LOGGING AND DRIVING MARITIME PINE

Thesis for the Degree of M. For.

Earl C. Sanford

1919

L O G G I N G A N D D R I V I N G

M A R I T I M E P I N E

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THESIS

I N D E X

A P P E N D I X

On the Courant.

LOGGING AND DRIVING MARITIME PINE.

Organization of the First Forestry Regiment.

At the time of the entrance of the United States into the "World War", our allies were greatly in need of specially skilled men and it was on their advice that special regiments of Forestry and Railroad Engineer troops were organized and sent to France among the first troops that went abroad. The first Forestry Regiment to be organized was the Tenth Engineers, which was mobilized at American University, D. C. during the month of August, 1917, and sailed for foreign service September 10, 1917. It landed at Glasgow, Scotland, traversed England rapidly, crossed the channel, and went into concentration camp at the old city of Nevers to await the arrival of the American made equipment with which it was to work and to perfect plans of operation.

Areas Allotted to Company "B".

At Nevers the "advance party", which had been securing timber for American exploitation, joined the regiment and furnished maps and other data concerning the timber areas which had been purchased, which enabled the commander to dispose of the regiment most effectively for purposes of lumber production. Half of Company "A" went to Lambel-Camors in Morbihan, Brittany, where they operated in Scotch pine. The remainder of the first battalion, comprised of the remainder of Company "A" and Compa-

panies "B" and "C", was detailed to the Department of Landes, in the southwestern part of France while the second battalion was scheduled to work in eastern France.

The main part of the first battalion was located some sixty miles southwest of Bordeaux in the vicinity of Pontenx-les-Forges, the part of Company "A" being two kilometers east in the Forest of Burricos; Company "C" four kilometers northwest in the Forest of Labroquette, and Company "B" seven kilometers northwest in the Forest of Ste. Eulalie. The map in the appendix shows the areas allotted to Company "B" in their relation to the little village of Ste. Eulalie, to the Courant River, to the Etang d'Aureilhan, and to each other. It is with the logging of these tracts that this article has to deal.

Topography.

The timber tracts which were to be exploited by Company "B" were situated about five miles from the Bay of Biscay, part of them being in the famous "dune" region and part of them in the flat country just back of the dunes which had formerly been swamp land. There were a few dunes east of the Courant River, but, in general, the line of the river marked the division line between the dunes and the flats. Both the dunes and the flats had been reclaimed from a vast waste by draining and planting. The "dunes" are simply banks of sand blown from the sea shore and piled up like hugh snow banks to heights of from one hundred to three hundred feet.

There is usually a flat, varying in width from one or two hundred feet to as many yards, between the base of one dune and the base of the succeeding one. The west slope of each dune is generally long and gentle, while the east is short and abrupt. While the entire dune region is loose white sand, the flats between the dunes are somewhat firmer than the dunes themselves and are not only easier to log, but are also of advantage in affording means of approach to the dunes.

The flats east of the dune region are the areas which were not reached by the drifting sand, but which were converted into marshes by action of the wind in piling up the sand in dunes between the flats and the sea, thus cutting off the drainage. The soil of the flats is quite firm when dry and presents a satisfactory surface for logging. In the process of reclamation, however, a very great number of open ditches were dug in order to drain the flats, and these were often the source of considerable inconvenience in the logging operations.

Timber.

The timber on these parcelles was the same as that covering practically all the Landes region, i. e. Maritime Pine. Each parcelle was even-aged and the range of ages for all the parcelles cut was between 50 and 75 years. The timber on the flats was taller and of much better quality than that on the dunes, being straight and sound and attaining, at an age of 55 to 60 years, a height of 100 feet and a breast high diameter of

Turpentine "Faces" - Lettot Parcelle.

Cones of Maritime Pine.
Major David T. Mason.

15 inches, although many of the trees were much smaller.

Turpentining.

In accordance with the custom in this region, all the trees of these tracts had been resined since attaining an age of 15 or 20 years and showed, in the butt log, evidences of seven or eight faces. In the vicinity of each face the wood was densely impregnated with resin and it was thought, at the time that driving this timber was first contemplated, that this would influence the floatability of the butt logs unfavorably. It also appeared in the woods that the faces would make excessive slabbing necessary at the mill, but it was found that ordinary slabbing would take care of the faces but that heavy slabbing was occasioned by the great amount of crook in the first log.

It is notable that under the French system of turpentining cupping goes on year after year until cutting of the timber is scheduled under the system of management and that dead trees are entirely unknown.

Reproduction.

Normally the forests are kept free from undergrowth of all kinds in order to permit of easy access and convenience in the collection of resin and in making thinnings, as well as to minimize the fire hazard. On the moist flat lands there is a heavy growth of bracken which is cut each fall, placed in compost heaps with stable refuse, and used on the land as fert

lizer. In these yearly cuttings of undergrowth bracken, gorse, heather and reproduction are removed so that the forest is left quite park-like in appearance. This was the case with the parcelles on the flat land east of the river, but the cuttings had not been made west of the river, except on two dunes, and the reproduction had come in densely. It ranged from knee high to fifteen feet tall and stood so thick that it was impossible to ride a horse through it.

According to the terms of our contract of purchase, it was necessary to cut all underbrush level with the ground before proceeding with the logging.

Stand by Parcelles.

The following table, prepared from data furnished by French foresters, shows the stand by diameter classes in each parcelle, with the exception of Lettot, of the tracts purchased from M. Thevenot and which were logged in the Aureilhan-Courant operation. The estimates of defect and board feet equivalents were made by American Forest Engineers.

Parcelle.	No. of Trees by Diameter Classes.							
		30cm	40cm	50cm	60cm	70cm	80cm	Total
Le Pioc	164	836	1874	308	9	0	0	3027
Douillats	165	1667	1091	340	66	21	3	3183
Bremontier	172	1363	1879	384	58	7	0	4191
Larraillet (Nord)	167	2437	4641	461	26	0	0	7615
Larraillet (Sud)	162	634	912	138	6	0	0	1690
Larraillet (Sud)	168	1795	2210	1214	234	11	0	5464
Nid de l'Agasse	169	1302	2391	900	16	0	0	4609
Pourjeau des Tucs	120	1113	1354	414	37	5	0	2923
Pourjeau	127	627	873	514	160	21	0	2195
Naou	132	2078	2658	776	120	10	1	5643
Loustaline	137	337	258	125	40	2	0	762
Gona Martz	139	211	326	203	49	2	0	791
Dune de l'Oustaline	161	1107	690	291	13	0	0	2101
Totals - -		16057	21157	6068	834	79	4	44199

Total number of Trees	44199	
Total volume	50746	cubic meters
Less 20% for punk and crook	10149	" "
Net Volume - - - -	40597	
Board feet	11,367 M.	

There were subsequently added to this logging chance the parcelles and numbers of trees listed below, for which no diameter measurements are available, but which were comparable in size to those already listed.

Parcelle	Number of Trees
Lettot (Est)	3393
Lettot (Ouest)	5166
Sargos	1100
Crouzet	1162
Puysegur (Gorgones)	730
Total - - - -	11551

Comparison of Estimate with Actual Scale.

