the stroke, after cut-off, causing the sheet to "bar" on the wire -- that is, develop heavy streaks crosswise, twice on each revolution of the engine. Some time in the summer of 1931 a pulley broke on the basement line shaft of No. 5 machine, and the whole main line tore out, requiring the replacement of six concrete piers, 140 feet of shafting, thirteen bearings and nine pulleys. Four new steel gates were installed at the Stone Dam, and as a last note on the year, an experimental digester -- a fair-sized vessel, from memory perhaps three feet in diameter and six or seven feet high -- was installed in the sulphite mill, it having been decided that more work should be done on the quality of this pulp in an effort to reduce the amount of long fibre required.

The big job of 1932 was the start of the change-over from the old two-foot Holyoke to four-foot Great Northern grinders, which we mentioned in another part of our story. A little more detail on this important development is in order. Work was actually started on the east end of two lines, Nos. 5 and 6, by an H.J. Deutschbein crew under Charlie Fklund, who had moved over from the Foundation Company to become Deutschbein's Superintendent, in January. The first move, as we said, was breaking out the old grinders on this end of No. 6 line, but those on No. 5

were also removed promptly. Work was started at the same time in the wood room, as a new conveying system from there to the grinder room was required for the four-foot wood. Cleanly barked wood did not now have to be processed in the wood room, and a new steel water conveyor was built on piers in the wood room basement, connecting with the yard pond at a new opening in the north wall, and, running most of the length of the wood room just below the floor, curved around toward the grinder room, past the discharge end of the barking drums, and connected with the existing sluice to the grinder room. The yard pond end was provided with a jointed "bear-trap" to take care of small variations in the level of the pond, and to control the amount of water going through the sluice.

It will be recalled that the generator room was in the grinder room building, but did not run the full width of it, leaving a sort of large alcove, with its floor at the level of the grinder room floor, in the northwest corner of the latter, and that this had originally been the machine shop. It had long since ceased to be used for that purpose, and was at this time storage for stones and grinder parts. The existing steel water conveyor from the wood room passed above the roadway and entered this space about midway of its west wall, discharging into another steel sluice that ran quite steeply down to the waist-high concrete block tank that ran the whole length of the west wall of the grinder room, and from which branch tanks ran east and west between the grinder lines. This arrangement had to be changed, as the new grinders were to be fed from overhead, not from floor level. This space that had been the old machine shop was made into the block storage tank, the windows being bricked up, and waterproof concrete walls poured inside it to the height of a new elevated steel wood tank

running from it and along the north wall of the grinder room, an overflow at its easterly end discharging water through a pipe into No. 6 tailrace. The end of the old water conveyor from the wood room was temporarily modified so that four-foot wood could be run into this new block tank, or two-foot wood into the old one. A 20-ton Whiting crane was installed on the east side of the grinder room, and the entrance from the yard was moved southerly in the west wall, out of the new block tank area.

The couplings on Nos. 5 and 6 wheels were changed, the floors over the tailrace flumes east of the wheels were reinforced with heavy structural steel, foundations for the four new grinders on these lines were poured, the stock spouts were modified, new pressure pumps and piping were installed, and the new grinders were put in, a short section of the water conveyor to the grinders from the tank along the north wall, and the walkways along it being run out to them. The new units on No. 6 line were coupled to the wheel and started up on May 15th. Those on No. 5 line were in service ten days later.

The Great Northern grinders already installed at East Millinocket had water-cooled babbitted bearings, but these had given some trouble, and the Millinocket units were provided with anti-friction bearings. The type selected, after a long investigation, was the Messenger bearing, which had rather long cylindrical rollers, with no taper either on the race or on the shaft, the inner ring of the bearing being pressed on.

Work proceeded at once on the extension of the feed conveyor, and the two grinders east of the wheels on all six lines were in

service about the middle of August, all driven from the wheels at this point. Without any delay, work began on the upstream end of No. 6 line. Another 20-ton crane was installed on this side, another pressure pump was added, all the remaining two-foot grinders on this line were taken out, a second north-south wood feed conveyor was started, and one four-foot stone was installed west of the wheel and connected to it. This grinder got into production on September 12th, and three four-foot stones were running on Nos. 6, 5 and 4 lines by the middle of October. At this point, a larger crew was put on, and work proceeded at both ends of the room. The old grinders on Nos. 3 and 2 lines were taken out, leaving only the west end of No. 1 line on two-foot wood, and while the new grinders were being installed on Nos. 2 and 3 lines, work was started on No. 4 stone on No. 6 line. This was delayed for parts, and was not ready to run until the middle of November. However, in the meantime the last of the two-foot stones were removed from No. 1 line; the old steel sluice for two-foot wood was removed, and no more wood of this length was ever used. The block tank end of the water conveyor from the wood room was now rebuilt and provided with gates and gratings so that the water and wood did not shoot straight out, but could be distributed on both sides. Late in the year, the No. 4 stones were installed on Nos. 4 and 5 lines. Foundations had been built for two grinders on the west side of the wheels right across the room, but only that next to the wheel was installed on Nos. 1-3 lines, so that a total of 21 four-foot grinders were in operation by the first week in January, 1933. These new units were all provided with Baxter exhaust systems furnished by J.O. Ross Engineering Corp., which took the vapor

generated by the stones out of the pockets and grinder pits, discharging it through ductwork under the feed conveyors to a 20-inch header into the tailrace flumes. No motors were put on the grinder lines at this stage.

This description can give only a vague idea of the scope of this job, which involved among other things changes in the stock spouts running under the floor to the bull screen; a lot of steel under the grinder foundations; a concrete and steel platform at the new entrance, with a store-room under it; elevated steel platforms on the south wall for the 125-lb. Cameron pressure pumps; a new washroom and locker room along the south wall, the first such facility to have a heat duct under the lockers; removal of all the old concrete wood tanks, a section at a time as the old grinders were taken out; a new floor for almost the entire grinder room; a new foreman's office, also elevated on steel, and two relocations of the hydraulic stone press; all this work being completed within a few weeks after the 21st grinder went into operation.

The new type grinders and artificial stones -- large sandstones had been tried at the Lower Mill, but did not stand up -- produced some problems with pulp quality, and there was considerable experimentation with stone grit and burring. To expedite this work, a little single pocket grinder, with a 24-inch diameter by 12-inch face stone, on which conditions in the large grinders could be duplicated, was bought and installed in a corner of the grinder room. This was done quite early in the game, in fact before completion of the installation of the first lot of four-foot stones east of the wheels.

Still in 1932, the old wood-partitioned offices at the north end of the finishing room were torn out and replaced with new cement on steel lath construction, containing a washroom and locker room for the boss machine tenders, a new office for the paper room foreman and a new office for the finishing room clerical people. This was done in anticipation of the extension of No. 1-6 machine room, which we will note later. We believe that it was at this time that the Mill Superintendent, whose office had been in this location ever since the mill was built, was moved up into what had been the conference room on the ground floor of the Administration Building. Bob Hume protested this vigorously, but William O. McKay was convinced that he could do a better job if he were not so close to the mill, and made the decision stick. In this year, new foundations were built for the Bird screens on Nos. 9 and 10 machines, and they also were moved ahead 12-1/2 feet to catch up with the fourdrinier and eliminate the long spout to the flow box, which did nothing to improve quality.

The concrete wing of the Stone Dam at Quakish forming the river wall of the canal just below the gates, had become dangerously deteriorated. About half its height was removed and replaced, Hardy Ferguson being called in to assist in planning this repair, which required a series of coffer-dams, very carefully sealed.

The shift to four-foot wood required a number of changes in the wood room. The slasher plants were discontinued. The few old knife barkers and one of the two concrete tanks supplying them were removed. The remaining tank was extended at both ends in a north-south direction, and four Crouse rossers were installed along it. These were two-man affairs, but later in the year were

converted for one-man operation. The change of hand barkers required that the waste conveyor running to shavings burners in the boiler house be rebuilt and relocated, and a new conveyor from the rossers led to the water sluice to the grinder room. A hydraulic splitter for four-foot wood was provided, and new lighting was installed. A steel apron conveyor, discharging to the grinder room sluice was installed across the outlet of the barking drums, with a sorting platform beside it, and a return chain to the drums, so that wood from them could be allowed to go on to the grinder room, could be returned to the drums for another pass, could be dumped into the rosser tank, or if very large, could be pulled off for the splitter. A new uptake was built from the yard pond into the wood room, discharging onto a conveyor that ran past the intake end of the drums and to the chipper conveyor, to which the conveyor taking wood from the cars or from No. 2 pile also led. A steel chute was also installed from the head of the new uptake to the rosser tank. This made a very flexible arrangement. Wood could now be barked at Ferguson Pond and put into the piles or allowed to go into the yard pond. From the pond, clean barked or peeled wood dumped from cars could be sorted and sluiced directly to the grinder room, or could be put on the uptake and allowed to go to the chippers. Rough or partly barked sticks could go to the wood room drums, to be handled as described above, or if only a little bark had to be removed, or there were bad seams, the stick could be sent directly to the rosser tank. During the winter, all the same processes could be carried out with wood from the piles. Truck wood, which was becoming a factor, was unloaded into the yard pond, or onto the railroad conveyor near the Administration Building.

At this time, the 234-inch machine proposition was very much a possibility, but now the machine room which had been built for these units was now clearly not long enough, and in the fall of 1932 a basement was excavated, and No. 1-6 machine room was extended fifty feet into the finishing room. This extension had a concrete slab roof, with cork insulation. It was built right at this time to take advantage of low labor and material cost, and was possible because of the heading machine equipment, which made it unnecessary to have so much width in the finishing room, now reduced to a width of 50 feet in front of Nos. 1-6. At the same time, the wooden roof of the remaining half of the finishing room was removed and replaced with concrete and Celotex insulation on the reinforced trusses.

Of the small miscellaneous jobs of the year, we will mention only the replacement, with treated lumber, of the wooden deck of the Millinocket Lake Dam, and the installation of five steel gates in this structure, which as we have noted, was owned by the old Penobscot Log Driving Company, but maintained and operated by the Company.

Great Northern, while better off than most, was now in the depths of the depression, and new work slowed up some at Millinocket in 1933. Several jobs having to do with wood handling were at first approved and then cancelled, although some wooden construction at the top of each of the four piling towers was replaced with steel. The old spur gears on the drive of the conveyor to the chip loft were replaced with a modern worm gear unit. An electric arc welding outfit was bought in this year. We do not

remember that there was any such unit in use at the mill at that time, although there is record that one had been bought back in 1920. Considerable electric welding had been being done, but all on construction, with hired equipment. We remember this purchase vividly, as it was one of the depression-type bargaining deals that we have described elsewhere, a Lincoln unit finally being chosen. A start was made on a program of eliminating counter-shafts and belting by putting V-belts from individual motors on a number of pieces of equipment, and this became pretty much a continuing process, except as machinery with direct-connected drives was purchased. New safety switches were installed on almost every motor in the mill, at a cost, believe it or not, of only \$934.00. The power line to the barking drums at Ferguson Pond was in bad shape, and was replaced -- a small job. A steel pipe back-mast was built for the wood pile drags, and mounted on steel skids so that it could be moved along the back of the pile and anchored to any one of a series of "dead men". The wooden roof and old monitor were removed from the wood room, the trusses were reinforced, and a poured concrete roof, with skylights, was put on.

There remain only two jobs on which to comment in the remarks on this year. The first came from a Rube Goldberg scheme which worked out to be a huge success; the other from a well-conceived idea which was ahead of its time and was a huge failure.

The shipment of sulphite pulp to East Millinocket in laps required running six wet machines, a crew loading cars at Millinocket, a crew unloading cars at East Millinocket, and handling the laps directly into the sulphite beater there, without any

preliminary shredding. This was a high-labor operation, besides creating something of a problem in cold weather, when the frozen pulp took a long time to beat up, even with the use of a steam hose in the beater, which was the situation in the winter of 1932-1933 when it came up for study in the Boston office as a place where it should be possible to save some money.

In discussing the problem, Dick Caspar and the writer conceived the idea of not letting the sheet build up to lap thickness on the wet machines, but instead to doctor the single ply off the bottom roll continuously, onto a moving belt running along in front of the presses and discharging into a shredder, from which the pulp could be blown through a pipe to the cars. To make it easier on the shredder, because wet sulphite is tough stuff, small wires were to be soldered around the cylinder mold, a few inches apart, so that the pulp would come off in strips. This scheme was proposed to the mill people, who immediately said it would work, and that no dividing wires would be needed, and no shredder either, as by painting narrow stripes on the molds in both directions, the pulp would come off in little flakes the size of a playing card, at the expense of a little reduction in the capacity of the wet machine, and that the pulp could be blown in that form. A Holly rotary lock and blower were immediately bought and installed in a concrete pit suspended from the floor steel just north of the last wet machine; a 5-inch steel pipe was run from the blower out along the conveyor supports, ending in a length of flexible hose to go into the cars; the first wet machine was modified and a short section of belt installed, and the system was tried out about the end of February, 1933, working very well, except that it became clear that the blower and lock were not

large enough. Equipment of larger capacity was ordered, the belt was extended and the other wet machines modified, and by the middle of May all the sulphite for the Lower Mill was being loaded in this manner. The old chip unloading equipment at Millinocket, which was no longer in use, was moved to East Millinocket and set up at East Millinocket to blow the pulp from the cars directly to the sulphite beater by the end of February. It was not really designed for this type of material, and had to be rebuilt several times, mostly by trial and error, but by the end of May it too was working satisfactorily, and this system, which had cost very little, was used for the next twenty years or more. The only real trouble with it was that the flake pulp froze to the wooden linings of the cars, even after they had been insulated, and had to be broken loose with pickaroons, a process which did no good at all to the car linings, and, as they deteriorated, splinters and rotten wood began to come in with the pulp. This problem too was solved by more careful inspection of the cars, and the use of a steam hose. The lap conveyor was maintained to handle pulp for storage, which, as best we can recall, was run on the groundwood wet machines when needed.

The second development really had to do with the Spruce Wood Department, but since all the work on it was done by the Engineering Department and the Millinocket mill shop, and it was never used in the woods except on a trial basis, we will tell about it here. At this time, except in very heavy stands, stump cutting was going out, and more and more wood was being yarded with horses, sawed with bucksaws, and piled at the yard for winter hauling. To William A. Whitcomb, who was pretty far-sighted about

these things, this indicated some kind of power equipment for sawing yarded wood, and he turned the writer loose on it. The result was the McLeod articulated slasher, which nobody ever heard of. If there was any credit to give, it should go to Dolore Theriault of the Engineering Department and George Bears, who was in charge of its construction in the shop. A patent on the machine was taken out in the writer's name, but his part was only in providing the basic idea.

We will not go into all the preliminaries, which started with the idiotic concept of an electrically-driven portable unit, several of which could be run from a central portable power plant. The chain saw had not yet arrived, and William A. Whitcomb was not in favor of having a lot of gasoline engines all over the woods to start fires, but a portable electric power plant of sufficient capacity was utterly impractical, and this idea was promptly abandoned. The machine in final form was intended to be moved by a tractor, and was in two parts, each mounted on a low sled or skid of structural steel, about 12 feet long. Along one side of the saw unit was a log deck of dished spiked live rolls, with a steel backboard and two removable skids. At one end of this deck was a steel stop which could be raised by a foot pedal. On the center line of the sled, crosswise, and four feet from the stop, was a four-foot circular saw, at the top of a short, pivoted, upright steel arm, counterweighted at the bottom. The saw was driven by V-belts from a shaft lined up with the pivot. The motive power was a truck engine. The trailer sled, of about the same size, had two removable skids and a live roll deck, driven by a chain from the saw sled, with space for parts, tools and extra fuel.