The above figures show an average volume of 1.15 cubic meters per tree or, after deducting for defect, of .92 cubic meters per tree. The metric scale in the woods was made without any deduction for defect and is comparable to the gross volume of the estimate when proper allowance is made for firewood. Detailed measurements on 167 trees (shown in appendix) gave a total volume in the sawlogs of 173.27 cubic meters or 1.04 cubic meters per tree. To this figure should be added .3 cubic meters per tree for firewood. The following table, compiled from the scale books of the operation and covering the parcelles on which logging had been completed at the time, show the cubic contents of the sawlogs taken from each tract:

Tract	No. of trees	No. of logs	Scale cu. meters	Average scale per tree cu.meters
Naou and Pont de l'Oustaline	5946	25825	7508.79	1.26
Gona Martz	791	2623	690.35	.87
Dune de l'Oustaline	2101	7116	1559.19	.74
Pourjeau des Tucs	2923	15051	3607.39	1.23
Nid de l'Agasse	4169	14232	3625.89	.87
Bremontier	3790	12871	3384.33	.89
Puysegur	730	3397	810.18	1.11
Crouzet	1162	3683.	855.70	.74
	21592	83793	22041.82	1.02

To this volume should be added .3 cubic meter per tree for firewood.

From the tops of 242 trees in the Mauu tract, 96 steres (cubic meters) of firewood were cut, or an average of about .4 cubic meter per tree This was in the largest timber on the operation, however, and was among the first logged, so that utilization for saw timber was not as complete as it was on the areas logged later. For these reasons it is thought that a figure of .4 cubic meter allowance for firewood is excessive and that .3 cubic meter per tree is nearer the actual average for all the trees logged.

Cost of Stumpage.

The greater part of this logging chance was made up of timber comprised in a purchase of 230,000 trees from M. Thevenot to whom 5,000,000 francs were paid. As the established rate of exchange was then 5.70 francs per dollar this would be about $877,930. for the entire purchase, the cost per tree being 21.74 francs or $3.82. This would correspond to a stumpage rate of between $15.00 and $16.00 per thousand board feet.

Plan of Logging.

In formulating logging plans there were a number of factors to be considered, such as:

1. Class of Mill to be used.
2. Availability of Equipment.
3. Obtaining suitable shipping yard on French Railroad.
4. Obtaining rights of way for narrow gauge railroad.
5. Difficulty of railroad construction in the sand dunes.
6. Necessity of adapting logging plans to the conditions of timber purchase contract.
7. Possibility of water transportation.

1. Company "B" had two mills, one of them being a small easily portable mill of 10M daily (10 hour) capacity, made by the Lane Manufacturing Company of Montpelier, Vermont, while the other was a heavier, semi-portable mill of 20 M. daily (10 hour) capacity, made by the Clark Bros. Company of Olean, New York. In laying out the logging it was more practical to locate the large mill at a point to which the bulk of the available timber could be logged, leaving the small and more scattered tracts to be picked up by the small mill. The mills arrived piecemeal, but the small mill was complete and ready for operation some two months before the large one. The small mill was set up at Bellevue, one kilometer southeast of Ste. Eulalie and one and one half kilometers northwest of the Company "C" mill site at Labroquette. It was planned to put up the large mill in the vicinity of the Pont du Gouvernement on the Courant River, connecting it by narrow gauge railroad with Bellevue, Labroquette, and Pontenx and handling the output of all three mills over the

same railroad and through the same shipping yard. A number of objections to this plan developed.

2. When equipment was purchased in the United States for the use of the Forestry troops, it was not known under what conditions it would be used in France, and frequently sufficient quantities of the most desirable equipment for a particular job were not available. This condition was increased by the distance and difficulties of ocean traffic, the great number of ports at which landings were made, the excessive demands made on the railroads of the country, and the great number and scattered location of the Forestry operations.

Before leaving the United States, about thirty miles of 25 pound steel, suitable for narrow gauge railroads, were purchased, but up to the time of starting the Bellevue mill no trace of it could be found in France. As railroad material and railroad equipment of all kinds were very scarce and difficult to obtain, it was seen that it would be wise to limit railroad construction as much as possible.

3. Great difficulty was experienced in securing a site for the shipping yard in Pontenx. There were few vacant places and the French railroad officials were very exacting as to the conditions under which they would allow the installation of a switch to the main line. Finally, by purchasing and cutting the trees on a tract of about one and one-half acres, a yard of that size was secured. As it was necessary to have at least two main line switches and two narrow gauge tracks in the yard, there was little space left for the piling of lumber at such times as standard gauge cars were not available. It was soon seen that while it was feasible to handle the output of the Labroquette and Bellevue mills, it was not practicable to try to put through the output of another large mill.

4. Rights of way for narrow gauge railroads were granted along the highways by the French authorities with the reservation that the shade trees be not interfered with and that the highways be restored to their previous condition at the close of the operation. Whenever it was necessary to go outside of the highways or the areas on which we had purchased the timber, special negotiations had to be carried on with the owners concerned. There was not sufficient space between the hard roadway and the flanking row of shade trees to permit the construction of a standard gauge railroad, so

that it was necessary to transfer in the yard all products brought in from the mills, as they were necessarily brought over narrow gauge tracks.

5. Careful examination of the dune country showed that there were more difficulties in constructing railroads to it from the vicinity of Bellevue than had been expected. Being formed by wind action rather than erosion, there is no drainage system in the dunes and one may pass up a seeming valley and be suddenly confronted by a dune fifty or a hundred feet in height and calling for more excavating than he is prepared to do on a temporary logging railroad.

6. Logging plans in the dunes were influenced greatly by the conditions of the contract of purchase of the timber, and many economies in logging were prevented by its terms. There were excellent opportunities for power skidding, but all power skidders, locomotives, and other appliances using fire, were prohibited on account of the danger of starting a conflagration. The necessity of using horses as motive power on the railroad was a strong argument in favor of other means of transportation.

7. As all the timber which it was proposed to handle through the large mill lay tributary to the Courant River and Lake Aureilhan, it was proposed by Captain Inman F. Eldredge that the feasibility of driving the river be investigated. If a practicable mill site and outlet to the French railroad could be secured many of the difficulties of railroad construction, transportation of boilers and other heavy equipment over sandy roads, delivery of supplies and loading of products would be eliminated.

Floatability of Timber.

As the first consideration of a plan involving driving was that the timber should float, experiments to determine the floatability of Maritime Pine were instituted. It was known that the timber when green was very heavy and it was thought that the heavy impregnation of resin in the butt log might cause excessive loss by sinkage. During the early part of November a number of trees growing near the river in the vicinity of Port du Gouvernement were felled, cut into log lengths and put into the stream for observation. All of the logs floated off and passed rapidly down the stream, but after going varying distances they were caught in eddies or held on obstructions in the river. Here they were under observation for several days, and although they became somewhat water-logged and floated low in the water, their buoyancy was considered sufficient to warrant a conclusion that they could be driven successfully over the five or six miles between that point and the mill. In this

experiment, the butt logs were watched with particular care and not all of the other cuts were accounted for at the end of the experiment.

River.

The river was gone over carefully to determine its driveable character, to locate the obstructions, and to estimate the amount of work necessary to put it in shape for use. There was a river gauge at the Pont-du-Gouvernement and the French government had records of stream flow covering a period of several years. These records were secured and showed that the maximum flow had been 1.29 cubic meters per second, while the minimum reached in October, 1913, was .37 cubic meters, the yearly average being about .62 cubic meters per second. The average width of the stream is about thirty feet. The fairly steady flow of the river with absence of sudden freshets and extremely low water is accounted for by the fact that it is fed by the large lakes Biscarosse and Cazeau which have extensive drainage basins, and are kept up by numerous streams.

The lower three miles of the river were found to be of sufficient depth to float logs without difficulty, even during the lowest water, but the upper two miles in the vicinity of the Pont du Gouvernement had a number of sharp curves, small islands, rapids, and shallow places where the river flowed over a hard pan or layer of soft sandstone about 18 inches in thickness. These last difficulties could be removed without excessive cost, but it was foreseen that in a year of extremely low wat-

there would be considerable difficulty in driving the upper reaches of the stream during the months of August, September and October.

Mill Site.

A practicable, though by no means ideal, mill site was found on the south side of the Etang Aureilhan. It was on the hard land about a hundred yards from the shore of the lake and approximately a mile from the standard gauge railroad. By putting in a switch to the standard gauge line, it would be entirely practicable to load out manufactured products directly from the mill, thus doing away with the necessity of laborious transfer from narrow gauge to standard gauge railroad.

Decision in Favor of Driving.

After due consideration of the facts affecting logging, milling and transportation of the unfinished and finished products, it was decided to drive the river. The plan of operation was, briefly, as follows: to establish three camps simultaneously,- a logging camp on the Courant River near the Pont du Gouvernement, a small boom-camp at the mouth of the river and the mill camp at Aureilhan; to cut the logs in the woods and transport them to the river by the best means available; to drive them down the river, catching them at the mouth in bag booms; to tow them across the lake and place them in the pond at the mill, using a gasoline driven motor boat for the purpose;

to dig a canal from the lake to the mill so that the logs could be floated from the pond to the haul-up; to build a spur from the French railroad to the mill so that the sawed products could be loaded directly from the mill to the standard gauge cars. These general plans were carried out, the first step being the establishment of the three camps: Aureilhan, Boom and Courant.

Aureilhan.

The mill camp at Aureilhan was in direct charge of Captain Inman F. Eldredge, who exercised general supervision over the entire operation. As soon as the surveys were completed and the rights of way secured, crews were immediately set to work on the railroad spur, the canal, and and mill foundations. A kitchen was built of lumber hauled from Bellevue, but other buildings were not erected until the mill began producing. The railroad when completed had a track on each side of theloading dock and a siding for empty cars which ran alongside the storehouse. The canal was dug deepest at the end toward the mill and a narrow gauge railroad laid on the bottom for a distance of about thirty feet. On this was operated a steel submarine car on which the logs were floated and then hauled into the mill by a cable and drum arrangement.

A thirty-six foot motor boat was purchased in Bordeaux to do the hauling of logs from the mouth of the river to the mill pond.

Camp Aureilhan - Lake in Distance.

Cabin Constructed by Members of Boom Camp.

Boom Camp.

A small camp of nine men with Sergeant James Spencer in charge was established near the mouth of Courant River to drive piling, to put in shear booms, to get out boom sticks for the bag booms, to assist in driving the lower part of the river when driving began, and to attend to the filling of the booms. The piles driven here were of small size, being eight to ten feet in length, and six to eight inches in diameter. A pile driver was constructed on the ground from hewed timbers. It had a horse operated, automatically released hammer, with a maximum fall of fifteen feet and was economical, rapid and wholly successful in every way.

The piles were cut out of the tops of trees, about a quarter of a mile above the river. After being peeled they were thrown into the river to float down to where they were to be used, but instead of floating they dove to the bottom of the stream and remained there until fished out again. This was the first intimation received that there might be difficulty in driving the small sized pieces.

Courant Camp.

The logging camp, of which First Lieutenant Earl C. Sanford was in charge, was established at an almost ideal camp site on the Courant River, about two hundred yards above the Pont du Gouvernement, and three-eights of a mile below the end of the hard road leading to Ste. Eulalie. This was to

Courant Camp in Summer.
In Foreground - French Sawmill Moving.

Some Buildings at Courant Camp.
1: Cooks' Quarters.
2: Kitchen.
3: Canteen.
4: Storehouse.
5: Office.

be the largest of the camps, and was laid out to accommodate two hundred men and seventy-five animals. The number of men on the operation varied from time to time, ranging from one hundred and ten to two hundred and fifty-six. The number of horses and mules was more uniform, as there were usually about seventy animals in use, but at one time when a change from horses to mules was being made, there were eighty-one horses and sixty-eight mules in camp.

The first men were taken into this camp on January 6, 1918, and immediately crews were organized for (1) camp construction: (2) road building: (3) river work: (4) brush cutting: (5) felling and bucking, and (6) logging.

Camp Construction.

The men were quartered in tents, sixteen feet by sixteen feet, which were later floored and sided up about three feet, so that they were very comfortable. A kitchen was constructed as soon as possible, and this was followed by a stable accommodating ninety-six horses, a blacksmith shop, an office, storehouse, officers' quarters, Y. M. C. A. hut, oil house and saw filing room, mess hall, meat house, pig pen, barber shop and shoe shop, and hay shed. Lumber for all purposes was secured from the Bellevue mill.

Road Building.

It was very difficult for heavy wagons and automobile trucks on which our supplies were carried, to get from the end of the hard road to camp on account of the sand. A corduroy road was started at once and carried on as fast as possible, from the hard road to camp, the stables, and on to the Pont du Gouvernement. The slabs were laid directly on the sand after leveling off a bed, and were held in place by three or four inches of earth thrown on the top. It made a fair road which, though somewhat rough, accommodated heavy traffic for over a year in a satisfactory manner.

River Improvement.

A great deal of work was put on the river. First, a trail was cut along each bank from the Etang Aureilhan to the highest point at which logs would be put in; all obstructions, such as snags, rocks, fish weirs and foot bridge abutments that could be removed by hand were cleared out; then heavier ones were removed by horse power, using double blocks where necessary. It was extremely difficult to secure dynamite, and a great deal of work was done with horses that could have been much more economically accomplished by the use of explosives. Two wing dams, each about forty feet in length, were built to deepen channels on shallow rocky riffles and a great number of shear booms were placed in curves and eddies to prevent jamming at those points.

Brush Cutting.

According to the terms of our contract of purchase it was necessary to cut all reproduction and other undergrowth even with the ground before logging. This was not construed to mean that all the undergrowth on all the parcelles must be cut before any logging could proceed, but rather that the brush on any particular tract should be cut before the area was logged. This brush cutting was a very tedious and unpopular job and did not progress very rapidly. At one time an effort was made to have it done by the French. By way of experiment to determine the cost, eight women - who were at least equal to our best men on this kind of a job - with a French man supervising the work, cut for one day on the Larraillet Sud parcelle. They were able to cut the brush from a strip 100 feet wide and 700 feet long, or about 1.6 acres, this particular area containing 107 trees of merchantable timber. This was all the cutting that was done by the French, but the job was pushed with as many men as could be spared for the work, until it was finally completed early in September.