Only one operator was required. The live rolls could be started and stopped by a lever-operated clutch. The saw was pulled down to cut by a rod on an eccentric, operated through another lever operated clutch, which let go at the end of the cut, the counter-weight returning the saw to an upright position against a stop, allowing the engine to pick up speed. In use, a log was rolled up the skids onto the deck and butted against the measuring stop, which was then dropped out of the way, the cut was made, and the log was advanced again, pushing off the sawed piece, which fell clear in time for the stop to be raised again. This rig, when completed, was tried out in the mill yard, and after some adjustments were made, and the stop was juggled into a position where the log would bounce back from it just enough to get a four-foot stick fairly accurately, it was turned over to the Spruce Wood Department in August, 1933. They put it into a stand of big crooked hemlock nearby, and it sawed this stuff at the rate of about 75 cords a day. The saw was a success, but the operation was a failure. The trouble was that at one end it took fourteen horses to yard enough logs to keep up with it, creating an equine traffic jam, and at the other, the short wood, which had to be piled in tiers for hauling, could not be handled fast enough. This crude machine was far too heavy, but its weight could quite easily have been halved. With present-day roads, skidders and cranes, it might have been a smashing success, but, like we said, it was ahead of its time.

This experiment did lead directly to a relatively more successful development in 1934. Working from the counter-balanced saw

principle, the Engineering Department designed a much smaller unit. Three of these were built in the Millinocket mill shop, and actually saw some use. They were built mostly of old automobile parts. A long rectangular steel frame was mounted on a solid axle between two Chevrolet disc wheels, if anybody remembers those, chosen because they would not catch in slash or underbrush. This frame was positioned on the axle so that a Model A Ford engine mounted transversely, just overbalanced a 36-inch saw, driven through a belt from a countershaft, at the other end. The saw could be pulled down to make the cut by a straight handle, long enough for a man to put his weight on, turning on the wheel bearings, and was returned to its raised position by the weight of the engine. With this ~~want~~ a separate wooden idle roll deck on skids, which could be set crosswise under the saw, the log skidded up onto this being pushed along by hand. These units, which could be moved easily by a horse, were put into an accessible poplar operation on one of the Indian Townships, some poplar being used at this time for groundwood, and were worked for a couple of seasons, but they were good only on small wood, and no further use was made of them.

There was again not a great deal of work at the mill in 1934, activity being concentrated at the North Twin power development. The grinder pressure pumps, which had a lot of capacity, were tied into the fire protection system through reducing valves, new pipe being laid along the south wall of the grinder room, and an underground connection made to the wood pile protection piping. This system, of course was for emergency use. The experimental machine, which was in a dismantled condition from some trial or other, was reconditioned and put back together for the experiment with combina-

tion vacuum cylinder and wire forming which gave it the name "the Hornet". We have covered this in another part of our story. Two of the No. 1 Haug refiners were replaced with one No. 2, a larger unit. The waterproofing was removed from the entire No. 9-10 machine room roof, and 3 inches of cork insulation was installed. As early as this, the progress which Dr. Charles Herty was making with his southern pine groundwood was beginning to get attention, and the Company decided that it had better find out what this was all about. We have mentioned later full-scale grinding of southern pine, but at this time some old flat screen equipment and a small home-made wet machine were installed near the 12-inch experimental grinder, to make another little groundwood mill, and a small amount of loblolly pine was obtained with which to experiment. We do not have the results, but we know that they did not impress the President.

The cinder road to the North Twin dam was surfaced with gravel in 1934. A Fairbanks-Morse trash pump was installed as a stock pump on No. 4 machine. This unit was bought over-size -- intended to be big enough for one of the proposed 234" machines -- and Sheahan ropes were put on 25 of the 32 dryers on the old Nos. 1 and 2 machines, the sheet being stiff enough at the dry end to pass itself. The information on paper machine hoods is highly confusing -- any given machine seems to have had a hood of some kind at one time and not at another. For instance, in this year J.O. Ross steel and asbestos hoods, with uptakes to the exhaust fans, were put over Nos. 9 and 10 machines, the stated purpose being "better working conditions and less maintenance of roof structure", and it may be recalled that a hood was installed on No. 9 machine in 1919. Of course that was quite a while back, and it would seem

that whatever kind of protection this may have been, it had been removed, or was not a hood in the usual sense, as the trolley steel had to be lowered so as to be under the new hood. There had been a few home-made bubbler type drinking fountains in the mill, but as the last note on this year, sixteen more were installed in various parts of the plant, those at the south end being connected to an artesian well of unknown date, which was in the yard near the finishing room; those at the north end to the town system. Incidentally, there was, a spring in the basement back of No. 1 machine, which provided drinking water in the early days. It may still be there.

We have described in another place the construction of the North Twin hydro-electric station, which was nearing completion at the end of 1934, and in 1935, motors to use this power were put on the grinder lines. As the amount of power available was variable, it was decided, for flexibility, to use a size small enough to divide up the use of it most effectively, and large enough to drive some number of stones on only some of the grinder lines, so that others could be added later as more power became available. The first units, therefore, were 2,500 h.p. General Electric 6000-volt synchronous motors, installed at the east end of Nos. 5 and 6 lines, each to drive two stones. The first part of this job involved the building of a small brick switch house at the transformer station on the east side of Millinocket Stream, the installation of two 2,500 KVA step-down transformers, and circuits from them across Millinocket Stream to the grinder room. As there was no way to move the motors across the room, a second entrance was made in the east wall, at the southeast corner, and a concrete and steel platform and ramp to grade were built, so that the equipment could be unloaded south of the mill, hauled up along the bank of

stream past the groundwood tanks and so into the building. This work was all completed early in the year, as was a control room for the motor switchgear and exciter sets -- a hyrib and cement plaster enclosure on a steel frame, along the inside of the east wall of the grinder room.

At East Millinocket, the motors and water wheels, being of about the same rating, had been connected together through the grinder shafts, on the premise that if the grinders lost their load the motors would simply act as generators and feed back into the system. However, at Millinocket there was so much disparity between the capacity of the 2,500 h.p. motors and the 5,250 h.p. wheels that it was not deemed wise to do this, the feeling being that if anything should happen to cause the turbine to run away, the motor would immediately be overloaded and damaged. For this reason the two grinders east of the wheel were to be disconnected from it, and were to be driven by the motors alone. This brought up the question of end thrust, which at East Millinocket was taken care of by the water wheel bearings, and after much discussion it was agreed that a separate thrust bearing should be installed between the two grinders, space being available, as there was a stub shaft between the grinder couplings in this location. These, it was decided, would also be Messenger type bearings. The motor foundations were not so complicated as those for the grinders, although the floors had to be cut out for conduit and for ventilating ducts, and the motor on No. 6 line was turned over for a few days to dry out, connected to the wheel, starting March 21st. The thrust bearing was then put in, and the motor was started up under light load on March 27th, but ran only about fifteen minutes, when the thrust bearing burned out. The bearing for the other line was

installed in its place, and the motor end of No. 6 line was put into service on April 8th. In the meantime, No. 5 motor had been put in, the damaged thrust bearing had been repaired and installed on this line, and it started up on April 24th, but the rear bearing on the motor immediately heated, and it was discovered that the stator and rotor were not in the same plane. The bolt holes in the base were enlarged, and the stator was jacked upstream into line, but the rear bearing still heated under load. The Falk flexible coupling was taken apart and examined, but the trouble was not there. It was then found that the shaft in the stone next to the motor was worn, throwing the whole works out of line; a new shaft was installed and the motor was started up again, but still had a tendency to pull downstream. Limit stops were then placed in the flexible coupling to keep the load on the thrust bearing, and these two stones finally got into service about June 1st. We should say here that the Messenger bearing, although it was not responsible for this trouble, was found to be unsuitable, and we do not know exactly how many of them were used. We do know that they were on all the grinders on Nos. 5 and 6 lines, and probably more. However, fairly soon after the installation of these first motors, one of these bearings, we believe the one on the downriver side of No. 2 stone on No. 5 line, next to the thrust bearing, backed itself off the shaft, breaking its housing and the stands of the thrust bearing. There was never any satisfactory explanation for this. The pressure exerted as it moved, judging by the damage it caused, was unbelievable, although the movement was very slow, and was undetected until the break occurred. There was no external force working on the bearing itself, and the only half rational theory was that the grinding of the bearing

fit had been rough, and had left microscopic helical grooves, acting like threads. This damage was repaired, but at some point, the new grinders installed came with SKF bearings, and later the shafts on the earlier units were modified to take SKF bearings also.

In spite of the ventilating system on the grinders, there was still a lot of drip from the roof in the grinder room, and the motors were provided with metal hoods, open on the grinder side. Later hoods, over larger motors, were provided with exhaust fans, supplementing the normal motor cooling system. Late in this year another transformer was added to the sub-station, and another 2,500 h.p. motor was installed, on No. 4 line. The No. 4 grinders were also installed on the west end of Nos. 2 and 3 lines. This job was not hurried, and was not completed until February, 1936, by which time the fourth grinder for No. 1 line had been authorized, and by the first of March, 1936, there were 24 stones in operation, with motors on three lines.

There were a lot of smaller jobs in 1935. In the early years, 3-inch steel pipe had been used as cores on which to wind paper, but the use of these "iron" cores had been almost entirely discontinued some time around 1920, in favor of returnable paper cores, purchased from several sources, the mills being provided with equipment for salvaging those which came back damaged, by pulling off the metal ends, cutting them to shorter lengths and replacing the caps. Paper from the wrapper machine was being sold to at least one supplier of cores, and in this year, it was decided that the Company should make its own. After considerable study and testing, the choice was to make them straight wound, rather than the more generally used spiral wound type, which was

made in a continuous tube, requiring that the rolls of paper be slit into narrow strips, the equipment taking up more space than seemed to be available. It is the writer's impression that a Coram machine was purchased, but that this was not satisfactory, and was shortly replaced by one of the Company's own design, built in the shop. The equipment was installed in the southwest corner of the beater room. This new operation produced a crop of troubles. For a considerable period some of the cores were weak, some bootlegged, some warped, and some were of uneven diameter due to variations in the caliper of the sheet, so that those made from different lots of paper could not be run together on the same winder shaft. Some customers refused to take paper wound on them. However, experimentation with adhesives, rebuilding of the machine and more careful control of the quality of the paper eventually resulted in a pretty good product. It seems to the writer that it was along about this time that the mill began to make on the wrapper machine a special sheet containing groundwood screenings, much thicker, and without finish, in an effort to get something which would provide more cushion when made into inside heads for newsprint rolls. The Sales Department was able to sell quite a little of this for one thing and another, and quite a lot of it was made. For a while, some of it was converted at the mill, being made into sheets, with cut-outs to a template, which we believe were used by the Ford Motor Co. for some unknown purpose.

Someone conceived the idea that the circulation in the digesters could be improved, with better pulp the result, by a combination of direct and indirect cooking, and 2-inch copper steam coils were installed in the bottom cone of No. 1 digester,

more of a job than it sounds, as a lot of special bronze headers and other fittings, cast at the Millinocket Foundry and machined in the shop, had to be made; holes had to be cut in the digester shell and fitted with flanged connections, and anchors to hold the coils had to be set in the lining. This experiment was not a success.

With the new power station at North Twin, and many more motor vehicles in use, the road to the dam was carrying a lot more traffic. There was a dangerous grade crossing, and to eliminate it, the road from this crossing to the West Branch was relocated to the south of the tracks, and got across them and up along the river bank to the easterly end of the dam by going under the railroad bridge on a low fill of granite blocks and concrete built in the river against its easterly abutment. There was no highway bridge across the West Branch at this time, and access to the power house for vehicles was still across the dam. At the same time, a very bad knoll in the road, nearer town, was cut down.

A second-hand 10,000 gallon tank was purchased for diesel fuel -- the mill had some diesel tractors by this time; another wooden acid tank was replaced, and one of the outside steel groundwood storage tanks was piped up to hold sulphite. Piping was also put in so that excess white water could be run to the block tank and the water conveyors to the grinders, to help remove ice from the wood coming from the piles. An experimental rosser was tried out. This was one of the writer's less brilliant ideas. The Crouse rosser head did not know how to differentiate between

wood and bark, and a careless operator could chew a lot of wood off a stick. The barking head on this experimental device was an endless chain, with tool steel bars across it, intended to scrape off the bark rather than cut it, as the Crouse head did, but it did not work well, particularly on fir, on which the bark is stringy, and there was a lot of fir. The upper part of the westerly coal trestle was rebuilt. Smoothing presses were installed on Nos. 9 and 10 machines. The one on No. 10 was provided with a special Reliance electric drive, on trial, but this did not work out well, and was replaced by a mechanical drive. The wooden roof over the core room and store room area at the north end of the beater room building was replaced with concrete, the old trusses being reinforced, as usual on these jobs. Along with this work, some new partitions were put up, and new lighting was provided for the store room. A 60-cycle circuit was run from the Bangor Hydro system to the boiler house for emergency lighting in that area.

It may be remembered that some of the roof trusses in the digester building had been repaired or replaced. The others had begun to deteriorate, and these too were at this time either reinforced or renewed, very carefully, one at a time. We say very carefully, because this was a ticklish job, the roof having to be shored up at the location of the truss, so that deteriorated sections could be removed and new members put in, and all this took place over the bins filled with chips, where torch cutting, welding and riveting were not safe. We do not remember how the old pieces were cut out, but the new ones were put in place in sections and fastened with special bolts, using torque wrenches to give as tight a hold as rivets.

On May 18th, fire broke out from spontaneous combustion in the rotten wood in the dri-ki pile at Ferguson Pond, burning part of a nearby wooden storehouse, but there was no great loss. The recent repair of the pulpwood unloading trestle at the Cape had not been adequate, and early in the spring it was clear that the structure would have to be rebuilt. After consultation with the Bangor & Aroostook people, money was appropriated, and in May the Spruce Wood Department began to get out material for piles; timbers were ordered, and some temporary repairs were made at the north end. However, on June 12th, while the new piles were being peeled and the cast iron points were being made, four bents of the trestle fell apart, and three cars loaded with pulpwood went into the water. The job of rebuilding was started while these were being salvaged, about 150 new piles being driven and a new deck put on from the north end out, but only part way across. The trestle was put back into use about the middle of July, but since only the repaired part could be used, and so much wood had to be unloaded, no more work could be done until fall, and it was the end of October before the job was completed and the full length of the trestle could be used. Again as a matter of record, there was yet another earthquake in the early morning of November 1 of this year.

In contrast to 1935, very little of any importance in the way of capital improvements took place in 1936. As a matter of fact, between May 25 and July 13, 1936, the Chief Engineer's reports, for the first time since they were started in 1921, stated: "No work under way on construction jobs at Mills 1 and 2". There was none at Mill 3 either, and this may have been the first time

in the history of the Company that there had been such a situation. However, some things were accomplished on both sides of this slack period.

The earliest event of the year was a meeting with Bangor & Aroostook officials who were getting ready to make changes in their yard near the station. At that time, the station was on the south side of the main line, and the road to Millinocket Lake went by way of Katahdin Avenue to the east of the Foundry, over a grade crossing and through the station yard. Their plan was to expand their yard trackage lying east of the station, and raise the area around the latter some 13 feet, to make a "hump", from which cars could be shunted off the main line into the yard without using an engine. This plan involved moving the station to the other side of the main line, and grading the yard almost out to the Iron Bridge across Millinocket Stream, and this involved the purchase of some land from the Company. There was no difficulty about this, although some of the property involved was part of the grounds around the Spruce Wood Department storehouse and office, and William A. Whitcomb was opposed on principle to the process of humping cars, which he considered to be a source of damage to newsprint loaded in them, as indeed it was in some places. However, this was not a very big hump, and this work was done in this year. The raising of the tracks produced a substantial fringe benefit in that the grading toward the west allowed the railroad to provide an underpass for the Lake road on the extension of Bates Street, eliminating the grade crossing.

As far as Company work was concerned, new Cameron pumps were installed to provide separate pressure water to the squirts

on all the machines; the lining, wooden floors and deck of No. 2 blowpit were rebuilt, and another acid tank was replaced -- these cypress tanks lasted surprisingly well in cold acid service -- the old wooden roof on the filter house was replaced with concrete; steel gates were installed at the entrance to the canal at the Stone Dam, and another Elwell-Parker truck was purchased for handling rolls of wrapping paper. Foundation work had been started the year before, in connection with the four-foot grinder job, for the relocation of the 16-inch Cameron groundwood pumps, rebuilt to take larger motors. This job had been held up for one thing after another; electrical work seemed to have been a problem, for some reason, and this job was not actually completed until the spring of 1937. Toledo automatic weighing equipment was installed on the 24" belt carrying coal up to the boiler house bunkers. Late in the year, another No. 2 Haug refiner was installed, replacing the remaining No. 1 unit. A motor-driven hoist was provided to shift pulpwood cars being unloaded into what was still called the "log pond" in the mill yard. Other than these few jobs, there was only some preliminary work on projects which really belong to the following year.