Several kinds of cutting implements were tried out for this work, including scythes, brush hooks, bill hooks and axes. It was found that for reproduction alone the axes were most satisfactory, though more rapid progress could be made by pulling where the trees were not over four or five feet high.

For gorse, which is exceedingly prickly, a bill-hook hung on a single bitted axe helve worked well.

Felling and Bucking.

Cutting was started on the Naou tract on the end nearest Ste. Eulalie and carried progressively forward to the river, including, after Naou, the parcelles Pont de l'Oustaline, Dune de l'Oustaline and Gona Martz, as it was desired to drive all of this timber before the high water of spring had passed. The trees were cut as close to the ground as practicable, so as to leave very low stumps and secure as much length as possible, and were bucked into logs to a top diameter limit of five inches, or slightly less. The tops were cut into meter lengths to a diameter of about one half inch and later converted into charcoal, while the small amount of brush remaining was scattered evenly over the surface of the ground. It was customary on most operations to cut trench timbers and entanglement stakes from the tops and larger limbs, but on this particular job it was not done, as a deal was made with the French manager of the forges at Pontenx whereby we secured 15,000 additional trees and got rid of the task of slash disposal.

Fire Hazard.

As the warm weather came on the slash dried out rapidly. The French and Spanish woodcutters were unable to keep up with the logging operation and there was a constantly in-

creasing danger from fires. Strict precautions were taken against the setting out of small fires in the woods for any purpose, and smoking was restricted to a ten minute period in the forenoon and a ten minute period in the afternoon, at which time the men ceased work and came together in a cleared spot. The roads between the dunes widened into fire lines and additional lines were constructed on the boundaries of several of the tracts. These measures were effective to such an extent that there was no fire on the Aurelihan-Courant operation, although the season was a very dry one and fires were constantly breaking out in the region. Many thousand acres of valuable timber in the Landes Department were burned over during the months of July, August and September, 1918.

Logging.

At the time of beginning to log, there was still a distressing lack of logging equipment and it was not until late in the spring that this lack was overcome to any noticeable extent. This being the case, the equipment available had to be used as advantageously as possible, but often had to be used beyond its range for economical logging. There were used at various times for the transportation of logs: wagons, tongs and chokers, bummers, big wheels and railroads.

Wagons.

Wagons or logging trucks were not used to any great extent on account of not being available when the timber on the flats was logged and not being practicable in the dunes. Three logging trucks were used for a few days during the early logging in the Naou parcelle and worked satisfactorily, but there were not enough of them to be used economically and they were discarded in favor of big wheels., In the dunes wagons were worthless, as they buried so deep in the soft sand that a team could scarcely haul an empty truck.

Tongs and Chokers.

Tongs and choker-chains were used extensively throughout the life of the operation in bunching for the wagons and big wheels, in skidding to the railroads on the landings, or wherever logs were to be moved for short distances. Tongs were used for moving single logs, while chokers were most effective in moving a number of the smallest logs at once. Several sizes of tongs were tried, but those opening to a maximum width of about twenty-four inches were best adapted to use in this sized timber. Tongs and chokers were used very economically for skidding distances of two hundred difty feet or less, but they were frequently used on the dunes for distances as great as four hundred feet, for the reason that they were so much easier for the horses to haul up the dunes than were bummers or other skidding devices.

Bummers.

Bummers, or spool skidders, were used during the entire operation with uniformly good success. They were especially valuable on the dunes as their wide (5½ inch) wheels did not sink badly in the loose sand; they were easy to load and unload; they were easy to move and could be taken up the dunes without heavy hauling. They were economical for skidding up to two hundred yards, but they did not carry sufficient load to make it pay on longer hauls. They were frequently used for distances up to three hundred yards, however, as they were the most satisfactory skidding device that we had for use on heavy grades which were beyond the range of tongs. Each set of bummers came from the factory equipped with a pair of heavy tongs, but we were able to increase their capacity materially by removing the tongs and substituting a choker-chain. In this way three or four logs could be loaded and hauled with considerable facility.

Big Wheels.

Five sets of 9-foot wheels made by C. S. Overpack of Manistee, Michigan, were taken across with the first instalment of forestry equipment, and these were soon supplemented by an equal number of French made wheels of somewhat different design. The main differences between the two styles were that the American wheels were nine feet high, six feet gauge,

French Type of Big Wheels. Note narrow gauge and ponderous construction.

Type of Logging Truck Used.

American Type of Big Wheels.

had a straight wooden axle, and were made of select, thoroughly seasoned timber while the French wheels were three meters (9' 10") high, 4' 8" gauge, had a 3" steel axle curved upward between the wheels to allow greater clearance for the load, and were built of large pieces of poorly seasoned wood, which made them nearly 50% heavier than the other type of wheels. Both types of wheels were used in logging the Naou, Dune de l'Oustaline, Pourjeau, Pourjeau des Tucs, Douillats, Bremontier and Lettot Ouest parcelles, so that they had thorough try-outs on flats and dunes.

On the flats both types worked very satisfactorily. The French wheels were a little harder to load and, at first, the drivers lost a number of trips on account of over-turning. As a general thing each set of wheels made the same number of trips daily and the loads hauled by each type were practically the same, as is shown by the following table:

AMERICAN WHEELS			FRENCH WHEELS		
Number of logs in load.	Volume in cubic meters.	Contents board feet.	Number of logs in load.	Volume in cubic meters.	Contents board feet.
7	2.56	538	6	2.89	607
6	3.26	684	6	2.63	552
7	2.13	447	7	2.76	579
6	2.24	470	6	2.97	623
6.	2.31	485	7	2.45	514
6	3.10	651	7	1.69	355
6	1.90	398	7	1.21	254
6	2.28	478	7	3.08	647
6	2.33	489	6	2.31	485
6	2.59	544	3	2.33	488
62	24.70	5184	62	24.32	5104

	Logs	Cu.meters	Bd. feet.
Average Load American Wheels -	6.2	2.47	518
Average Load French Wheels -	6.2	2.43	510

The appended table shows the contents of several loads of long timbers hauled on the American wheels. Each Load consisted of three pieces, each of forty, forty-five or fifty feet in length, which were first cut for piles but which were later hauled to the landing and sawed into the number of logs shown in the table:

	Number of Logs	Cubic Meters	Board Feet
	7	3.01	632
	7	2.12	445
	9	1.98	418
	7	2.09	439
	8	2.41	506
	8	2.54	533
	8	2.09	539
	8	2.55	535
	8	2.24	470
	7	1.79	376
	9	2.54	533
	8	2.47	519
Total - -	94	27.83	5845
Average	7.83	2.32	487

On the dunes the American made wheels were far superior to the French built ones, but their capacity was diminished about 20% on account of the sinking of the wheels in the loose sand and the consequent dragging of the load. The higher wheels and curved axles of the French made wheels were advantageous in the sand, but the narrow gauge which was responsible for a tendency to upset on hill sides or even on the level when one wheel ran over a stump or root was a handicap so serious and disagreeable as to more than offset any other points of advantage.

Railroads.

Narrow gauge railroads were used for logging the dunes farthest from the water which are embraced in the parcelles:- Puysegur, Nid de l'Agasse, Larraillet Nord and Sud, Crouzet, le Pico and Lettot Est. The main landing was at the south end of the Douillats parcelle and the main stretch of railroad ran from there to the Dune de Puysegur. Branch lines were laid along the small flats between dunes to bring them as near as practicable to the timber to be logged. The cars used were meter gauge and about five meters in length. They had formerly been used for mining purposes and were of very solid constructions, so that when the frames were fitted with 8' bunks they made excellent logging cars. No locomotive

Logs Decked for Driving.

Starting the Drive.

was used on the woods railroad on account of the great danger of fire, but teams walking outside the tracks hauled the cars tothe landing. A team hauled two cars, each loaded with about 1500 board feet of logs, without difficulty except that the constant travel in the loose sand was very fatiguing.

Driving.

By the time the mill was ready to begin sawing, the logging crew had decked about 10,000 logs from the Naou tract on the river just below the Pont de l'Oustaline. The first drive in which about 1,200 logs were taken down, was watched with much interest and concern, as the action of the logs in the water and the effect of driving on the river itself were felt to be the most uncertain factors in the operation. The logs driven had been in the decks from four to six weeks, and they rode fairly well in the water and gave little trouble except on riffles, or at obstructions which had not been discovered in clearing the river or which it had been impracticable to remove without blasting powder. Shortly after this time, dynamite was secured and the obstructions blown out.

Periodic or Continuous Drives.

After the first small drive had been down and the river further improved, a drive of approximately 5,000 pieces was started. This drive revealed the small capacity of the river and determined the policy in regard to driving. With a large number of logs in the river, jams were constantly forming, and in the case of jams forming at night, it was not practicable to break them out until several hours later. This invariably resulted in great damage to the river, as the soft sand of the banks and bed cut out so rapidly under the action of the water that in three or four hours holes ten feet deep would frequently be cut out under a jam and the sand deposited in a bar below. These bars oftentimes extended entirely across the river and came so near the surface of the water that it was necessary to shovel or scrape them out in order to form a new channel.

In order to preserve the river in driveable condition, the plan of a continuous drive was adopted. The logs were rolled directly into the river when logged from the woods and were kept moving by patrols stationed at intervals along the banks. This plan prevented the accumulation of large numbers of logs and the formation of heavy jams, and resulted in a minimum of erosion and change to the banks and bed of the stream.

Sinkers.

As soon as driving started, it was noticed that the butt logs floated higher than any other portion of the tree, and that the smallest logs were the ones which sank quickest and in greatest numbers. Continued observation showed that the number of sinkers varied directly as the distance of the log from the butt and indirectly as the size of the logs and the amount of heart wood and bark which they contained. In order to reduce the number of deadheads to a minimum, a number of expedients were used, such as,- felling and bucking as far as possible in advance of driving, decking for a time before driving, leaving bole with needles on for varying lengths of time, peeling and partial peeling.

Felling and Bucking in Advance of Driving.

It was found to be more economical to buck at the time of felling and where both operations could be performed four weeks or over in advance of logging, the ends of the logs seasoned sufficiently to permit driving to the mill with little loss. The length of time necessary for drying depended, of course, on the weather which was liable to be stormy a considerable part of the time from October to April.

Decking Logs.

Logs Decked Near River.

Decking.

The first logs were decked in order to have sufficient room for the large number of logs on hand, but decking as a factor in seasoning was disappointing. The top logs of each deck dried out rapidly, but those which were in the lower layers seasoned much more slowly than logs which lay in the open, due to the absence of sunshine and the poor circulation of air.

Felling and Leaving with Needles on.

On the flats where the trees grew most rapidly and contained a great amount of sap-wood, the methods of felling the trees and leaving limbs and needles on until ready for logging was put into effect. Under this plan the lower logs of the tree dried out first and it required from thirty to forty days to bring about satisfactory seasoning in the top logs to make driving practicable. During the rainy season this plan had considerable advantage because transpiration from the leaves continued at times when the ends and sides of logs were saturated with moisture and little drying action was taking place. During warm dry weather, however, logs felled and bucked at once were driveable as quickly and with less expenditure of labor than were those left with the needles on.

Peeling.

Top logs peeled and thus deprived of the buoyant effect of the bark invariably sank when placed directly in the water. If peeled and placed on skids so that air circulated freely about them, they seasoned sufficiently in three weeks so there was no doubt but that they would reach the mill. Peeling strips on four sides and seasoning on skids for an equal length of time was equally effective, while peeling on two sides required only a slightly longer seasoning process. As peeling was an expensive operation it was not extensively practiced, but was restricted to deadheads and small logs. The landing crews became expert at picking out logs which were liable to sink, and these were peeled on two sides with spuds kept at the landing for the purpose and placed on skids for further seasoning before driving.

Methods of Handling Deadheads.

In spite of the precaution taken to prevent sinkage, there was a driving loss of about 2%. This loss was only temporary, however, as the river was so shallow that a large proportion of the logs were recovered and ultimately reached the mill. A salvage force of three men and one team was constantly employed in handling deadheads. At first they were pulled from the water and decked, but the inner logs of the deck dried out so slowly that other methods of handling

were employed. Some were pulled out on the dry, hot sand; some were placed on skids; and some were peeled on two or four sides before being placed on skids. The last method was found to have advantages in expediting seasoning and was extensively used during the latter half of the operation.

The length of time required for seasoning deadheads sufficiently to again make them driveable varied with the weather, but six weeks was the usual time necessary. By the end of six weeks the bark had dried out and season-checks had begun to open in the ends. If struck in the end with a pike pole or peavey when this condition was reached the log felt firm and hard, while an undriveable condition was indicated by a soft, soggy feeling.

Summary of Methods.

By the end of six months the various parts of the operation had become adjusted to each other, methods had been standardized, and the activities of production reduced to a fairly regular routine of accomplishment.

In the woods two sets of fellers and buckers and two sets of loggers were kept at work, one set operating in tracts accessible to big wheels and the other in more remote areas where railroads were used. Trees were felled as far in advance of logging as possible, a great effort being made to

keep at least four weeks ahead of the logging crews. On the areas to be logged by the big wheels, the boles were left with the needles on until ready to log. They were then swamped, cut in two at the end of the second or third log, and hauled to the landing where they were bucked into log lengths and rolled into the river. Any small logs which appeared insufficiently seasoned to float were spudded on two or more faces and placed on skids for further seasoning. Where railroad logging was used, the trees were felled and bucked into log lengths on the spot. The logs were then skidded to the railroads with tongs, chokers or bummers, loaded on cars, hauled to the river, and rolled directly from the cars into the water.

The drive on the river was continuous but each week the rear was thoroughly sacked to see that no floatable logs remained in the stream. Any necessary river work, such as deepening the channel or removing obstructions was carried on simultaneously with the driving operation. The deadhead crew pulled sinkers from the river, broke the bark along two or more sides, and placed them on skids for seasoning.

At the mouth of the river the logs were caught in bag booms, holding from 600 to 1,000 logs, and towed across the lake to the mill pond. As the prevailing wind came from the west, the filled booms could usually be turned loose in

the lake, and when they had drifted opposite the mill could be swung into the mill pond with the expenditure of but little time or effort.