There was nothing very startling in the way of capital improvements at Millinocket in 1937. It will be clear from all the foregoing that with a few exceptions, things were physically in pretty fair shape. Most of the old wooden construction of importance was gone; a lot of the original steel and concrete had been patched up; the mill had a new hydro-electric power station, a new wood room, a new grinder room and a new groundwood screen room. The maze of countershafting, pulleys and belting had largely dis-

appeared, except from the machine room basement; horses had been replaced by motor vehicles, and electric trucks rolled around the finishing room. There was a considerable amount of old equipment in use, there will still be a lot of things about the processes that could be improved, and there was still too much being done by hand, but by and large the plant had been pretty well overhauled, except in two places -- the sulphite mill and the machine room. The first was considered a necessary evil, and while the mill people were constantly pressing for improvements, the management just did not want to spend any more money on it than was necessary to keep it in operation. Two of the ten machines, Nos. 7 and 8, were relatively new; two, Nos. 9 and 10 had been kept modernized, but the old Nos. 1 to 6 were antiques. However, we have explained the reasons, primarily lack of power, why nothing much had been done about them, other than planning for replacing them with 234-inch units.

Starting late in 1936, another effort was made to improve conditions in the old machine room. Asbestos hoods were installed on No. 1 and No. 6, and new exhaust fans and one economizer unit were put on each of these machines, the installation being engineered so that the equipment could be used without change on the proposed three-roll machines. This job was completed by early February, 1937, and did make some improvement in drying and in the heat and humidity in the room. Also starting late in 1936, the wrapper machine was rebuilt again. New Bird screens and a new jordan for treating the stock were installed; the four cylinder vats were taken apart one at a time and rebuilt; new foundations were built for the stacks, which were moved ahead to

allow the installation of twelve more 48-inch dryers, and the hood was extended over these, with another exhaust fan. We have lost track of the total number of dryers now on this machine, but we can account for more than 50, and it extended almost the entire length of the beater room. This job, which included changes in the stock system, changes in the roof steel, the relocation of trolley beams and replacement of all the electrical circuits, was intended to improve not only production but the quality of the sheet, as stronger and more uniform paper was needed not only for the new core making operation, but for roll wrapping, the screenings-culled wood-dri-ki sheet being a little tender, and complaints were being received from the Company's customers, including the St. Croix Paper Company, which was buying its wrapper from Great Northern. It was completed in May, 1937.

This was the time when so much emphasis was being put on the formation of the newsprint sheet, and various experiments, more or less rule of thumb, were being made with the baffles in the flow boxes and the racks in the head boxes, which of course was the place to start. However, less importance was attached to this aspect of forming the sheet than to the action on the wire, and this was when William A. Whitcomb got hung up on the shake. The wires on Nos. 7 and 8 machines were too short. It was decided to change this, and early in the year Dolore Theriault of the Engineering Department, a highly competent designer, was assigned to work with Rice Barton on the development of a new removable shaking fourdrinier. This involved a long study, in the course of which the McDonnell roll was revived, and while the new fourdrinier was being designed, the Submarine Signal shake compensator

which we have described was developed and built, and a McDonnell shake was re-installed on No. 10 machine, starting up on May 30th with the compensator equipment.

The fourdriniers installed in this year on Nos. 7 and 8 machines were built by Rice Barton, but were really designed, right down to the table roll bearings, by Dolore Theriault, after he had studied the process of changing wires and the designs of other manufacturers. He, working with Rice Barton, produced a number of designs, one adopted and finally approved by William A. Whitcomb and William O. McKay, with some revisions, being his No. 8 scheme. Nothing of any consequence was ever built until the design or layout had been submitted to the Boston office for approval, at least of the principle. This sometimes slowed things up a little, but the top people in the Company always knew what was going to be done before it was done, and those carrying out the work could proceed with more confidence, knowing that the brass was involved in the decision and would bear its share of the responsibility therefor. Also, it sometimes produced a new idea.

Since fully removable and centilever type fourdriniers had by this time become commonplace, we will not go into far the details of this one. The wire was 77' 6" long, and was pitched about 12 inches, as we recall, although at least one of the designs had called for a flat wire, so far had the Fibel process been discredited by this time. The frames were of box section, with only two supporting stands, so that the front side was almost wide open. The breast roll and table rolls were arranged to be shaken, the breast roll bearings and table roll rails being supported on beryllium copper springs, and a Submarine Signal compensator was part of the

installation. There were six oscillating suction boxes, a dandy roll and a Beloit couch with a lump breaker roll. This fourdrinier was of course rolled out by power onto the removable beams set across the aisle. An unusual feature was that when changing the wire the breast roll was pushed ahead by hydraulic jacks to provide slack, instead of being swung down on a geared arm as was common practice. The installation in each case involved moving the first press and drive, and a new Beloit second press, with a Nash pump. A smoothing press, which, as it did not take much power, was driven through cone pulleys from the dryers, was installed, and substantial couch pit changes were required at the fourdrinier.

Preliminary work was started on No. 7 machine in April, the Nash pump being installed first, and the press changes were made on three successive Sundays, with only a few hours' lost time, this work being completed by June. The fourdrinier part, however, was much delayed, not being received until August 18th, a Wednesday. The machine was shut down at 8 A.M. on Sunday, the equipment was installed, and the sheet was on the wire at 5:45 P.M. on Monday. There was no time to fool around, because everybody was clamoring for paper, and the Company was rationing its customers, borrowing from the big accounts to keep the little fellows supplied. In the interval between the press and fourdrinier changes on No. 7, such preliminary work as could be done on No. 8 got under way; the press changes were made, and the new fourdrinier on this machine was installed on Sunday, September 13th, starting up at 2:15 P.M. on Monday.

While this was going on, it was necessary to do quite a bit of monkeying with the McDonnell shake on No. 10, which worked fine

mechanically, but was not getting results. It was moved six feet down the wire, which made it even less effective. It was put back in its original position, several rolls with different surfaces were tried, and the roll was raised several inches to get more wrap on it, with no better results. The only roll that would not slip in the wire was the original soft rubber one, and this gathered pitch. However, someone finally came up with the idea of a felt jacketed roll like those in use on the old couches, and by the middle of August this equipment was performing successfully.

The use of white water in the block tank to remove ice had not proved to be as effective as it might, because the cold fresh water from the sluice from the wood room was also coming in, and work was started in March on an arrangement to stop this, sections of grating being put in the end of the wood room sluice, through which the fresh water fell into a saveall trough and was carried away through a 20-inch pipe into Millinocket Stream, and a new pump was put in to pump the white water back from the overflow, as there was not enough coming from the system to keep the supply conveyors to the grinders full. Later in the year, the blow-down water from the boilers was also piped to the block tank to bring the temperature still higher.

The last piece of wooden sluice, running from the yard pond to Millinocket Stream, was rebuilt in steel in 1937. The transfer under the tracks from No. 2 wood pile to the wood room conveyor was never satisfactory, and in this year a new cross conveyor was built; two chains running from a new concrete pit under the return of No. 2 cable in a wooden, steel-strapped trough on

trestles, to a steel chute that dropped the wood into the underground part of the cable conveyor leading to the wood room.

A lot of miscellaneous work, which we will not go into in detail, was done in 1937. The stokers on all the boilers had some changes made in them, and P.I.V. drives were installed on them. The steam driven winch on the coal drag at the north end of the storage trestles was replaced by a motor driven unit, mounted on a carriage set on a short piece of track crosswise the trestles, so that it could be moved from one to the other. A lump-breaker roll was put on No. 10 machine couch. All these years, the dressing of scored paper machine suction box covers had been a hand job, but in this year a dressing machine was bought from Fastwood-Neally Corporation and located back of No. 9 screens, another great improvement. A new Brown & Sharp milling machine and an 84" Niles boring mill replaced the vintage 1900 units in the shop. Three steel pipe masts, on permanent concrete foundations, replaced several old wooden back-masts around the coal piles. The engine room was unbearably hot, and a blower and duct-work were provided to distribute outside air from the north end of the room down as far as No. 5 engine, making conditions more tolerable in that area. An old wooden bridge across Millinocket Stream at the foot of Cherry Street, of uncertain age, was replaced by a steel and concrete structure. This involved coffering on both sides of the stream for the concrete abutments, and it was found necessary to drive sixty piles under the footing on the Little Italy side. The main girders, 88'6" long, were taken from the huge bridge built by the Spruce Wood Department across the Fast Branch at Grindstone, and never used for much of anything, of which we will tell in another place. This new bridge remained a Company

property, although open to the public, until 1950, when it was turned over to the Town, as we have already noted.

What was probably a last, except perhaps for some temporary use, was the removal of the Triplex pumps still in use on the wrapper machine, which were replaced by a centrifugal pump; and a first, the use of stainless steel in new relief lines from Nos. 1 and 2 digesters, which were being used to cook culled wood and dri-ki, occurred in this year.

Some time in the fall of 1937, there turned up in Boston one Walter M. Spring, a middle-aged man, lame in one leg, claiming to be an inventor, who had nothing particular on his mind except a job. Something about him impressed William A. Whitcomb, who hired him on a sort of probationary basis as Experimental Engineer, and sent him to Millinocket in November to look for something to invent. Mr. Spring decided to go to work on a roll wrapping machine, and he had very large ideas, as indicated by his first report, written after he had been at the mill all of two days:

"We are now laying out a machine that will have three rolls of body wrapping, twelve rolls of end strips and four rolls of heading stock. Do all the work now done by hand, including the cutting of the heads and weighing. This machine will be operated by one man and will wrap one roll of newsprint every two minutes...."

We will see what this bombast amounted to later.

The newsprint business suddenly went very sour in 1938, and not much work was done at Millinocket. The McDonnell roll on

No. 10 machine was closing up the formation of the sheet very well, although any effect of this on strength was questionable. The parts of the original equipment used in the 1931 trial were dug up and reconditioned, and were installed, with a new shake head and a compensator, on No. 9, the fourdrinier being lowered to its original pitch at this time. The Sales Department had developed a market for sheathing paper, made on the wrapper machine, calender stained the familiar orange color. This had to be made into rolls 9 inches in diameter. The regular winder could not keep up with the machine on these small rolls, and a second hand rewinder was purchased for this business, which became quite extensive.

At a point in this year, for some reason, the worst slime condition developed in the stock system that had ever been experienced. A wet felt removed from the press and thrown on the floor would ooze a puddle of it like something out of a horror movie, and both production and quality suffered. Inquiry disclosed that the chlorinator in the filter house had been shut down for some time, and was not in shape to use, and over Bob Hume's strenuous objections a chloramine system was put in. This helped, but the slime problem did not go away entirely, and other slime control measures, continued as needed, were adopted. The writer never saw such bad conditions again. A new "boom jumper", the first to be owned by the mill, was put into service on Ferguson Pond. There had been one in use, but it belonged to the Spruce Wood Department. It had rotted beyond repair, but its engine was salvaged and used in the new boat. We will discuss the development of this unique type of craft elsewhere. The experimental machine was dismantled and rebuilt again. A new fourdrinier for

it was built at the mill, and the big vacuum cylinder, with a pressure roll, was installed in the dryer nest as a press, a woolen felt being run over a few dryers and through this press. We do not recall anything about this experiment, but the idea was to take the sheet directly into the dryers from the couch and heat it up to reduce the surface tension of the water in it before pressing. It did not work, anyway, although quite a lot of money was spent on the project. Three more Bird gravity-type groundwood thickeners were added, and individual motor and gear reduction drives were put on the twelve Improved deckers. The wooden trucking platform down the middle of the trainshed between the two tracks was replaced in concrete. There was not a great deal of work at the other mills in this year either, and the Engineering Department concentrated on the Mattaceunk hydro-electric development, where construction had been started in the spring.

Speaking of spring, Walter M. Spring was a nuisance. He borrowed a draftsman from the Engineering Department to work on his wrapping machine, turned his attention to the Spruce Wood Department, and then came back to Millinocket to do his own design, complaining that no one could understand what he wanted done. He produced some drawings of what looked like a motor-driven octopus the size of a box-car, and was told that, if that was the direction of his thinking, to forget it. He then went back into the woods, and after several weeks announced sagely that a considerable saving could be made in the operations if a power saw and better tractor equipment were available, which was no surprise to anyone. He tacked on a comment to the effect that the method of drying paper was all wrong, and that he could design

a much better paper machine if people would cooperate with him. In another report on woods operations, he stated that he was convinced that a system could be worked out to salvage tops and limbs, and, visiting the Madison mill, stated flatly that he could build an automatic machine that would finish all the paper they were shipping. This was patently ridiculous, as the paper being made at Madison was in an almost uncountable number of roll and sheet sizes. William A. Whitcomb told him to get lost, and he resigned in February, 1938.

Going back to his comment about a power saw, by 1936 or 1937 chain saws had begun to turn up in the market, but they were heavy, cumbersome, two-man affairs, and the woodsmen made very little use of them. The first we recall were the Stihl and Wolff saws, both of European origin. The Disston people, and some others, came out with lighter saws, but these did not meet with much favor either. Then there was the Precision bow saw, with the chain across the arc and around inside the bow on rollers. This was used to some extent, but was very unhandy. We do not intend to go into the history of the chain saw here, but these early jobs were just not acceptable, and inventors turned in other directions. It must have been about this time that the Cummings Machine Co. of Boston tried to interest the Company in the Sally saw, which the writer was sent to investigate. This was a very curious contrivance; a cast housing, somewhat the shape of a two-tined fork, the cutting member a centerless circular saw, about 18" diameter, between the prongs of the fork, driven through holes punched around its perhaps 2-inch wide rim by the teeth of a gear on a shaft connected to a small gasoline engine at the handle end, the whole business being maybe four feet long. This machine was intended for both felling and cutting up. The

writer's opinion of it was unfavorable, and the Company passed it up. A number of these were produced, but contrary to statements the writer has seen, they were never used to any great extent, and have become museum pieces. Somewhere around this time, too, he investigated another power saw, of which a prototype had been built in Framingham, Mass. This was a circular saw, mounted horizontally low on the front end of a farm tractor, from the rear end of which a telescoping springpole, with a serrated end, jutted forward at an angle over the operator's head. This machine was intended for felling, the procedure being to run the saw up against the tree, and by advancing the tractor, cut through it, the springpole pushing the tree away from the operator and keeping the saw from binding. This rig had possibilities, but not for Maine terrain, and the writer steered the inventor toward a southern mill. Whether or not it developed from this, such a device, mounted not on a tractor, but on a wheelbarrow-like carriage, pushed by hand, was a little later used to a considerable extent in that area.

At this point in time, the Spruce Wood Department was not much interested in power saws, it being Bill Hilton's contention that the big problem was handling and transportation, not sawing. However, William A. Whitcomb, still insisting that there should be some way to use power for sawing on the yard, kept pushing them, even forcing upon them a Davey drag saw, which was nothing but a one-man crosscut, driven through a crank and crosshead from a stationary gasoline engine. This was a waste of time, because a beaver could chew through a log faster than one of these. He then had the thought that a tool of more familiar configuration

than a chain saw, if it worked, might gain approval, and instructed the writer to design, forthwith, a power driven bucksaw! This project was approached with no great enthusiasm, but a summer's work produced something that looked something like a bucksaw, and might just possibly do what it was supposed to do. This device, air driven from a small portable compressor, which was entirely feasible, consisted of two frames, one attached to a set of jaws by which it could be clamped to the tree or log, and carrying a double-acting air piston of small diameter and about 14-inch stroke, which operated the second frame, arranged to slide vertically and horizontally on the first, and fitted with a standard pulp saw blade. This contrivance was built in the Millinocket shop in October, 1938. It probably would never have worked anyway, but while the writer had designed the frames to be made of the lightest possible alloy in the stiffest possible structural shapes, the shop elected to simplify things by using steel pipe, which practically guaranteed failure. It clamped onto the log, and went back and forth very nicely, but about half-way through the second cut, with William A. Whitcomb watching, it began to buck like a bronco, and folded in the middle like a jackknife. End of experiment.