From the mill pond the logs were poled into the canal leading to the mill, floated upon the submarine car, hauled into the mill by a cable and drum arrangement and rolled off upon an inclined ramp leading to the saw carriage. The products of the saw were conveyed to the edger by live rolls, and after passing the edger were loaded upon small cars and distributed to the yard. From the yard they were loaded expeditiously to standard gauge railroad cars and shipped to their destination.

Success of the Operation.

The mill was operated two ten-hour shifts and produced from fifty thousand to sixty thousand board feet daily, or more than 25% over the rated capacity of the mill. Throughout the life of the operation, the mill was never forced to shut down on account of lack of logs and this was sufficient justification of the methods employed in the woods, and reward for the diligent efforts of the woods crews.

APPENDIX.

Detailed Measurements on 167 Trees.

Appended are measurements on one hundred sixty-seven (167) trees, showing the size of trees, logs and tops, as well as the volume of saw timber taken out. The scale in cubic meters can be converted to board feet by allowing two hundred ten (210) board feet per cubic meter for this class of timber.

Tree No.	D.B.H.	Logs		Scale, cu. M.			
		Length Decimeters	Mid.Diam cms.	Log	Tree	Lgth.of Top in decimtrs.	Diam.of top at pt. of cut cms.
1	50	18	50	.31			
		20	48	.22			
		50	42	.69			
		50	32	.40			
		24	26	.13	1.75	60	24
2	40	54	38	.61			
		48	32	.38			
		24	28	.15			
		30	24	.13			
		24	20	.08	1.35	50	20
3	46	54	44	.82			
		24	38	.27			
		48	30	.34			
		30	26	.16			
		24	22	.09	1.68	44	16
4	56	56	52	1.19			
		48	46	.80			
		36	36	.37			
		40	26	.21	2.57	52	22
5	28	48	26	.25			
		48	24	.22			
		30	20	.10	.57	76	20
6	46	38	42	.53			
		56	36	.57			
		28	32	.22	1.32	84	28
7	30	30	26	.16			
		30	24	.13			
		36	20	.12	.41	80	18
8	46	50	40	.63			
		54	34	.49			
		30	24	.13	1.25	36	20
9	30	26	18	.06			
		24	24	.11			
		24	28	.15			
		30	30	.21			
		24	28	.15	.68	44	18
10	28	30	28	.19			
		30	22	.11			
		28	18	.07	.37	60	16
11	24	38	22	.14			
		36	18	.09	.23	50	18
12	26	36	26	.19			
		50	26	.26			
		26	20	.08	.53	56	16
13	38	56	36	.57			
		30	30	.21			
		24	28	.15			
		24	20	.08	1.01	40	20
14	32	36	32	.29			
		38	26	.20			
		42	22	.16	.65	44	16

15	36	36	36	.37			
		32	32	.26			
		24	26	.13			
		24	22	.09	.85	36	18
16	30	36	20	.12			
		30	24	.13			
		36	28	.22			
		30	30	.21	.68	60	18
17	24	30	24	.13			
		30	24	.13			
		24	22	.09			
		24	18	.06	.41	52	16
18	46	54	38	.61			
		48	34	.44			
		34	26	.18	1.23	50	22
19	34	36	32	.45			
		36	28	.22			
		24	22	.09	.76	46	20
20	32	54	32	.43			
		54	30	.38			
		36	20	.12	.93	34	16
21	35	24	20	.08			
		36	24	.16			
		30	30	.21			
		36	32	.29	.74	44	16
22	32	24	24	.11			
		30	28	.19			
		48	32	.38			
		36	32	.29	.97	48	22
23	34	50	34	.46			
		54	30	.38			
		36	24	.16	1.00	46	18
24	30	30	30	.21			
		40	28	.25			
		36	22	.14			
		24	18	.06	.66	40	16
25	40	24	22	.09			
		24	26	.13			
		36	34	.33			
		54	36	.55	1.10	50	20
26	26	48	24	.22			
		42	24	.19			
		30	18	.08	.49	60	16
27	36	54	34	.49			
		36	30	.26			
		36	26	.19			
		24	20	.08	1.02	46	18
28	42	54	40	.68			
		54	36	.55		50	16
		36	26	.19	1.42	68	24
29	40	24	20	.08			
		30	26	.16			
		54	24	.48			
		54	38	.61	1.33	40	16
30	48	50	46	.83			
		36	36	.37			
		24	34	.22			
		24	32	.19			
		24	26	.13	1.74	60	24

31	38	30	20	.10			
		24	24	.11			
		48	30	.34			
		54	32	.43	93	36	18
32	44	33	44	.58			
		30	34	.46			
		36	30	.26			
		30	28	.19			
		24	22	.09	1.53	40	18
33	42	30	42	.42			
		30	38	.06			
		30	34	.46			
		30	28	.19	1.63	46	24
34	44	24	22	.09			
		24	26	.13			
		42	30	.30			
		48	36	.49			
		30	42	.42	1.43	40	18
35	42	24	40	.30			
		33	34	.35			
		24	34	.22			
		24	30	.17			
		24	26	.13			
		28	22	.11	1.28	52	16
36	34	26	16	.05			
		28	20	.09			
		48	26	.25			
		36	32	.29			
		26	34	.24	.92	36	12
37	40	38	40	.48			
		38	40	.48			
		26	30	.19			
		36	24	.16	1.31	40	20
38	38	14	26	.07			
		42	24	.19			
		38	28	.24			
		38	34	.35			
		38	36	.39	1.24	38	16
39	34	50	32	.40			
		48	26	.25			
		36	22	.14	.79	52	20
40	44	56	42	.78			
		50	38	.56			
		50	28	.31	1.65	50	24
41	38	24	36	.24			
		50	32	.40			
		48	26	.25			
		36	20	.12	1.01	42	18
42	38	26	34	.33			
		50	32	.40			
		28	24	.13			
		24	22	.09			
		24	20	.08	1.03	40	16
43	42	32	40	.40			
		50	36	.51			
		40	30	.23			
		24	24	.11	1.30	56	22

44	40	30	40	.38			
		38	36	.39			
		24	30	.17			
		30	30	.21			
		12	26	.06			
		30	22	.11	1.32	36	20
45	38	50	34	.46			
		30	28	.31			
		30	24	.13			
		30	20	.10	1.00	32	18
46	40	48	32	.38			
		30	40	.38	.76	110	28
47	32	38	32	.30			
		24	30	.17			
		24	28	.15			
		42	24	.19	.81	70	20
48	36	30	24	.13			
		24	24	.11			
		24	22	.09			
		30	18	.12	.45	40	16
49	32	26	32	.21			
		50	28	.31			
		42	26	.22			
		18	22	.07			
		30	18	.08	.89	38	15
50	40	26	38	.29			
		38	34	.35			
		24	30	.17			
		36	24	.16			
		24	20	.08	1.05	56	18
51	48	56	42	.78			
		38	36	.39			
		38	28	.24			
		26	26	.14			
		36	26	.19	1.74	48	22
52	40	32	38	.36			
		50	32	.40			
		48	26	.25			
		26	20	.08	1.09	46	18
53	44	26	42	.36			
		50	36	.51			
		24	32	.19			
		38	30	.27			
		18	34	.16			
		26	20	.08		34	18
		26	20	.08	1.65	40	18
54	46	30	24	.13			
		24	30	.17			
		26	32	.21			
		50	36	.51			
		50	42	.69	1.71	42	26
55	40	32	40	.40			
		50	32	.40			
		50	26	.26	1.06	86	24
56	40	24	40	.30			
		26	34	.24			
		32	30	.23			
		30	28	.19	.96	62	24

57	34	26	34	.12			
		26	32	.10			
		42	26	.23			
		30	22	.11	.55	64	20
58	46	50	42	.69			
		48	34	.44			
		42	30	.30			
		30	24	.13	1.56	54	20
59	46	26	46	.43			
		24	34	.22			
		50	30	.36			
		6	22	.02			
		26	24	.12			
		24	20	.08	1.23	52	18
60	36	30	36	.31			
		30	32	.24			
		38	26	.20			
		24	24	.11	.86	66	22
61	42	36	44	.55			
		48	34	.44			
		42	28	.26			
		36	24	.16	1.41	56	22
62	46	32	46	.53			
		50	38	.56			
		24	34	.22			
		24	30	.17	1.48	60	22
63	44	26	22	.10			
		30	28	.19			
		30	32	.24			
		50	38	.56			
		42	42	.58	1.67	60	22
64	44	36	34	.33			
		38	40	.48			
		30	32	.24			
		26	30	.19			
		26	26	.14	1.38	56	24
65	40	48	40	.60			
		36	32	.29			
		36	30	.26			
		24	24	.11	1.26	60	22
66	38	38	34	.35			
		42	28	.26			
		36	26	.19			
		38	20	.12			
		24	18	.06	.98	48	16
67	44	50	22	.19			
		48	30	.34			
		26	36	.24			
		48	40	.60	1.37	50	20
68	30	50	28	.31			
		36	24	.16			
		48	22	.18	.65	50	18
69	52	56	52	1.19			
		30	44	.46			
		42	42	.58			
		30	34	.27			
		24	26	.13	2.63	64	24

70	42	56	40	.71			
		43	34	.40			
		26	28	.16			
		36	24	.16	1.43	42	20
71	28	42	28	.26			
		24	24	.11			
		42	22	.16	.53	70	20
72	38	54	34	.49			
		32	32	.30			
		36	28	.22			
		30	22	.11	1.12	70	20
73	46	50	40	.63			
		48	36	.49	1.12	80	34
74	38	54	36	.55			
		56	30	.40			
		28	36	.15	1.10	60	24
75	44	38	42	.53			
		56	36	.57			
		26	34	.24			
		36	26	.19	1.53	66	22
76	38	54	36	.55			
		48	32	.38			
		42	24	.19	1.12	36	22
77	44	36	42	.50			
		38	28	.24			
		30	24	.13	.87	32	20
78	46	54	42	.75			
		54	38	.61			
		48	30	.34	1.70	20	20
79	30	38	28	.24			
		26	28	.16			
		24	24	.11	.51	42	22
80	40	36	36	.37			
		42	30	.30			
		24	26	.13			
		24	24	.11	.91	72	22
81	46	24	42	.33			
		42	36	.43			
		24	30	.17			
		24	26	.13	1.06	76	24
82	36	54	32	.43			
		24	30	.17			
		30	26	.16			
		30	24	.13			
		26	18	.06	.95	44	16
83	44	12	44	.13			
		54	40	.68			
		54	32	.43			
		36	24	.16	1.45	44	20
84	40	48	24	.22			
		24	26	.13			
		32	28	.20			
		26	32	.21			
		48	36	.49	1.25	46	20

85	42	54	40	.63			
		54	34	.49			
		30	38	.19			
		28	22	.11	1.47	44	20
86	46	54	44	.82			
		56	38	.63			
		40	32	.32	1.77	60	24
87	44	42	40	.53			
		42	34	.38			
		54	30	.38			
		38	22	.14	1.43	44	20
88	40	38	40	.48			
		30	34	.27			
		28	30	.20			
		26	26	.14	1.09	86	24
89	40	56	38	.63			
		40	30	.28			
		32	28	.20	1.11	60	28
90	38	54	34	.49			
		36	28	.22			
		24	26	.13			
		32	22	.12	.96	36	20
91	54	50	50	.59			
		56	42	.78			
		36	34	.33			
		32	26	.17	1.87	46	22
92	40	54	34	.49			
		48	32	.38			
		24	26	.13			
		36	22	.14	1.14	50	20
93	40	32	20	.10			
		12	22	.05			
		36	26	.19			
		54	34	.49			
		42	36	.43	1.26	36	26
94	44	42	44	.64			
		43	34	.44			
		24	32	.19			
		22	28	.14			
		24	24	.11	1.52	42	20
95	44	54	40	.68			
		38	34	.35			
		36	30	.26			
		40	24	.18	1.47	60	20
96	50	54	40	.68			
		54	30	.38			
		26	28	.16			
		28	26	.15	1.37	50	22
97	44	42	44	.64			
		56	38	.63			
		36	34	.33			
		24	30	.17			
		24	26	.13	1.90	48	20
98	56	56	46	.93		50	24
		54	46	.90			
		30	30	.21			
		24	26	.13			
		54	24	.24	2.41	56	20

99	36	42	34	.38			
		24	30	.17			
		24	28	.15			
		30	24	.13			
		24	20	.08	.91	46	18
100	32	36	30	.26			
		32	28	.20			
		20	26	.11			
		12	24	.05			
		24	24	.11	.73	60	22
101	36	24	34	.22			
		40	30	.23			
		24	28	.15			
		24	26	.13			
		24	22	.09	.87	30	20
102	38	30	20	.10			
		36	24	.12			
		36	26	.19			
		54	32	.61	1.02	60	18
103	46	28	46	.47		50	18
		52	30	.59			
		24	34	.22			
		24	22	.09			
		24	20	.08			
		24	24	.11			
		26	20	.08	1.64	60	16
104	46	24	46	.40			
		42	42	.53			
		36	38	.41			
		30	32	.24	1.63	102	30
105	38	48	34	.44			
		36	30	.26			
		30	26	.16	.86	30	22
106	48	42	46	.70			
		36	40	.45			
		24	36	.24			
		30	34	.27			
		28	28	.17	1.83	72	26
107	46	54	44	.82			
		54	30	.61			
		32	28	.20	1.63	68	26
108	44	54	44	.82			
		54	36	.55			
		38	38	.20	1.66	72	30
109	20	38	10	.10	.10	36	14
110	40	50	36	.51			
		38	30	.27			
		30	24	.13			
		24	20	.08	.99	46	18
111	42	30	24	.13			
		24	28	.15			
		54	36	.55			
		54	40	.68	1.51	53	22
112	42	54	40	.68			
		50	36	.51			
		24	30	.17			
		36	26	.19	1.[illegible]	53	22