The year 1939 was a very busy one at Millinocket, much of the work being in anticipation of the upcoming power from the new Mattaceunk station, and it may be hard to keep the events in any kind of order.

The old scraper-type bull screens in the grinder room were replaced by six Fibre Making Process rotating screens. These were

installed in the screen room basement, necessitating relocating the Haug refiners and extensive changes to the steel supporting the screen room floor; another groundwood pump, and the relocation of the old groundwood and white water pumps. This job was actually started late in 1938, and the six new screens were in operation by the middle of May, 1939. A sixth steel outside groundwood storage tank, duplicate of the others, was erected at the south end of the row. Two additional four-foot grinders were installed on the upstream end of Nos. 1 and 2 lines, starting late in February. This job, which involved another water conveyor the length of the grinder room to reach these two stones; the third units on the west end of these lines; and foundations for 4,000 h.p. motors on the east end, was completed late in July. It is the writer's recollection that the permanent steel water feed conveyor was installed only at the grinders, and that a temporary wooden section was built from this back to the block tank. A ground wire was installed on the old transmission line from Dolby to Millinocket -- the steel line had not yet been built -- and we believe that General Electric lightning protective devices were also put on this and on the North Twin line at this time. The grinder motor control room was extended; two 4,000 KVA transformers were added to the Little Italy station, with new circuits across Millinocket Stream, and the two big motors were installed in October, in time to take power from the new station. The 1,500 h.p. motors which had been put in at East Millinocket were not large enough, and later in the year the two 2,500 h.p. motors were taken from Nos. 5 and 6 lines at Millinocket and sent to the Lower Mill, in exchange for two of the smaller units from that plant.

The core making operation was taken out of the congested south end of the beater room, and was moved down to the mezzanine near the experimental machine room, and racks for seasoning the cores were built there. As the paper had now to be taken down one floor, and the cores brought back up, a new elevator was installed, in the same location as the old one, near the south end of the beater room building.

Over all the years, access to the finishing room, through which most of the foot traffic passed on the way to the machine room, the beater room and the shop, was by way of the so-called core platform and through a small but heavy door cut in a large door in the west wall of the finishing room at its northwest corner, opening inward. This might not have been bad in the old days, but now, with so many fans exhausting from the paper room, the finishing room was under a vacuum, and this door was a real booby-trap. Entering from outside, one braced his feet, took a good solid heave on the latch, and was dragged into the finishing room, hopping over an eight-inch-high threshold on the way. From the inside, one obviously approached it with great care, risking a broken nose if anybody opened it from the outside at the wrong time. William A. Whitcomb narrowly escaped having this happen to him when he visited the mill at the time of the Annual Meeting early in 1939, and back in Boston, ordered the writer, that jack-of-all-trades, to see that something was done about it. The answer was just too simple; a revolving door, of the Kawneer collapsible safety type, installed in April in an enclosure built at a new opening in the north wall, just around the corner from the old door.

The cribwork along the track where wood was unloaded from cars into the yard pond was being pounded to pieces. Steel piling was driven along here, and concrete poured behind it. The wooden east coal trestle also had taken a beating, and was rebuilt in wood, it not being desirable to bury steel in coal. The new trestle was four feet higher than the old one, to take dump-bottom cars, and the increased height made a new concrete abutment necessary. Later in the year a steel tower was erected to the east of this trestle to act as a back-mast for the cross drag. It is difficult to explain the coal piles now, but roughly, the coal track left the main line into the yard and crossed the roadway to the mill at an angle, south of the Administration Building, dividing into two spurs to the two trestles, which angled off to the east toward Millinocket Stream, diverging slightly. These trestles started at a point north of the boiler house where the ground dropped away sharply -- perhaps about thirty feet. At the north end of the trestles was the winch that operated a drag pulling coal in lengthwise the piles, and in the space just north of the boiler house, between the westerly pile and the roadway to the mill, was the cross-drag to the crusher, from which the uptake to the boiler house bunkers ran up at an angle. The two ash drags were also in this area, the cinders from the tunnels under the furnaces being dragged out and up a steel plate incline, where they were wet down and dropped through a hole into a waiting truck. The way out for the trucks was up a narrow passage under the bridge to the electrical repair shop, entering the main roadway about under the waste conveyor from the wood room. Probably not very clear, but the best we can do.

Now skylights were put on the trainshed, and the main shipping platform, next to the west wall of the finishing room, originally made a wooden plank, was torn out and replaced with concrete on footings to ledge, which was just below the surface in much of this area. This was a long, slow job, as paper had to be moved while it was going on, and it ran far into the following year.

The wrapper machine had another job done on it in this year, a quick-change pulley arrangement being put on the first dryer section, so that it could be run faster than the rest of the nest, to allow of creping the sheet, equipment for creping also being installed. We cannot remember what this creped paper was intended for -- perhaps the idea was to get something that would have more cushioning effect, but we do not recall any great amount of it being used. At the same time, one vat was piped up to a groundwood supply, so that the paper could be made with a light-colored surface on one side. We do not know what this was for either, but the Sales Department was always turning up new orders for this machine, which at times was a highly profitable operation. The old portion of the machine shop, a room 100 feet wide and 136 feet long; part of the original finishing room extension, still had its old wooden roof, and in this year this was removed and replaced with gypsteel plank, skylights being added.

While no accident that we know of had occurred from this cause, the storage of dynamite used on the wood pile suddenly became of concern. If the writer remembers correctly, the main storage was kept at the Spruce Wood Department's storehouse near the railroad station, from which it had to be brought down through town, a small

amount being kept in a little wooden house near the piles. Anyway, it was decided to provide storage away from town and away from the mill, but not too far. Bob Hume and the writer together prospected for a site, settling on the wooded area east of Millinocket Stream, down toward Jerry Brook. About half a mile of road was built to it, and a small brick magazine was put up. This was provided with a light roof, no more than tacked on, so that if there was an explosion it would blow off without resistance, and the building was surrounded on three sides by an earth barricade, eaves high. By this time, truck wood was becoming a factor, and, again if the writer's memory serves, much of it was being unloaded into the yard pond between the piles, west of the railroad tracks, creating a lot more traffic on the crossing, opposite the old barn -- by this time the garage -- which was on the roadway to the mill immediately south of where the Engineering & Research building was built later. The view at this point was somewhat obstructed by the drive house for the trestle conveyor from No. 2 pile, and in this year crossing gates were installed, and a guard was put on at this point.

A small, but important move in this year was ~~te~~ purchase of a Hydro-Silica high pressure pump and nozzle equipment for cleaning the holes in the suction rolls. Each of these had a little million small holes in it, which plugged up with stock, and had to be drilled out by hand; a tedious and time-consuming job, which the new equipment, actually not put into service until the following year, took care of in a fraction of the time, with little effort.

We have examined the circumstances which led up to the start of the replacement of the six old paper machines in 1940, beginning

with No. 1. The 152-inch Rice Barton machine installed in this year was conventional, except in some details. The fixed-pitch fully removable fourdrinier was equipped with a McDonnell shake, which was unusual for a new machine. It had oscillating suction boxes and a Beloit suction couch and first press. The Multi-press, which we have described in another place, was removed from No. 9 machine and used as the second press. It had a smoothing press and 38 five-foot dryers in plain bearings, with open spur gearing. These dryers, in order to get the widest face possible, had dished heads instead of those of the usual bumped style. The bearings on the small rolls were all anti-friction. The screens, slice, calender stack, reel and winder came from the existing machine. The presses were loaded by conventional weight and lever systems. The machine was driven from the old Corliss engine through a basement main line shaft, but the Ferguson quarter-turns were discarded in favor of Rice Barton hypoid gear units on the back-line, draw control being through cone pulleys. The installation also included a new Shartle broke beater for two machines. The effort was to get it installed with as little lost time as possible, and the way the mill went about this will be of some interest, as a lot of things were learned from it which established the pattern for much quicker jobs on later replacements. We will, however, cover only the major points, more or less in order.

Work was started during the last weeks of 1939, with the building of new foundations for the Bird screens, nearer the beater room wall, and a new head box and flow box. The screens were moved back, and the new flow box was installed and connected

to the collector box at the screens by a temporary wooden chute on January 20, 1940, at which time parts of the machine had begun to arrive. The old screen foundations were removed, the wire pit was extended and remodelled and a new couch pit was built; and new sole plates were laid at the wet end as far as it was possible to go. At the same time, work was started on the foundation for the broke beater; on pump and motor foundations and on entirely new electrical circuits, and new trolley steel was put up over the fourdrinier and press parts. New calender stack and winder foundations were built, and some of the new supporting steel at the dry end was put up.

The winder was moved ahead on March 3d. Footings for the piers for the new basement main line were poured, and new piers were built for the extension of it. More trolley steel around the wet end was put up, and work on new piping all around the job was started. Sole plates were laid between the winder and the reel, and a new floor was poured in this area. The Nash pumps and the broke beater pump were set in place; more trolley steel along the back side of the machine was put up; the concrete beams under the floor where the new fourdrinier was to go were poured, and the Multipress was removed from No. 9 and made ready for No.1.

The old machine was shut down at noon on Saturday, March 30, 1940; the old fourdrinier was removed, working around the clock; the new fourdrinier was installed, and the machine started up at noon on Monday. The hood, which was supported on the dryer frames, was taken out on Sunday, April 7th; installation of the broke beater was completed, and the machine was shut down again at 8A.M. on Sunday, April 14th, with the Deutschbein crew, divided into three shifts, standing by ready to go.

The remaining part of the old machine was torn out in one day, no effort being made to salvage anything except some of the shafting and bearings, William A. Whitcomb having decided that he would sell no more machines that might wind up somewhere as cheap competition. The reel and calender stack were moved ahead to their new locations; new supporting steel was installed in the basement, and in one week the first press, the Multipress and the dryers, along with the basement main line, were in, at which point the Deutschbein crew was reduced to the day shift only. The installation (except of course for the replacement of the hood, changes in ventilating equipment and the usual odds and ends, mostly week-end work, which dragged out through July) was completed the following week, and the new machine was shipping paper by the afternoon of April 29th, having lost a total of almost exactly 15 days' production. No one who is not familiar with a paper machine, even the paper machines of those days, can really appreciate the fantastic amount of work done in this short time, but later such jobs went even faster. This installation, which cost \$461,000, added 25 tons per day to the capacity of the mill, as did each of the later replacements.

In this year, the steel transmission line from Dolby to Millinocket, mentioned previously, was built; another 4,000 KVA transformer was added to the Little Italy sub-station, and the structures there were extended; the third four-foot grinder was installed on the west end of No. 3 line, and a 4,000 h.p. motor was put on the east end. There were now thirteen four-foot stones in operation. The westerly coal trestle was rebuilt in 1940, it too being raised four feet to handle steel hopper cars; the Bangor & Aroostook put a fleet of these into service; and it was no longer necessary to shovel the coal off of flat-cars.

There was at this time a washroom and locker room for the maintenance crew in the north end of the machine shop. This was a dismal place, badly crowded, ill-lighted, the shower and toilet areas impossible to keep clean, and the men had been protesting about it for some time. Providing more space was one of those things that could not be done, but was, by double-decking -- putting up supporting steel and building a second washroom over the old one, which was renovated to some extent. As we remember, it was necessary to go up through the roof for the upper room. It was still contentious. First Bob Hume wanted to move some men who did not belong to the mechanical trades into it from another crowded area, to which the mechanics objected and were sustained, and then the people now wanted not only two lockers, one for working clothes and one for street clothing, which was reasonable, but also big 18-inch lockers, which was not, and a compromise had to be reached with smaller lockers, leaving nobody quite satisfied, but everybody a little happier, which was an accomplishment.

Another electric hoist was installed at the log pond in the mill yard. Although the record is not clear, we believe that this was for the bark derrick. The pond at this time still extended under the tracks all the way to the wood room, and the upper end of it, below the sluices, filled up with bark, which had to be dredged at intervals, a permanent derrick being set up on the easterly side for this purpose. This had previously been powered by a donkey boiler and a steam engine. The groundwood screening system now being short of capacity, two Waterous fine screens and an Improved third screen were installed -- nobody wanted any more of the Birds.

During the previous year, a new State Armory had been built on Spring Street, on land owned by the Company which had been used as the athletic field. To replace this, the Company had bought a piece of flat land east of Millinocket Stream above the bridge on the main highway into town, and in 1940, for access to the new field, it built a steel and concrete bridge across Millinocket Stream at the foot of State Street, the main girders again being taken from the Spruce Wood Department's old bridge at Grindstone.

The cooling system in the engine room was inadequate, and after considerable study, two new systems of ductwork were installed, one from the old blower at the north end of the room, and another from a new fan at the south end, and this did quite a satisfactory job. The need for low-voltage power, increasing by leaps and bounds, had outgrown the capacity of the low-voltage generating system, and in this year a new outdoor transformer substation was built just at the southeast corner of the boiler house, and connected to the high-voltage system and the generator room switchboard, and in the last weeks of 1940, work preliminary to the replacement of No. 2 machine was started.

The new No. 2 machine installed in 1941 was a duplicate of No. 1, except that we believe it had a 42-inch couch roll, which was larger than that on No. 1. No broke beater was needed, although a copper enclosure was built, as part of the job, to direct the broke from both machines into the new beater that had already been put in. The installation was carried out quite closely following the procedures used on No. 1. There were of course some differences

in the details of the preliminary work, and there was a little more of it, particularly in connection with the ventilating system. Also, the fourdrinier was put in along with the rest of the machine rather than in a separate operation. The old No. 2 machine was shut down at 7 A.M. on Sunday, February 23, 1941, and the new machine was making paper at 11 A.M. on Saturday, March 8th, with a loss of only 12-1/3 days' production.

About the only other work done up to the middle of March was the flood-lighting of the brick stacks on the boiler house, at the behest of the Civil Aeronautics people. This was occasioned by the point of development which had been reached at the Millinocket airport, and we should perhaps inject here at least a partial history of this facility, which goes back to 1930.

The moving spirit would appear to have been Frank LePage, Jr., one of several young men from the community who had attended a Curtiss-Wright flying school in Rockland, Maine, the year before, and who brought a representative of this company to Millinocket to advance the proposition that they might be interested in acquiring the use of a landing field in that vicinity. This resulted in the appointment of a Town committee to select a site, with an appropriation of \$250.00 to improve it. The place selected was a flat field east of the old Medway road, which had been reserved for possible future extension of the cemetery, and the appropriation was spent removing brush and doing a little grading. In 1931, it was pointed out that this location did not provide room for expansion, and a new committee was appointed -- there were half a dozen more before 1940 -- to find another place, and was given \$1,500.00 to work with.

This committee decided upon what had been the Town Farm of 31 acres, also east of the old Medway road, and this became the nucleus of the later much enlarged airport. Work was started in 1931, arrangements being made with the Company to deposit cinders there for fill and grading. By 1932, a strip had been levelled and gravelled, and by 1933 it was being used by a few small planes.

Late in 1933, a New Deal agency, the Civil Works Administration (CWA) made improvement of the airstrip one of several projects in Millinocket, contributing half the cost, and a larger area was cleared and filled with ashes from the mill. In 1934, the CWA disappeared, and the Emergency Relief Administration (ERA) took over, allotting three projects to Millinocket, one of which was expansion of this landing field. However, it required that the Town have at least a five-year lease on the property. This was owned by the Company, and in December it gave the Town such a lease on 60 acres of adjoining land in Lot 79, retroactive to January to meet the Government requirements. Under the ERA project, the North-South runway, 2,200 feet long and 110 feet wide, was nearly completed, an East-West runway of about the same length had been cleared, and some \$24,000, almost all Federal money, had been spent. In August, 1935, the ERA went the way of the CWA, and was superceded by the Works Progress Administration (WPA), an arm of the Public Works Administration (PWA). This agency required that the Town own the land on which it was going to spend money, and in October the Company donated the 60 acres covered by the lease. By the end of this year the North-South runway was surfaced, and the East-West runway was about half completed, the Town so far having spent only about \$4,000 on

the project. Early in 1936, the then War Department suggested that it would be interested in seeing both runways completed, and without going into all the complications arising out of this, by the end of that year, between the WPA, the Town and the Company, both runways had been surfaced and some work had been done on safety strips, the total amount which had now been expended amounting to \$75,000, of which \$6,000 had been contributed by the Town. In 1937, while some work was continued by the WPA in the community, it suspended the airport job in June, apparently in view of the improvement in general economic conditions. However, the slump in the newsprint business began to take effect later in this year, and the Town put some of the unemployed people to work on the safety strips. Scheduled service was started by Boston & Maine Airways in September, but we do not know just how long this lasted. By the end of the year, expenditures had reached \$112,000, of which the Town had contributed but \$9,000.

In 1938, the Company donated an additional 21 acres of land in Lot 79, and application was made for a WPA project to widen and lengthen the runways, but this got fouled up in town politics, which pervaded the airport scene from the beginning, and which we will not explore, and little was done. In 1939, however, although there was more local friction, work was continued; the North-South runway was improved, and 2,500 feet of the proposed 3,600 ft. East-West runway was finished. The Civil Aeronautics Authority established an office at the airport, and leased land near the Rice Farm from the Company for its radio antennae. At the end of this year, expenditures since 1930 had been run up to \$168,000, of which \$28,000, one-quarter of this being for the purchase of a power shovel, had been put up by the Town. In 1940, it began to look

as if the Millinocket airport might become important militarily, and an ambitious program of improvement, involving money from the WPA, the State and the Town, was proposed. The Company provided another 15 acres in Lot 79, this time at a price of \$1.00 an acre, and by the end of the year the North-South Runway was 3,000 feet long and the East-West runway, 3,600 feet long, was nearly finished, at which time the total cost had risen to \$242,000, only \$38,000 of which had come from the Town. In 1941, things got very complicated. It had been indicated that the airport was indeed of strategic military importance, and another major expansion, including extension of both runways to 5,000 feet, with lighting and drainage was proposed. This got hung up awaiting relocation of the highway around the north end of the North-South runway. This being resolved, the Company sold to the Town another 34-1/2 acres in Lots 53 and 79, this time for \$10 an acre, since nearly all the funds involved were coming from the government, and William A. Whitcomb was disgusted with the whole thing, feeling that it had grown out of all proportion. The Town condemned and took, under a 1931 law, 4-1/2 acres from the Cassidy and Webber estates, with whom they could not deal in any other way. In June, the Army Air Force inspected the field, and the Town offered to sell it to the Government for \$1.00, upon which they asked for 1,400 acres more land to be made immediately available for barracks, hangars, and extension of the runways. This was immediately agreed upon, but after considerable waffling, and in spite of political pressure, the Army decided not to proceed with the deal. The Town, however, went ahead with further improvements anyway, almost entirely with Government money, both runways being widened and extended to 5,000 feet. The remainder of the proposed improvements -- wider safety

strips, better drainage, and so on, were completed in 1942, much of the earlier work having to be done over. We have no figure for the total cost at the end of that year, but from the estimates for what was proposed, we would guess that it had reached at least \$600,000.

We have no further detailed information without research that does not seem worth while at this point. The airport was a scheduled stop for Northeast Airlines for a time, starting in 1939 or 1940, creating an insoluble problem of plowing in the winter, as neither the Town nor the Company had the facilities to meet the conditions laid down by Northeast. During the war, it was used quite frequently by military aviation for re-fueling and emergencies, particularly by the Royal Canadian Air Force, whose field at Pennfield, N.B., not many air miles distant, was often fogged in. The first Canadian military aircraft, incidentally landed in October, 1940, and it was shortly after this that the mill stacks were lighted -- this of course being discontinued during the blackout, when the fliers had to take their chances, one plane being lost, as we recall, not in Millinocket, but in the mountain area around Katahdin. After the war, with no commercial service and no Government money, the Millinocket airport deteriorated, reaching a point, as we remember, where the CAA would allow only limited use of one runway, and it was not until the 1950's, again from memory, that it was put back in shape, probably at the time the Great Northern Paper Company acquired its own plane. The CAA closed out its operation there in 1971 or 1972.

Immediately following the start-up of No. 2 machine, and while the hood and fans were being put up, work was started on

the installation of two new Trimbey mixing systems. These were placed on elevated steel platforms in the beater room, against the machine room wall, allowing the old unit in the middle of the beater room floor to be removed. At the same time, the crew began to get ready for the replacement of No. 3 paper machine. The new No. 3 was a replica of No. 2, opposite hand, and like No. 2 required a substantial amount of preparatory work as compared with the first machine, and the installation of another new broke beater. This being a left-hand machine -- that is, the drive was on the left as viewed from the winder end -- the fourdrinier rolled out into the aisle to the right, and in the middle of the aisle was the row of columns supporting the roof that had been built in two bays for wide machines. More by good luck than by good management, only one of these was in the path of the fourdrinier. This problem was solved by putting in two more columns, from the basement up, and bridging between these under the roof over Nos. 3 and 4 machines with a heavy truss to pick up the old plate girder, after which the column that was in the way was removed. Some basement steel also had to be relocated so that the broke beater could go in. All this took a long time, and permitted more work to be done ahead of time on the ventilating system -- building the fan penthouses on the roof and that sort of thing -- but although there was no let-up in the work, it was August before the old machine could be shut down. The broke beater, which of course was to serve No. 3 and the existing as well as the future No. 4, was put into service the first week in that month. The old No. 3 machine was shut down at 7 A.M. on Sunday, August 10, 1941. The tired men in the crew, who had been "right out straight", as they would have said, for more than six months, were still out to beat

their record, and did, the new machine starting up at 3 P.M. on August 21st, with a loss this time of only 9-1/3 days' production. This was when Great Northern got the name of being the Company that took only a week to install a paper machine; not quite true, of course, but flattering, and a compliment to the men who had brought it about. Later, another crew, containing many of the same men, would do even better. There was never any finer example of teamwork between the Engineering Department people, the contractor's crew and the mill workers, not only the maintenance men, but the paper makers working with them and the crews on the adjoining machines, who kept everything going in spite of the confusion of the construction all around them. These man understood the pride of accomplishment.

It had been decided that it was about time the rejections from the bull screens and the excess tailings from the groundwood fine screen system were kept out of the river, and installation of a Noble & Wood groundwood refiner was started in March. This was a long job, involving the removal of the old Improved knotters and the installation of a Jeffrey shredder and a battery of thickeners ahead of the refiner. The three deckers required were built in the shop from old parts. There were a lot of delays, and delivery was late on the refiner, it being September before it was ready for use, at which time not enough power was available to run it. In the meantime, two more Waterous fine screens were added to the groundwood screening system. An additional auxilliary flat screen for the rejections from the main screens was also added on Nos. 4, 5 and 6 machines.

By this time, many people were driving their cars to work, parking them wherever they could, mostly along both sides of the street outside the main gate, as there was no official parking lot. This resulted in a union demand for such a facility, the need for which was recognized, and in the summer of 1941 part of the flat ground between the Administration Building and Millinocket Stream was made into parking space. At this time, there was a short street -- Maple Street -- south of Cherry Street between Congress Street and Aroostook Avenue. This was incorporated in the parking lot. Two houses in the area were moved to new locations, one to a lot nearby, and the other across Millinocket Stream. It would have been cheaper to tear them down and build new ones. This allowed of running a steel fence in a straight line from the gate in front of the Administration Building to Millinocket Stream. Another fence was put up parallel to this, at the south end of the area designated for parking, which was graded. A steel stairway was erected from the parking lot level to grade near the easterly front entrance to the Administration, with a new walkway across the front of the building for access to the time office in the west wing, and the south end of Aroostook Avenue was graded down to an entrance to the new facility. This job provided little but space. The parking lot was unlighted and unsurfaced, and was an awful mud-hole at times, but it was better than nothing, and got the cars off the street. In later years, it was lighted, surfaced, and more than doubled in size by extension to the south and west, with a second entrance.

A substantial amount of peeled hemlock, all truck-delivered, was by this time being used in the sulphite mill, and a storage

pile at the mill became necessary to eliminate the expense of piling it down around the producing area so that it would be available for delivery at a uniform rate in all seasons. It could not be mixed with the spruce and fir in the piles, as it was either cooked separately or mixed with the other wood in controlled percentages. The trucks had also become a problem, as there was no really suitable place for them to unload, resulting in reduced turnaround and dissatisfaction among the truckers, who were hauling on contract, on a per cord basis. The dri-ki pile at Ferguson Pond, where there was no proper fire protection, had been discontinued, and dri-ki, along with excess culled wood, to be used for wrapper grade sulphite, was being piled around the west or "B" tower of No. 2 pile; hoisted up in sling-loads, as we remember, and shaken loose to drop in a cone around the tower. At any rate, in the summer of this year, there was a substantial pile of this stuff, well up to the top of the B tower, reducing the capacity of the pile for regular wood.

There was a good deal of discussion between Bob Hume, Roy Weldon and the writer about these two problems, the thinking at first being to build a stacker for hemlock north of No. 2 pile, but this was a long way from the wood room, and the idea developed that since hemlock was now part of the regular supply, it would not reduce storage to put it on one end of No. 2 pile, and that this could be done by building an uptake to the B tower, with a low-level feed conveyor, long enough so that trucks could be unloaded into it without delay. Hemlock could then be piled on one end and spruce and fir on the other, at the same time. This scheme was adopted, and we believe it was Bob Hume who suggested

that a damaged steel derrick on hand be repaired and set up for piling dri-ki at a point just west of the No. 1 pile, along the road coming down from the Stone Dam, to which fire protection lines could readily be run from the No. 1 loop. As nothing could be done on No. 2 conveyor until at least part of the material piled there was removed, the derrick was set up in August, a steam donkey engine being used for power on account of the shortage of electricity. Some of the dri-ki and culled wood was then cleared away from the west side of the No. 2 B tower and transferred to the new location, leaving several thousand cords around the other three sides.

The new uptake was to be a chain conveyor in a steel trough, on steel tower supports. The fire protection line also had to be extended and the loop around No. 2 pile closed, and the job was done as knitting-work for the construction crew. It was the middle of December before the steel girders for the new uptake got up to the top of the B tower, and while work was going on there, a heated rivet was dropped, going down into the dri-ki pile. This was frozen, and covered with six or eight inches of snow, and had it been regular pulpwood, the chances are that nothing would have happened, but there was a lot of punk and small stuff there, and it caught fire. This was a real mess, as the fire was down inside the pile, and while the pipe line had been hooked up, water from the nozzles froze on the surface and ran off, never getting down into the wood. To make things more interesting, the main from the fire pumps chose this time to break under ground, just outside the boiler house. This really did not make much difference, as the water was not doing any good anyway, and all that could be done was

to wait until a hole had been burned up through the pile, which took the best part of two days. By that time the line had been repaired; water could be pumped directly into the crater, and the fire was extinguished. We have taken some space to tell about this incident, as to the best of our knowledge it represents the only time that a fire of any magnitude has occurred in a Great Northern mill wood pile, excepting the log pile fire at Madison in the very early days. Since neither the B tower nor the new uptake were damaged, cleaning up probably cost more than the actual loss of several hundreds of cords of this low-grade wood. The job was immediately resumed, but as the new conveyor and uptake could now not be used until the next hauling season, they were not completed until August of the following year, the fire protection loop around the pile being completed at the same time.

Another new roof was put on the beater room building in 1941, the columns being reinforced and extended, new steel rafters put up over the old wooden roof, the walls bricked up to the new height, and a concrete roof slab poured, after which the old wooden roof deck and steel trusses were removed. This job was very slow, as all the electrical circuits had to be raised, and a great amount of piping moved; new fan houses had to be built, and it was not completed until August, 1942.

There were many more and much larger rubber-covered rolls now in use, and these had to be ground. The roll grinders, as we have noted, were in the machine shop, which was unventilated, and, when one of these rolls was being worked on, became filled with dust and fumes. The men, particularly the roll grinder operators, justly

complained, and in this year a blower and a wet-type dust collector, rubber dust being subject to spontaneous combustion, were provided for the roll grinder most used on this type of roll. This was also the year that the "Graf Spee" 2500 KW turbo-generator, which we mentioned in another place, was installed. We will not go into any further detail on this job, except to say that as usual in connection with any heavy installation in the boiler house, piling had to be driven under the foundation, and that the whole job was completed, and the unit operating in seven weeks, starting November 3d. As well as we can recall, the turbine bled at 135 lbs., and the exhaust went to a condenser. This generator was not run except when power was short, and the water supply to the condenser was adequate at this time. Later on, however, in another low water period, it was necessary to provide a separate water supply for it. We have pointed out in another place the reason for this installation; the desperately low water conditions of 1941. When this unit got on the line in December, there was only about six billion feet of water in storage, and everything imaginable was being done to stretch it out. Things were so bad that immediately following the turbine installation, a 600 h.p. synchronous motor was hooked up to No. 1 paper machine basement main line by a 48-inch belt, so that it could be driven from the paper machine engine. This unit was not ready to run until March, 1942, when there was no water in storage at all, and produced some power when machines had to shut down on this account.

Relatively little new work was done during the war years, but it did not stop altogether. Early in 1942, a 42-inch suction couch, which had been received late in the preceding year, was installed on No. 1 machine, making it like the other two. In

February, the work of blacking out the mill and the North Twin power station was started, all the windows and skylights being painted over or covered with plywood, this being completed some time in July, following which time there was a lot of adjustment to get some ventilation, and plant security measures, which may seem far-fetched from this point in time, but were taken very seriously then, were instituted -- wire mesh or bars over all the lower windows, additional protection around the transformer stations, sand boxes for use against fires which might be set by incendiary bombs, the creation of the force of armed guards mentioned in another place, and other precautions dictated by the Army or the Civil Defense authorities.

New gates were needed in the North Twin dam, but as steel could not be obtained, eleven of those north of the log sluice were coffered off in groups of three and repaired. As we have mentioned elsewhere, No. 4 machine was changed over in April to make creped paper. In June, a set of old calender frames and rolls were reconditioned and installed as a second stack on No. 6 machine, the basement line shaft being extended and one of the old spiral bevel gear sets resurrected to drive it, and the winder being moved ahead to provide space. An old beater was rebuilt and installed in the beater room; No. 4 jordan was piped over to No. 6 and connected up with a spare jordan installed for this machine, and the drive was changed to reduce speed, for the purpose of making the Twin Lakes Fibre sulphite sheet. A leak developed in laitence joints at the angle of the abutment at the east end of the spillway section of the canal at the Quakish dam. About 40 feet of steel piling on hand was driven into the earth dyke below it, the area was coffered off and the old joints were cut out and grouted

and a new concrete lining and facing were placed.

A ten-knife chipper, on order for a long time, was finally released by the War Production Board, on the ground that it would make less sawdust and hence save wood; a new spout was made by the Bangor & Aroostook shop in Derby, from material on hand at the mill, and another chipper was rebuilt and put into service in August, 1942. At the same time a one-man, horizontal four-foot hydraulic splitter, designed by the Engineering Department and built in the shop, was installed in the wood room, replacing the one that had been bought some years before.

The bark from the drums at Ferguson Pond had been being hauled a short distance and dumped below the dyke, between the drums and the North Twin road. This had built up to a height where the clearance under the power line to the drums was dangerously low, and the poles had to be jacked up, good-sized holes being excavated around each pole and filled with an island of earth. We might say here that a little later, as this bark pile was built out toward the mill, the face of it became so high that Frank Bowler warned that it might cause a bad slide, and the dump was moved over to the north side of Ward's Dam, filling the gully below it for a considerable distance. This was all right for a while, but the juice leaching out of it ran down Little Smith Brook, and was not appreciated by the people who later built homes on the Bowdoin Street extension. It was then moved to another place, but that does not figure in this part of our story.