113	43	54	46	.90			
		54	42	.75			
		24	34	.22			
		24	30	.17	2.04	50	24
114	34	36	32	.29			
		42	28	.26			
		38	22	.14	.69	100	20
115	32	36	30	.26			
		36	26	.19			
		24	24	.11			
		24	20	.08	.64	62	20
116	40	54	38	.61			
		48	32	.38			
		40	30	.28	1.27	70	26
117	40	48	38	.54			
		48	34	.44			
		24	30	.17			
		36	24	.16	1.31	52	20
118	42	54	42	.75			
		42	38	.47			
		24	34	.22		44	20
		10	34	.10			
		36	24	.16			
		30	22	.11	1.81	60	20
119	44	26	44	.40			
		26	38	.29			
		50	26	.26	.95	32	24
120	20	50	18	.12			
		30	12	.03	.15	18	8
121	46	50	46	.83			
		24	42	.33			
		38	40	.48			
		50	30	.36	2.00	64	24
122	20	36	20	.12			
		36	16	.07	.19	74	14
123	32	30	30	.21			
		30	24	.13			
		32	20	.10	.44	64	18
124	28	24	20	.08			
		48	24	.22			
		36	26	.19	.49	30	20
125	30	38	28	.24			
		30	24	.17			
		38	20	.12	.53	64	18
126	44	54	40	.68			
		36	34	.33			
		24	30	.17			
		36	24	.16	1.34	62	20
127	44	60	38	.68			
		56	34	.51			
		42	30	.30	.49	56	24
128	44	24	42	.33			
		44	38	.50			
		36	34	.33			
		26	30	.19			
		24	26	.13	1.48	68	24

129	68	30	64	1.61			
		50	60	1.42			
		26	46	.43			
		50	34	.46		60	20
		32	20	.20			
		32	32	.24			
		42	28	.26	4.62	68	20
130	50	38	46	.63			
		30	42	.42			
		42	36	.43	1.48	76	30
131	32	48	32	.38			
		24	24	.11			
		30	20	.10	.59	62	20
132	34	24	34	.22			
		50	28	.31			
		42	28	.26	.79	82	22
133	44	36	24	.16			
		24	28	.15			
		26	30	.19			
		40	38	.54	1.04	50	20
134	52	30	30	.39			
		40	40	.50			
		24	26	.13		46	18
		36	20	.12		130	30
		34	30	.24			
		24	22	.09	1.67	72	20
135	42	50	40	.63			
		50	30	.36			
		26	26	.14	1.13	66	22
136	54	54	52	1.15			
		48	42	.67			
		24	36	.27	2.09	82	32
137	20	36	18	.09	.09	20	14
138	26	24	16	.05			
		42	20	.14			
		10	26	.05	.24	52	14
139	26	24	26	.13			
		50	20	.16	.29	64	18
140	28	24	26	.13			
		48	18	.09	.22	60	16
141	34	36	30	.26			
		30	26	.16			
		48	18	.09	.51	66	16
142	26	24	26	.13			
		48	20	.16			
		24	16	.05	.34	52	14
143	26	36	24	.16			
		50	20	.16	.32	60	16
144	22	24	22	.09			
		36	20	.12			
		24	16	.05	.26	52	14
145	30	36	24	.16			
		48	22	.18			
		26	18	.06	.40	50	16
146	32	24	30	.17			
		24	24	.11	.28	66	18
147	30	36	30	.26			
		50	26	.26			
		24	20	.08	.60	48	17

148	32	30	30	.21			
		42	24	.19			
		48	18	.12	.52	54	18
149	24	24	22	.09			
		36	18	.09	.18	74	16
150	26	24	26	.13			
		36	18	.09	.22	60	16
151	24	48	18	.12			
		24	24	.11	.23	68	16
152	22	26	20	.08			
		36	18	.09	.17	70	14
153	28	26	28	.16			
		24	22	.09			
		30	20	.10	.35	52	16
154	30	24	18	.06			
		24	22	.09			
		30	26	.16	.31	46	16
155	36	24	32	.19			
		24	30	.17			
		24	26	.13			
		36	20	.12	.61	54	18
156	22	24	20	.08			
		24	22	.09	.17	36	18
157	22	50	20	.16	.16	70	20
158	24	50	18	.12			
		24	22	.09	.21	62	16
159	32	24	26	.13			
		24	22	.09			
		42	20	.14	.34	64	16
160	22	24	20	.08			
		36	18	.09			
		24	16	.05	.22	58	14
161	36	24	36	.24			
		48	30	.34			
		42	22	.16	.74	56	20
162	36	48	34	.44			
		48	28	.30			
		24	20	.08	.82	60	20
163	42	48	40	.60			
		50	32	.40			
		48	26	.25	1.25	62	20
164	36	12	36	.12			
		32	32	.26			
		30	24	.13	.51	80	20
165	24	30	22	.10			
		48	18	.12	.22	56	14
166	20	12	20	.04			
		24	16	.05	.09	58	16
167	30	30	30	.00			
		34	24	.15			
		30	20	.10	.33	70	16

COMPARISON OF MILL CUT WITH DECIMAL C SCALE.

The following Table indicates the scale of six (6) trees by the Decimal C Scale and actual mill cut.

Age of Tree.	Log No.	Length Meters	Mid diam cms	Cubic Meters	Scale Bd. Ft. Mill run	Bd. Ft. Dec. C.
	6038	4.8	40	.60	130	100
	6039	4.8	48	.87	180	160
	6046	4.8	62	1.45	300	240
	6047	3.6	32	.29	60	30
	Total for Tree - - - - - - - -			3.21	670	530
50	6048	4.8	46	.80	168	160
	6049	4.2	34	.38	80	70
	6050	3.0	28	.19	40	10
	6051	2.4	18	.06	12	5
	Total for Tree - - - - - - - -			1.43	300	245
46	6064	4.2	44	.64	134	100
	6065	5.4	32	.43	90	90
	6066	4.8	24	.22	46	30
	Total for Tree - - - - - - - -			1.29	270	220
53	6067	3.6	46	.60	126	120
	6068	4.8	36	.49	103	100
	6069	3.6	30	.26	55	30
	6070	3.6	26	.19	40	20
	Total for Tree - - - - - - - -			1.54	324	270
	6078	3.0	42	.42	88	90
	6079	4.2	34	.38	80	70
	6080	4.8	28	.30	63	30
	Total for Tree - - - - - - - -			1.10	231	190
	6081	3.6	46	.60	126	120
	6082	3.6	38	.41	86	90
	6083	4.2	32	.34	71	50
	6084	3.6	24	.16	34	20
	Total for Tree - - - - - - - -			1.51	317	280

Boom Camp While Logging Lettot Tract.

Kitchen at Boom Camp.

Mess Time at Boom Camp.

River and a Portion of Courant Camp.

The River was Popular at Courant Camp.

Placing Sheer Boom.

Bucking on Landing - French Wheels Unloaded.

Loading Big Wheels.

The Lower Part of the Courant was Deep.

Rapids Near Courant Camp
Master Engineer Kenfield and 1st Sergeant La Forest
in Foreground.

Locomotive Used on Narrow Gauge Line from Pontenx to
Bellevue.

Log Rolling Contest,
May 30, 1918.

Exercises at "Jouvain Field" Decoration Day, 1918.

Contests at Mimizan-les-Bains, July 4, 1918.