In 1943, everything was at a standstill, there being only one job at the Millinocket mill. The electrical crew had never had a washroom of its own, there being as usual no space for one, but in this year some steel was salvaged from somewhere, and a bridge was thrown across the gap between the pump room and the generator room, the washroom being built on this, it being necessary to leave the clear passage between the boiler house and the generator room for the escape of water in case one of the penstocks should rupture. At least, this was Bob Hume's contention. This work was not done until December. Water conditions were very poor early in the year, and by late April there was none at all in storage. After that, things improved.

In 1944, there was a bit more action, but not much. Early in January, the 5-foot radial drill which was in effect requisitioned from the Ford Motor Company by the Navy on account of the essential work being done for it in the Millinocket shop was received and installed. This "defense" work and this particular incident have been discussed in another place. A small humidified paper testing laboratory, a temporary affair made of insulating board, was built, but we do not recall the location.

All the rest of the work of this year had to do with wood, which as we have seen, was the great concern at this time. Because there was not sufficient river wood to be able to hold any over in the water through the winter, to use before the new drive could get in, a much greater proportion of the supply was car wood, hauled and shipped during the winter, and in January, 1944, in order to get this unloaded and the cars, which were in short supply, turned around as fast as possible, and also so that more of this car wood could be put into the water, a side-track was run off the main line of the railroad, just above the North Twin Dam,

and a wooden tower, perhaps 40 feet high, was built in the water close to the shore, with a conveyor along the spur, and a chain uptake, so that wood could be dumped in a pile on the ice at this point. This stacker was used for several years, and was the scene of another near-miracle when the pile slid into the water with three or four men working on the top of it. Unbelievable as it may be, they all rode the slide like skiers, landing in the water unhurt. At some time before this, the Spruce Wood Department had built, along another side-track, also on the west side of the West Branch, a car unloading conveyor, discharging into the river. This conveyor, about 300 feet long, was, we believe, powered by an internal combustion engine. It was in hard shape, and in the spring was completely rebuilt in wood, on mud sills. Later in the year, it was possible to get plate to line it, and it was motorized, a power line being run to it from the North Twin station.

The wood that was being received at this time was mostly rough and green, and the drums were having a hard time with it, the bark often resisting several passes. There were not enough rossers to clean it up, and they were wasteful anyway. Starting in May, two barking machines, designed by Warren Daniell, Foreman of the groundwood mill at the time, were built in the shop. This machine was a species of hammer mill, with loose, swinging bars intended to pound the bark off the stick. It was not a spectacular success, but it did work. Its most effective use proved to be on partly barked wood being returned to the drum for another pass, the bark almost always coming off clean after

been massaged in this manner. This invention was patented and the sale of it was licensed, but we know of only one or two being bought by other mills, and its use by the Company was short-lived.

We have explained the reason for this difficulty with the barking of wood, and the eventual release to the Company by the War Production Board of three Allis-Chalmers hydraulic "Stream-barkers", two for Millinocket and one for Madison. The principle of debarking with high-pressure jets of water had been used in applications on the big wood on the West Coast for some time, and the Allis-Chalmers unit, designed for smaller wood was a life-saver for many Eastern mills at this period. It was simple enough in concept; and we will over-simplify still further; a chamber into which the sticks of wood were fed endwise, one at a time, by a conveyor; were picked up on worm-type rolls which turned them and worked them ahead at a controlled speed under a jet or jets of water at some 1,000 p.s.i., this smashing off the bark quite effectively, the stick then passing on to a short delivery chain. However, in detail, these machines required heavy foundations, high-pressure pumps and piping, the conveyor drives, and waste water and bark removal systems, and they used a lot of power. Space was of course a problem also.

Plans were being made for a hot pond inside the Millinocket wood room, with the hope that soaking the wood for a short time in this would help to loosen the green and frozen bark, but this was dropped when word was received that the Allis-Chalmers machines had

been made available. The engineering work was started at once, and preliminary construction was under way when the first machine arrived in July. Another haul-up was built from the pond to feed the machines. This was one of the first, perhaps the first A.P. Wyman job at the mill, his crew starting on foundation work late in August. Electric power still being scarce, it had been decided to drive the pressure pumps, which were placed in the basement, with steam turbines, which meant that a steam line had to be run from the boiler house. A hole also had to be cut in the west wall of the wood room through which to move the barkers into the building, where they were installed, side by side, crosswise the room, west of the barking drums. Feed and discharge conveyors, a steel chute to the grinder room sluice, and bark screens and conveyors were installed, and a concrete sewer was built in the basement for the barker water supply, which as we remember, was recirculated. This took a long time, and with slow delivery on everything that could not be made at the mill, the first unit was about ready, but had not been started up, when the second machine arrived in January, 1945. The first barker was started up in February, the second early in March. This second one ran only a few days when the feed rolls jammed and were wrecked, about a week being required for repairs, after which both machines were in service, and while there was more or less mechanical trouble with them, they were of great help. Much of the work that had been done in connection with these installations was necessarily temporary, and permanent equipment with some rearrangement for better efficiency, was not all installed until the middle of 1945.

To get the most out of these machines, every dog on the feed chain had to carry a stick, and this meant a man on each chain

around the clock. In addition, it was necessary to know how much wood they were barking. The only way to find this out was by a stick count, and this meant six more men, who did nothing else, a completely unproductive expense. This was one of the kinds of thing that kept you awake nights, and one of those nights the writer devised a counter -- a small jet of high-pressure water across the trough of the feed conveyor just above the chain, normally interrupted by the sticks going up it, but shooting through a hole on the opposite side at each gap between them, striking a target operating an ordinary manual counter. Bob Hume promptly said, as usual, that it would not work. Charlie Carrier said, just as promptly, that it would, and had one in operation in a few hours. It was accurate to within two percent, missing only when a clump of bark or something filled up the gap between the sticks. This is thrown in just to indicate the difference in the way these two men thought, which was important to them both later, as we will see.

Apart from the streambarker job, which ran into 1945, it was not possible to do much in this year either. What equipment could be obtained was mostly on a hardship basis, and came late in the year. Some additional heater fans were obtained for Nos. 1, 2 and 3 machines. The trunnions on the wood room barking drums had worn flat in spots, and through the summer and fall new ones were cast at the Foundry, machined in the shop, and installed, with some new shafting.

It will be remembered that drinking fountains had been installed around the mill some years before, but by the time the water got to most of these, it was luke warm. Late in this year,

it was possible to obtain commercial coolers, and 17 of them were installed. Only eight 40-cycle motors for them could be found. The other nine had either direct current or 60 cycle motors -- there is disagreement in the records about this -- and separate circuits had to be run for them. Later on, when 40 cycle motors could be bought, they were changed over. Other than this, no new work, except what were really capitalized repairs; new baffles in the boiler furnaces, a couple of digester linings, and the like; was done until almost the end of the year, and then only a small job.

Shortly after the streambarkers had been started up, the turbine exhaust was piped out to the yard pond and discharged under water through perforated pipe, in an attempt to heat up the water to help thaw out the wood. This accomplished little, as the volume of water in the pond was too great, and as it hurt to see this heat going into the air, the exhaust was piped back to the hot well in the boiler house. However, the idea was viable, and in November some steel piling was collected and driven down the middle of the pond, from the railroad bridge to the wood room, separating it into two parts, and the steam was piped into the westerly section, raising the water temperature appreciably, and wood which seemed to need the heat treatment the most was sorted into this side at the bridge. This system was of course not used in warm weather.

Before the end of 1945, the wartime restrictions were off on the use of steel, and in 1946 things began to get going again. The defense work in the shop had pretty well run out by that time, and the manufacture of special papers and pulping stock for other mills, on Government orders, was discontinued. The blackout stuff came down, as we recall, after VE day, and most of the security measures

were relaxed, although from that time on there was more consciousness of the need for a certain amount of protection.

The barking plant at Ferguson Pond was now nearly thirty years old, and the whole outfit was in pitiful condition. During the winter of 1945-1946 the old drums, foundations, drive houses and all, were removed; a temporary building was erected over the site so that work could be done under cover, a concrete mixing plant was set up, entirely new foundations and drive houses were built, new trunnion shafts were made and installed, and new bark conveyors were put in. New drums had been ordered, but could not be obtained in time to begin barking in the spring, so the old ones were patched, riveted and welded and put back on the new foundations and running gear, and the plant was ready for operation when the river opened up.

The receiving sections of the 8-foot drums in the wood room were worn out, and these were replaced with new ones in February. At this same time, the Millinocket Water Company's filter house was extended another 27 feet to the west, and two more sand filters were installed. We mention this in Great Northern work, as all the Water Company jobs of any size were done by the Company or its contractor.

In 1946, new, larger Filer & Stowell Corliss engines were installed on Nos. 1 and 5 paper machines; No. 5 in June or July, and No. 1 in December. These were complete new engines except for the flywheels, which had to be sent to Bath Iron Works to have the hubs bored out for larger shafts, and there was a long time interval in

each case between the removal of the old engine and the start-up of the new one, the machines being driven in the meantime by two large motors belted to the main line. The Spruce Wood Department's car dumper, mentioned earlier, was designed by the Engineering Department and built, on the west side of the West Branch, below the North Twin station, in this year, many of the parts being fabricated in the Millinocket shop. This was put into service in December, but trouble developed with the mechanism for holding down the cars and unlatching the swinging sides. This was re-designed and the changes were made in March of the following year, after which operation was highly satisfactory. A well to provide drinking water for the people in the North Twin station was drilled and piped up, air pressure being used instead of a pump for lifting. This water was not very good, and we do not know whether it was ever satisfactory. A new house, on heavier steel, was built for the movable coal drag engines, and three new steam engines were installed, we believe two on the trestles and one on the cross-haul. One of the engines replaced was the original equipment, in use for 45 years. The drive houses on the coal uptake conveyor and the bunker conveyor were rebuilt, and reduction gear drives replaced the old open spur gearing. In June and July, the new 10' x 60' drums for the barking plant at Ferguson Pond were received and were all installed, one or two sections at a time, by the end of July. The blower for the Holly system handling the flake sulphite gave out, and instead of replacing it, compressed air was piped in. As this put a heavy load on the mill air supply, a new compressor was purchased for this service, but delivery was very slow, and it was not possible to get it into service until December, although

the foundation for it was built in July. Another of the old wooden acid tanks was replaced in this year. There were four of these at this time.

The time clocks were relocated in this year, some changes being made around the time office area in the Administration Building. It is possible that new clocks were provided, although the record is not clear on this. A small, but very important addition to the groundwood mill equipment was a portable pump, developing 1,000 p.s.i., with which to wash the faces of the stones after sharpening, to remove loose grit. Some changes were made in the Chemi-pulp system in the sulphite mill, providing high and low pressure storage, supposed to produce stronger acid. This was a very small job, making a correspondingly small improvement. New vapor-proof lighting was installed in the chip conveyor uptake and the chip left; the Kinnear doors on the trainshed were motorized; sprinkler systems were installed in the machine room basement under all the machines except the three old ones, Nos. 4, 5 and 6; late in the year the old second sections of the 8-foot drums in the wood room were replaced, and starting in November, Nos. 1, 2 and 3 paper machines were speeded up. For this purpose, a fourth Bird screen was added to each machine, two second-hand units being purchased and reconditioned, and one on hand being rebuilt; new pulleys were machined and new flow boxes were built in the shop, and the changes were completed in February, 1947. Late in 1946, work was started on the Mutual Assistance Housing scheme, which we have discussed elsewhere, and the Company laid a water line from Cherry Street to the new Eastland Avenue, and built a new piece of street to connect the Cherry Street Bridge with Granite Street, this con-

construction later being turned over to the Town, along with the bridge. Up until this time, there had been only one way in and out of Millinocket, unless one counts the almost unimproved road up to Sourdnhunk Stream, across the Ripogenus Dam and out to Greenville, but in this year the State constructed a highway from Brownville to the West Branch below the North Twin dam, and although no bridge was built across the river at this time, it became possible to get in and out of Millinocket on this road, by way of the Company's road to North Twin, and across the North Twin dam. The highway bridge was built a couple of years later, and the Company turned the North Twin road over to the State.

So much work was authorized in 1946 that much of it spilled over into 1947, and 1947 was a very busy year, rather mixed up, for purposes of our story, as much of the work was started and then held up for long periods for lack of material or equipment or something. Three additional groundwood thickeners -- old units taken off the dump and reconditioned, were installed. New discharge sections, received and moved into the wood room late in the previous year, were put on the wood room drums, completing their replacement. The new locker room built for the mechanical crew had not entirely solved the problem, there being friction between the millwrights and the machinists, the latter demanding separate accommodations, and to keep the peace, the old boring mill, which had been set in the space between the original locker room and the east wall of the shop was relocated, the lower room was extended to the wall, the washroom section was rebuilt, and the east end of the room was partitioned off for the shop crew.

The old boiler house washroom was a dirty place, and a new one was built on a mezzanine erected under the electrical repair shop. A small locker room was also built for the storehouse people. All these locker room jobs were going on at the same time early in the year.

Part of the empty space on the third floor of the Administration Building's west wing was made into an office for the payroll and Social Security departments, the new N.C.R. payroll machines being installed there, a new stairway being built for access thereto. The Administration Building was re-lighted throughout, in two steps, with what were then the most modern indirect incandescent fixtures. The Apprentice Dormitory, mentioned elsewhere, with one room made into a shower room, was established in the Great Northern Hotel. Two more wooden acid tanks were replaced, and some changes were made in the Baxter grinder ventilating system ductwork. All this was relatively small stuff, and was mostly done in the period up to the middle of May, although some of it, like the lighting in the Administration Building, straggled out through the entire year, and the second acid tank was an October job.

It will be recalled that the digester house roof trusses had been patched up some years before. These were again getting to be in poor shape, and in May, work was started on a complete replacement of the roof. This was a slow job. The chip bins were shored up, and new steel was installed under them. The old monitor was removed, and starting at the north end of the building the roof was braced up from beams across the bins, two trusses were removed, and repairs were made to the tops of three or four columns. At

this point, early in August, the 24-inch beams and ether steel which was to replace the trusses had not been received, and the job was stopped, nothing more being done until October, when this material arrived. This was all coated with bitumastic; the remaining trusses were removed, two at a time; the tops of the remaining columns were reinforced, and the new steel was installed. As before, this was a touchy job, everything having to be bolted, rather than riveted or welded, because of the fire hazard. According to the available record, the new roof deck was of wood plank, as this was felt to be more resistant to sulphur fumes than other materials. A new monitor, on a steel frame, was built, everything was closed in by the middle of December, and the roof was covered temporarily with tar paper, leaving the permanent waterproofing to be done in the spring.

A second Noble & Wood refiner had been ordered early in the spring of 1947. An old decker was reconditioned to be added to the three previously installed ahead of the first refiner; a locker room in the way of the installation was rebuilt, and the decker was installed, but nothing more was done until July, when work on a new electrical circuit from the generator room was started. This was not finished until December, when foundations were built for the 800 h.p. motor, and the switchgear was installed. There really was no great hurry, as the refiner itself was not received until March, 1948, a year after it had been purchased, the job being completed by the end of that month. Falk gear units and new 300 h.p. motors had also been ordered early in the year for the Ferguson Pond drums, but delivery on the electrical equipment was slow, and nothing could be done until piling had been completed in November, at which time the two new drives were put in, the job being completed before the end of 1947.

The wooden tank of one of the original New York sand filters, 47 years old, went to pieces at this time, and a new one was purchased and installed. We do not remember what manner of surface, if any, was on the yard area bounded by the wood room, the grinder room, the sulphite mill and the tracks at this time, but the roadway down between the boiler house and the woodroom was paved with granite blocks, and in this year the above area was also paved with granite, requiring that a new and heavier roof be put on the steam tunnel along the west wall of the grinder room. Another ten-knife chipper was installed. The two brick chimneys were pointed and otherwise repaired again. In the fall, sixteen heaters were put in the machine room, where the problem of roof drip had not yet been solved. We have no recollection of this job, but would guess that these were unit type steam things, placed in the trusses, in an effort to warm up the roof.

It had been decided that in the following year a program of salvaging sunken wood from Ferguson Pond would be undertaken. Some awesome wood shortages had raised the question of how much sinkage there was, and a considerable amount of wood had already been taken from the bottom of Dolby Pond, with rather makeshift equipment. In preparation for this, two flat-bottomed scows, 24-feet long and 9 ft. 10 inches beam, were constructed, the second not being completed until early in the following year. This salvaging of wood went on over the next few years, and while we have no figures, it seems to the writer that between Dolby and Ferguson Ponds about 25,000 cords altogether was raised.

In September, 1947, Charlie Carrier was transferred to the East Millinocket mill as Superintendent, and his place was taken by Ivan C. Ames, who was then Assistant Superintendent at the Lower Mill, and who a few years later became Superintendent at Millinocket, at which time we will have more to say about him.

The first job started in 1948 was the replacement of one of the 1899 wood burning boilers, which had been condemned in 1946. This job had been authorized at that time, but it had taken a long time to get the new equipment, a problem all through 1947 and into 1948, everyone being busily modernizing after the hiatus of the war years. This was quite an extensive job -- in fact, a complete new little steam plant. A Mitts & Merrill hog was installed in the wood room basement, with a bucket elevator to a new waste conveyor in a steel housing on a new steel bridge between the wood room and the boiler house, discharging into a hopper with a screw feed. New forced and induced draft fans, air ducts, and an ash disposal trench and flush pipe were put in, and the northerly wood burning boiler -- No. 19 -- was removed. Extensive foundation work was done, and the old wood burning boiler room was completely rebuilt, the roof being raised in the process, involving very extensive changes in the electrical circuits, including those from the 1000 KW turbo-generator units, that ran through this area. New steam piping was run to the wood room, so that the stream-barker turbines could be run from the new boiler, and the exhaust line from these turbines was raised to a higher level where it crossed the roadway. A 200-lb. Babcock & Wilcox Sterling type boiler, with a Hoffft furnace and air preheater was then installed, getting on the line about the middle of November.

The other old wood-burning battery was left in place as stand-by, a chute being run to it from the new waste hopper.

While this was going on, a 2,000 h.p. Babcock & Wilcox boiler, with a Detroit Rotograte stoker, was being added to the main steam plant. This unit was located at the south end of the easterly bank of 755 h.p. boilers, the concrete ash tunnel from these being extended in February and March, along with the foundation work on the wood burner installation. Footings and basement supporting steel were put in during the summer, and apparently in this location it was not necessary to drive piling. Erection of the new boiler, with its air preheater, turbine-driven draft fans, dust collector, piping and auxilliary equipment was started in August, and the new unit was put into service in January, 1949, after which it took several weeks to complete pipe insulation and the permanent relocation of temporary pump installations.

The machine room basement had never been lighted by any plan, and visibility was very low -- not too healthy a situation with so much shafting close to the floor, and in this year new circuits were run between each pair of machines, and the area was reasonably well illuminated. Back in 1946, when Nos. 1, 2 and 3 machines had been speeded up, three No. 3A Bird Screens, a size larger than those in use for so long, had been authorized for No. 3 machine, but could not be obtained. This job was resurrected early in 1948, and the three new screens, with a new head box, were installed on this machine in May. A Cowan groundwood screen, which the writer understands was nothing more than the old Quiller

screen used away back in the early 1900's, modernized and turned on its side, at this time being almost universally installed in newsprint mills, and later standard with Great Northern, was received for trial and installed. We have found no record of the actual work, but believe that at this same time the old cast iron main groundwood line from the decker chest to the mixers, most of which was nearly 50 years old, was replaced, and in this year also, for the first time to the best of our knowledge, a runner had to be replaced in one of the I.P. Morris grinder turbines. A new larger Corliss engine was installed on No. 4 paper machine, following the same procedure as on previous such replacements, two motors being belted to the main line while the engine was out. The motor drive was made ready in May, but it was August before the old engine was taken out, and the machine ran on motors until October. In the meantime, preparations were already being made for the installation of a new No. 4 machine, which job we will take up shortly.

In 1948, the first cooking control, a Mason-Neilan system, was put into use on No. 2 digester. This digester had earlier been used, along with No. 1, for cooking culled wood and dri-ki. This kind of pulp was still being made. In fact, because by this time wood quality was better, and there was less cull, the Company had a contract for several thousand cords a year of Fraser Company wood being salvaged from the bottom of the Madawaska River and shipped to Millinocket by rail, and it would appear that the culled wood was being cooked only in No. 1, as over the next few years Mason-Neilan controls were put on all the digesters, two at a time, except that one.

The monitors over Nos. 9 and 10 machines, in which the exhaust fans were located, extended only the length of the dryers, there being skylights over the wet end. These skylights, as we have seen, were always a source of trouble, and the glass was falling out of them at this time. They were removed in this year, and the openings were roofed over. A complete new steel and asbestos hood, with a sprinkler system and some new fans, was put on the wrapper machine; and at this time or a little later changes were made to allow of using four dryer felts instead of two on this machine. An entirely new system of unit heaters was installed in the trainshed; new voltage regulators were installed on all the generators at the mill, including those on Nos. 7-8 paper machine drives; a fourth pressure pump was added to the grinder room system, in a temporary location, in anticipation of the installation of additional grinders. An automatic sprinkler system was installed in the digester house. The remainder of the usable space on the third floor of the west wing of the Administration Building was made into offices, part of the Spruce Wood Accounting operation being moved to that location. During the summer, this place became almost untenable because of the heat, and it was air conditioned, the first such amenity provided for any Company office, with the possible exception of the window units in the Boston headquarters, which we have mentioned, and which must have been put in along about this time. As we have noted in another place, what had been the chemical laboratory on the second floor of this wing was restored to its original use, and the Bureau of Tests was moved back to this location, only the pulp laboratory remaining in the basement. A print shop was also established in the basement at

this time, with a Multilith offset press to make forms and letter-heads which previously had been purchased from the local job printer, who now took over this new operation for the Company.

On September 29, 1948, a pulley broke on the basement main line of No. 10 paper machine, and ripped out the whole business from end to end, creating an unholy mess of smashed pulleys, fractured pillow blocks, sprung shafting, sheared keys, broken couplings, shattered concrete piers and twisted belting. No one was hurt. This created an instant emergency. There were nowhere near enough spare parts on hand to make repairs, and as we have said, at this time it was very hard to get any piece of equipment on short notice. The damage was surveyed, everything around all three mills and other mills in the state that could be used was located, and the Boston Office was given a list of what was missing. Every possible supplier of these things was contacted by telephone, and little by little, parts were gathered in from here and there. The mill shop and the Millinocket Foundry started making and machining pulleys and couplings, and the missing elements were gradually narrowed down to pillow blocks and some other parts, mostly castings of Rice Barton design and construction, and they, being completely loaded up with work, could be of no help. Thereupon, the writer prevailed upon them to take the unprecedented step of sending their patterns to Millinocket, and the final parts needed were cast at the Foundry. We have no idea now how long it was before the machine got back into operation; perhaps not as long as the difficulties might indicate; but there was a substantial loss of production.

Starting in October, 1948, the 1,500 h.p. motor was removed from No. 5 grinder line and replaced with a 4,000 h.p. motor, and the No. 5 stones were installed on the west end of this line and No. 4 line. This involved extending the steel platform at the south end of the room for the permanent location of the fourth pressure pump, and for a new locker and washroom at that elevation. The control room was extensively modified, additional exciter capacity was added, and the foreman's office was relocated on steel between the feed conveyors at the north end of the room. What was a spare 4,000 KVA transformer had already been installed the previous year. Some time before this, stainless steel liners had been put in all the grinder pits for cleanliness, and such liners were a part of this installation. At this time the remainder of the permanent westerly steel water conveyor was installed, and there was some remodelling around the entrance platform and the opening into the block tank. This job ran into the early part of the following year.

As noted above, work preliminary to the replacement of the new No. 4 paper machine was started in September, 1948, with the fabrication of sole plates, shafting, pulleys, couplings, and the like in the shop, and by late in October, work was under way on the electrical circuits, new foundations and steel in the machine room basement and on overhead trolley steel in the machine room itself. The Bird screens were moved to their new foundations, and a new headbox was installed by the last week in the year, by which time the Nash vacuum pumps had been set, a lot of new piping completed, the chutes to connect the new machine with the No. 3-4 Shartle beater had been installed, the work had begun on remodell-

ing the wire and couch pits. The old machine was shut down at 7 A.M. on Sunday, January 30, 1949, and was out of the mill by noon on Monday. The winder, reel and stack were moved ahead, and the new machine, duplicate of those previously installed, started up at 8 P.M. on February 10th, lost time being 9-2/3 days, only a few hours more than on the previous job. However, this machine was started up without the Multipress, which had not arrived. This was put in on Sunday, April 3d, with no lost time. Meanwhile, there was of course the usual stuff to clean up -- the new hood and fans, sprinkler system, more trolley steel, lighting, painting and so on -- all completed by April 18th. For comparison with the No. 1 installation, the No. 4 job cost \$908,343.

While this was yet going on, starting early in February, work had begun on No. 5, a duplicate machine, except that by this time the shake theory had been more or less discounted, and it is our recollection that while the frames of No. 5 fourdrinier were designed to take a McDonnell roll, no roll was installed. The pier for the drive was built, however, in case it should be decided to add the shake later. This time the crew was out to see just how fast a machine could be installed. The preliminary work, beginning with the new broke beater, to serve this machine and No. 6, followed very much the same pattern as that of previous jobs, and we will not repeat any of this description. There was a little more of it, as the old Bird screens had to be overhauled, one by one, and perhaps a little more was done ahead of the shutdown; for instance, the skylights were removed and the fan penthouses were built, this along with the same work being done at the end of the No. 4 job. Perhaps a few more sole plates were

laid, the wet broke disintegrator was put in place, and the driven rope sheave on the main line was changed, but essentially this part of the job was about the same as on the other installations. There was just so much that could be done with the old machine in operation, and it was late in July before it was completed. However, more careful preparations were made for the installation of the new machine itself. By this time it was pretty well known from experience what the critical path would be. All the parts of the new machine were laid out in the paper room, the finishing room, or outdoors, so that they could be reached in order, without moving anything else, and were marked and charted. A system of traffic control for the movement of parts was set up, so that pieces going to one part of the machine would not have to wait for those going to another. Improved arrangements were made for meals; fire watches, on account of welding, were appointed, and the augmented crew, organized in two twelve-hour shifts, was briefed on all procedure in advance.

The shut-down was scheduled for Sunday, July 10, 1949, but the wire tore off at 10 A.M. on Saturday, July 9th, and as everything was ready, the demolition crew went right to work. As the mens' schedule had not been set up for a start at this time, all work stopped from 5 P.M. Saturday to 8 A.M. Sunday, after which it went ahead on a 24-hour basis. This is one time when we do not have the date for the start-up of the new machine almost down to the minute, but it was on July 19th, and the writer's recollection is that there was stock on the wire at about 9 A.M., and paper on the reel before noon. If we figure this right, the lost time was approximately 8 days, 2 hours, and had it not been for the early

shut-down, the lost time might have been some 13 hours less. This was a new record, but it too was to fall. The total cost of this job was \$971,286.

The sulphite mill began to get some attention in 1949. In addition to the installation of the cooking controls, which continued into this year, the sulphur and limerock storage rooms were rebuilt, with new concrete floors and roofs, and improved space for handling the materials. The sulphur burner room was rearranged, with some rebuilding. The inadequate combustion chambers, made out of old sulphur burners, were replaced with much larger ones, built from discarded barking drum shells. The antique gas cooler, which at some time in the past had been supplemented by a sort of pre-cooler of large cast iron pipe out over the roof, down to near grade just north of the building, and back and forth in four or five loops of straight runs and return bends, was replaced by a modern Chemi-pulp gas cooling system. This went into service in October. In the meantime, a Cowan screen was tried out on sulphite pulp, in a temporary set-up.

In this year, the steam donkey engine and winch on the dri-ki derrick, still in use, was replaced with an electrically-driven hoist. We are not sure exactly when the production of dri-ki and culled wood pulp was discontinued, but it was not long after this. It was being supplemented at this time by purchased kraft clippings and old kraft cartons to make the stronger wrapper that conditions required. A new hot well was bought and installed in the boiler house, replacing the 1924 unit, which had become unsafe. Some changes were also made in the mixing systems for Nos. 9 and 10 machines, running into 1950.

This was another very poor water year, the worst of the drought period that had begun in 1947, and a number of moves to gain power -- the construction of the pumping station at Millinocket Lake, the installation of the second-hand 2,500 K.W. turbo-generator at the Lower Mill and the diesel generating plant at Dolby, all discussed in other places, were all under way and in one stage or another of completion in 1949 -- and in this year a considerable amount of outside groundwood pulp was being purchased. This became something of a problem, as the old beaters were gone, and the location of the lap shredder, away at the south end of the beater room, was unhandy. Late in the year, a new Jeffrey shredder was installed in the southwest corner of the wood room basement, a 16-inch line being laid underground from this to one of the grinder room stock spouts, and a white-water line run from the grinder room to the shredder tank, so that shredded pulp could be put through the groundwood screening and refining system. A belt conveyor on a wooden trestle on mud sills, with a steel chute down into the shredder, was built along the track west of the wood room for unloading cars, and this outfit was put into use in February, 1950. The use of the pulp lap tunnel under the mill had long ago been discontinued.

All the work done during the early part of 1950 was carry-over from the previous year. The first new job started with another replacement of the 8-foot barking drums in the wood room, new shafting, bearings and trunnions being made at the mill and installed on the old drums, this work not being finished until August, by which time the new drums had been received. In previous replacements, the west wall of the wood room had been torn

out to get the new shells into the room, but now the stream-barkers were in the way of doing this, so part of the south wall was removed; a door, big enough for these and future drums to go through, was made there, and the installation was completed by the middle of October. These small drums took a bad beating, as they ran the year round, while the bigger ones at Ferguson Pond, which lasted so long, were run only during the summer.

The Cowan screen had worked out well on sulphite, and in March work was begun on the replacement of the old worm knotters and the ten old Baker & Shevlin screens with four Johsson vibrating knotters and four Cowan fine screens. This was a very substantial job, requiring a great amount of electrical work -- as a matter of fact, new circuits, in conduit, were run for almost every new job, so that the old open wiring was gradually replaced -- a lot of steelwork; raising part of the screen room roof by building a large steel and cement plaster monitor; running a new thinning water line, which was provided with an Elliott strainer; putting in temporary pipe so that the old system could be torn out, and new foundations and supply and discharge spouts. This kind of problem was typical of most such jobs, as there could be no interruption of production. The concrete discharge spouts were lined with glazed tile, the first use of tile that we know of in the pulp mills, although tile white water tanks had been installed in the machine room basement, and tile had been used in the rebuilding of the wire pits for the new machines. For the last few years a consciousness of the value of corrosion-resistant material and of smooth, impervious interior surfaces in stock handling and processing facilities had developed, and while

the mill was still full of cast iron stock piping, quite a lot of "Lithcoat" plastic lined pipe had been used on new jobs. This material was very popular for a while, and even screen drums and screen plates had been Lithcoated. Stainless steel was being used more and more, although there was still some resistance to it because of its high cost. This dissertation aside, the sulphite screen job was completed in November.

Much earlier in the year, a new core machine, replacing the home-made equipment, which had given good service, but was worn out, was purchased, but underwent considerable modification in the shop, and was not installed until early in 1951. Yet another wooden acid tank was replaced. An additional hot well and heater installation was made in the boiler house, two new tanks replacing the remaining old one. Eleven new monitor towers, most of them 60 feet high, were erected around the wood piles.

We have explained the need for the big wood piles, dating from the early days when practically all the wood supply was driven down the West Branch, and enough had to be taken out and piled before freeze-up to run the mill during the winter, leaving at least enough in the water in the mill holding grounds to run on after the piles had been used up, and before the new drive came in. We might say here a little about some of the less obvious problems which arose out of using and piling river driven wood.

The measurement of all the wood cut eventually had to check out with, or be adjusted to, the amount used, as determined by weighing the paper as it left the mill, this weight being multiplied by a formula supposed to account for the losses of wood in

the process, and adjusted for the weight of cores and wrapping. The scale on the pulpwood put into the drive at various points was of course known, and the figure on each year's wood was kept separate. Car and truck wood came in small increments, which could be measured accurately as it went directly into the mill or into the pile, but there was no real way to know exactly how much of the mass of wood supposed to have been put into the West Branch came out. There could be, and sometimes was, quite a difference, usually on the downside, and efforts were made to be forewarned of any such condition, the action centering on the wood piles.

The wood going into the piles was roughly measured by stick counts, made every so often each shift, for some specific length of time. The piles, when completed, and at intervals during the winter, were measured for volume by the Engineering Department, and the amount of wood left in them was determined by applying a figure for the number of cubic feet taken up by a cord of wood piled in this manner, this figure being changed from time to time by test, but remaining fairly constant. Ideally, the piles would last until just after the river opened up in the spring, and after accounting for supplemental deliveries of rail and truck wood used during the winter, would check out to contain the amount they were supposed to. If they fell short or over, the difference was put back into, or taken out of, the wood left in the river, as might be indicated, on the assumption that it had never been piled, or that more had been piled than estimated. This was sometimes a little ridiculous, as there was clearly not that much wood in the pond, but there was nothing else to do until the last

of what had been left in the water -- the "old" wood -- had been used up, it having become the practice to run a boom behind this, to keep it from being mixed with new wood coming down in the spring drive, or wood delivered at the North Twin unloading plant during the winter, and allowed to run down into Quakish Lake. This did not always work, because the drive was not always clean; some wood being left back somewhere to be driven the following year, which fouled things all up. This led to an attempt to account for the river wood going to the mill in another way, two measuring pockets being boomed off at the lower end of Quakish Lake, to be filled and emptied alternately, the average amount of wood each would hold, taking into account prevailing wind direction and velocity, which had a great deal of effect, being determined by test. This system really was fairly accurate, but nobody believed it until a little later, when a small organization, independent of the Spruce Wood Department and the mill, was set up to make sure, among other things, that there was a clean drive each year, or to account for any wood held back. These people made **aerial** photographs of the measuring pockets, and other tests and counts indicated that they did produce quite accurate figures. We used the word "ideally" a little back, but weather and other factors often produced less than ideal conditions. Every so often there was a late spring; the piles ran out, and it became necessary to blast wood out of the ice in Ferguson Pond to keep the mill going. On the other hand, in an early spring, the mill, to save money, sometimes went to the river, leaving a substantial amount of wood in one or the other of the piles, which became buried up in the new wood put out during the summer, making the Accounting people most unhappy. All this is just by the way,

and has nothing to do with what comes next.

As consumption went up, the proportion of the wood supply delivered by rail and truck had been increasing. This wood still had to be hauled out of the operations during the winter. In the peeled wood era of the 1930's, a lot of it could be delivered and used directly in the sulphite mill, or could be put out on No. 2 pile, when that was arranged to handle car wood, and during the shortages of the war years it had been necessary to load and deliver wood as fast as possible, regardless of the season. However, with more normal conditions, there was much more car wood than could be used directly, and it had to go into water storage at the mills, hence the unloading facilities at North Twin. For East Millinocket, almost all wood had to go into the water, as there were practically no facilities for handling it from cars there, which was the reason for the trestle at the Cape. Even during the war period, East Millinocket wood had to be unloaded at Millinocket and driven down into Dolby Pond. The car dumper at North Twin had been so successful -- it could unload a car in about five minutes -- that in 1950 a second installation was made for the Spruce Wood Department on the west side of Millinocket Stream, just below the Millinocket mill, to handle unloading for East Millinocket. A new track had to be laid here, and a power line run to the site; the North Twin transmission line was raised for more clearance; a concrete discharge apron was built down over the bank of the stream; housing for the pumps and the shifting engine was put up, and the first car of wood was unloaded there in December.

We might say that at this time wood was also being unloaded from trucks by hand into the river below the North Twin Dam, into Millinocket Stream on the Little Italy side, and into the Dolby tailrace, the trucks, which were then being loaded shotgun fashion, with no tailgates, being backed onto cribwork along the edge of the water. This was a dangerous operation, particularly at Dolby, where the cribwork was high and the current swift. Safety belts, hooked to rings sliding on an overhead cable were provided, but they were widely ignored, as were life jackets. In 1952, an unloading device -- a platform onto which the truck could be backed and chained down; the river end pivoted, the other arranged to be raised by a hydraulic jack, allowing the whole load to slide off -- was built and installed at Dolby. A little later another was built on Millinocket Stream. This rig worked very well, and was equally effective with the larger trucks with drop tailgates, loaded two tiers crosswise, which had come into use a few years back.

A second runner was replaced in one of the grinder turbines in 1948 or 1949 -- there may have been replacements other than this and the one we mentioned earlier, but we have record of only these two in all the years that these wheels had been in use. In 1950, one of the draft tubes had to be replaced. As we recall, it had broken off under the floor, and had been left in that condition for quite a while before the repair was made. The sixteen Bird groundwood screens were taken out in this year, and were replaced by ten Cowans. This should have been done long before, and had been proposed several times, even before the war, but William A. Whitcomb, in his lifetime, had delayed, always

looking for a super-screen of some kind. This was another formidable job, started in August with the usual electrical work, before the sulphite screen installation had been completed. Stainless clad supply piping and tile-lined discharge spouts were used. Two of the new screens were set up in a temporary location, allowing the removal of four old units, which were replaced with two new ones, and so on, the last move, except for the usual final details, being to set the first two Cowans in their permanent location. This job was not finished until June, 1951.

A new wooden roof was put on the block tank section of the grinder room in 1950; new electric time clocks were installed in the time office; improved lighting, on new circuits, was provided for the machine shop and J.O. Ross Engineering Co. finally sold the Company a Grewin system, which was installed on the wrapper machine in November. The new line for condenser water for the old 2,500 K.W. turbine, previously mentioned, was put in during this year. The available record does not show from whence this line took water, and like many things, it has not seemed worth while to do the research necessary to find out. A new 4-inch pipe threading machine was bought for the shop, to replace the original unit installed when the mill was built fifty years before. It had threaded a good many miles of pipe. There were some routine but capitalized changes in broke and white water pumps in various places throughout the mill, most of this work running into the following year.

In 1950 and 1951, as part of the writer's accident prevention program, and following the example set at Madison, where its

effect had been startling, almost the entire interior of the Millinocket mill was repainted, the old familiar dingy gray giving way to coded colors; all the machinery a light green; walls and exposed steel a paler "vista" green with a darker dado; guards and safety railings black, yellow or striped these two colors; all motors, conduit and switch boxes a bright light blue; ceilings, where they could be painted, white, and the fire and sprinkler piping of course red. Much of the piping, except insulated pipe, and the outdoor steel, was left the dark gray. None of these colors seemed to be fitting to the huge scroll cases of the water wheels, and these were painted a very pale gray. Along with this, of course, went a general clean-up, the repair of bent sewer gratings, loose floor plates, and the like, all making the mill a much more inspiring place in which to work.

In 1951, about the first new job was the construction of a locker and wash room in the wood room. This was another one of those things that just could not be done, but the writer, who little by little was making inroads on the washroom situation, figured out how to put it up on stilts along the west wall, and Ivan Ames needled Bob Hume into grudging approval. This, like all other such facilities built before it, was of steel lath and painted cement plaster, with a bare concrete floor -- there was no tile for washrooms yet. This job was finished early in April, at which time work was under way in preparation for the replacement of the last old machine, No. 6. It is perhaps needless to say that the new machine, except in some small details, was exactly like the other five, and we do not believe that any McDonnell roll was put in, although the fourdrinier

was designed for it. As a matter of fact, we believe that all the other shakes had been shut down by this time. They had made some visual improvement in formation, but added little if anything to the printing quality or strength of the sheet. Although the new machine was not actually installed until 1952, most of the preliminary work was done in 1951, and we will cover it here. This was the last replacement, and the boys intended to outdo themselves. The preparatory work again followed much the same course as that for the other machines, new electrical circuits being run, the flow box and head box built, sole plates cast at the Foundry and machined in the shop, along with parts not furnished by the machine builder, and a new machine chest put in -- and incidentally, we have not previously noted that these chests on all the new machines were of steel, figure-eight shaped in section, the two compartments open into each other, with a vertical paddle-type agitator in each -- the relocation of old pumps and pipes and the installation of all possible new pumps and pipe, the alteration of the wire and couch pits, the building of new screen, calender stack and winder foundations, the relocation or renewal of basement supporting and auxiliary steel, including lowering the floor back of the dryer section to accommodate the new drive units -- this had been done on all the new machines -- new overhead trolley steel wherever it could be put up, the building of such new concrete piers for the basement line shaft as could be poured with the old drive in use, the fabrication of the new main line parts -- shafting, couplings, bearings, and such pulleys as did not come with the new drive, the erection of steel for supporting the basement felt rolls and stretches, and the installation of the bottom dryer felt rolls, always the first part of the machine to be received, the relocation of the

motor generator set for the winder, the construction of basement sewers and the chutes to the already installed broke beater, and everything else that could possibly be done was done. The screens were moved back to their new position in November, and the old foundations were removed, the usual wooden spout being put in between the screens and the flow box. The winder was moved ahead to its new location in December.

While all this was going on, a new engine had to be installed. The old machine was belted up to the two motors, as usual, late in June. The old engine was removed in August, and the new one, with the new driven sheave on the old main line -- all these machines were intended to run at about 50% higher speed than the old ones; around 1100 f.p.m., but were designed and the dryers were balanced for 1400 f.p.m. -- was started up on October 15th.

The preliminary work, which took a lot longer than that for the other machines, carried into 1952, dragging a little toward the end. It had been nearly a year since the job had been started; and other work around the mill had suffered. However, everything that could be done was done by the middle of February, 1952. Normally, the old machine would have been shut down immediately, but possibly to complete the installation of a new air compressor, a job that we know was in progress, and additional air capacity would be required during construction and after the new machine was in operation, there was a delay of two or three weeks, of which the mill took advantage to make even more elaborate preparations than were made for the installation of No. 5, scheduling crews and laying even more careful plans. Unfortunately, the Engineering Department reports, usually meticulous about dates, are

vague on this point, but by reconstruction, we can say with considerable assurance that the old No. 6 machine was shut down at 7 A.M. on Sunday, March 9th, and that the new machine had shipping paper on the reel about 9 A.M. on March 18th, which, again if our arithmetic is right, meant total lost production time of seven days and two hours -- we have of course not counted Sundays, when the machines would have been down anyway, in any of the lost time figures -- a record probably never equalled on any machine installation. The usual final follow-up work on this job ran along by fits and starts through almost all of 1952. Without the engine, it cost \$1,113,937, as compared with \$461,000 for the first replacement in 1939, and that included a new broke beater.

Further changes in the arrangement of the interior of the Administration Building were made in 1951, primarily to enlarge the drafting room, provide a file room and a conference room, and make an office in this building for the Electrical Engineer, all very simple; painted plaster walls and bare battleship linoleum and some prefabricated steel partitions -- wood panelling, wall to wall carpets and brightly colored contemporary furniture were many years away -- and the old building still retained most of its 1913 atmosphere even at this time.

Nos. 7 and 8 steel outside groundwood storage tanks were erected in 1951, it being necessary to drive wooden piling under the foundations, the area in which they were located apparently being fill from the old construction. There is a discrepancy in the numbers in the construction records, which refer to these tanks as Nos. 6 and 7, but No. 6 had been put up in 1939. This perhaps was because one of them was being used for storage of sul-

phite, not groundwood. Plans had been made for a new locker room and washroom for the paper makers, who were objecting to having to go away down to the beater room and then back through the hot machine room after having showered and changed to street clothes. This was to be located, as had become the usual practice, on a mezzanine in the machine room, built against the finishing room wall starting about in front of No. 2 machine and extending southerly. Steel for this room, and for a new office for the foreman, to be located in the northwest corner of the paper room, was received in July, but no work was done on these facilities in 1951, being held up until after the installation of the new No. 6 machine.

However, in 1951 a new steam line, supported on wooden poles, was run to the filter house, and hypoid drives were put on the calender stacks of the wrapper machine. A new American La France 750 gallon pumper of the latest design was purchased and placed in care of the Town, replacing an earlier engine furnished under the arrangement we have noted in another place. A new crossing for the transmission line was built at Dolby, and some new switch-gear was installed there. In this same job, three second-hand single-phase 25 cycle transformers, as we recall for 6600-550 volt step-down, which could be used on 40-cycle current, were installed at the transformer station back of the boiler house at Millinocket, and another river crossing, from wooden poles north of the Little Italy substation to the boiler house, connecting with these, was put in. We are not sure of the reason for this, but to the best of our recollection, it had to do with using more Mattaceunk power at the Lower Mill, and more Dolby power, at low voltage, at Millinocket.

With all the new work we have described going on, maintenance had been somewhat neglected, and while this is from memory, as there is no record of repair work, we believe that after No. 6 machine was put in there was a massive maintenance effort during the Sunday shut-downs, particularly in the grinder room, where things were in pretty bad shape. This went on for more than a year, with every mechanic who wanted to working every Sunday at time and one-half. Double time was not paid for Sunday work then.

On October 1st, work was started on the installation of the fifth four-foot grinder on No. 6 line, and 4,000 h.p. motors on Nos. 4 and 6 lines, this involving substantial changes in the control house in the grinder room. With this and No. 6 paper machine the only jobs in progress, we come to the end of 1951, the 50th full year of operation at the Millinocket Mill.

Looking back over what we have written, we find many things that may seem of little importance. Really, nothing was unimportant. One of those old acid tanks could send a flood of acid down into the screen room, and a broken pane of glass falling from a deteriorated skylight could split a man's head in half. We are sure that there are those who would remember things differently, or would interpret them more correctly. We can only tell it as we saw it or recall it. We have left out much, including one of the most important things of all; the names and records of many of the men who directed all this; but there were so many. So many. Bill Russell, the one-armed foreman of the wood room for thirty years; and Jim Wilson; Jack Farquhar, long-time yard boss; Larry Gregson, who preceded Warren Daniell in the groundwood mill

and Fred Marden and Leroy Maynard who came after him; Charlie Cobb and Bill Dean and then Franz Dolliver in the steam plant; Mel Embleton, who, after Bill Hinton, ran the sulphite mill for twenty-five years; Charlie Pennings, who presided over the paper room for some forty years, with Scotty Robertson before him and Vern "Medway" Hale after him; Parker Crabtree, electrical foreman for over thirty years and Andy Hume, the electrical maintenance foreman; Rome Thorndike, Master Mechanic from away back, and Charlie Thorndike for some thirty years after him, and Jack Fahey; Fred Bagley and Joe Mooney and Frankie Emery in the finishing room; Stan St. John, storekeeper for almost thirty years, and Ray Oliver and Mahlon Spruce; and the Engineering Department people, gentle old Mr. Richards and Roland West and Irving Harris and Ralph French and the stenographer and man-of-all-work, George (Milton) Jordan, and Vic Cram, the temperamental but highly capable construction engineer, and Mr. Construction himself, Chick Montgomery, whose works are to be found all over Northern Maine, and old-line Bureau men, like Earl Bruce and Eddie Dore, and Lewis Fling and office-types like Charlie Holden and June Danforth and John Bailey Brown and Elizabeth Walls and John McVey and Frances MacDonald and Bobby McMahon. Let no one whose name is not mentioned think that these are people selected for special mention, although they all deserve it. They are just names that come readily to the writer's mind as he thinks back over this period. They are all gone from the Company as this is written. There were others, contemporaries, and there were those who came before them, and there were those who will be mentioned later. Nor do we forget the other hundreds upon hundreds of people of all levels who worked with their minds and their

hands to do the things that got sticks of pulpwood made into rolls of paper and loaded in freight cars, which is what it was all about. The list is endless. There were very few of them who did not "give the best they had", in good times and bad. It is true that in 1951 the work ethic was not as strong as it had been in 1901, but the great majority of Great Northern people felt that they ought to do a fair day's work for a fair day's pay, and that was in the tradition of the old Company.