CHAPTER XI

THE MANUFACTURE OF WISCONSIN PEAT INTO FUEL

The Lamartine Peat, Light & Power Co., Fond du Lac

The peat marsh and factory of The Lamartine Peat, Light & Power Co., are located about seven miles due west of Fond du Lac. This company, composed of local business and professional men, has been in existence for a number of years. Considerable capital has been invested in the land and factory and operations were carried on for a time. But at present the plant is not being operated. The owners contemplate remodeling the factory with a view of resuming operations on more advanced lines as soon as necessary funds can be secured.

For a general plan of the property see Fig. 17. The factory lies about 800 feet from the eastern edge of the marsh and stands upon a high piece of ground. A system of narrow gauge railway tracks, with turnouts, switches, etc., connects the marsh and factory. Owing to the fact that there is no steam railroad connection, the property is somewhat inaccessible. Material brought to or taken from the plant must be hauled by team over the main road passing the property on the north and leading to Fond du Lac, seven miles due east.

More detailed descriptions of the more important features of the property are given elsewhere.

The Marsh

The marsh from which the peat is obtained covers an area of about 800 acres. It is of the shallow depression type, having good thoroughly decomposed peat to a depth of 7 feet. Roughly, therefore, this deposit has available peat amounting to 1,120,000 tons of finished peat fuel. The peat found here contains decomposed fibrous remains of marsh plants and seeds of aquatic plants. Sedges, grasses, rushes, arrow leaf and ferns make up the principal vegetation growing upon the deposit. Near the center of the marsh are patches of underbrush and bushes, but otherwise it is a characteristic meadow marsh, there being no large vegetation. The peat is

capable of being easily removed for there are no trees, stumps or roots to interfere with dredging or digging operations.

For a general view of the marsh see Plate XVIII.

Quality of the Peat

Sample 303 B given in Chapter VI shows the quality of the peat in this marsh. The analysis is reproduced here. It should be stated that the sample was collected from the marsh, the moisture partly removed before analysis, and then sent to the laboratory. It was not machined in any way.

PROXIMATE ANALYSIS OF PEAT FROM FOND DU LAC MARSH

	Air Dried	As Received	Dry Fuel
Moisture, per cent	11.99	76.94	.....
Volatile Matter, per cent	51.03	13.37	57.98
Fixed Carbon, per cent	21.75	5.70	24.72
Ash, per cent	15.23	3.99	17.30
B. T. U., per pound	7,169	1,879	8,149
Sulphur	0.66	0.17	0.74

Air drying loss: 73.80 per cent.

An ultimate analysis of this sample shows it to be made up thus:

ULTIMATE ANALYSIS OF PEAT FROM FOND DU LAC MARSH

	Air Dried	As Received	Dry Fuel
Carbon, per cent	41.50	10.87	47.14
Hydrogen, per cent	5.22	9.57	4.42
Oxygen, per cent	34.81	74.72	27.45
Nitrogen, per cent	2.58	0.68	2.95
Sulphur, per cent	0.66	0.17	0.74
Ash, per cent	15.23	3.99	17.30

The raw peat taken directly from the marsh and analysed in its original raw condition showed a moisture content of 86.16 per cent. After drying in the air of the laboratory for some time it still retained 7.72 per cent moisture.

Some of the machined peat, after having lain in the bins of the plant for several years, analysed as follows:

PROXIMATE ANALYSIS OF FOND DU LAC PEAT

	Air Dried	As Received	Dry Fuel
Moisture, per cent	9.95	15.89	.....
Volatile Matter, per cent	48.14	44.96	53.45
Fixed Carbon, per cent	25.14	23.49	27.93
Ash, per cent	16.77	15.66	18.62
B. T. U., per pound	7,468	6,975	8,293
Sulphur, per cent	0.79	0.74	0.88

METHODS AND MACHINERY USED IN WORKING THE MARSH

An approximate idea of the general layout of the plant and marsh may be had from Fig. 17.

The marsh lies west of the factory. A main ditch, 35 feet wide and 600 feet long, and a branch ditch of the same width and leading from

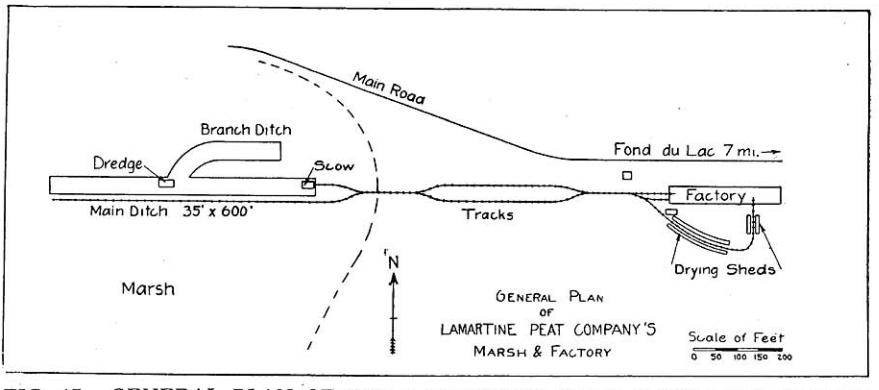


FIG. 17. GENERAL PLAN OF THE LAMARTINE PEAT, LIGHT AND POWER COMPANY S MARSH AND FACTORY, FOND DU LAC, WISCONSIN

the main ditch as shown, have been dredged out. Raw peat was dug from these ditches by means of a home-made dredge, a photograph of which is shown in Plate XVIII.

The dredge is made up of several parts as follows:

A box-shaped combination knife and scoop, whose dimensions are about 1′ x 3′ x 6′, is mounted vertically as shown and is connected,

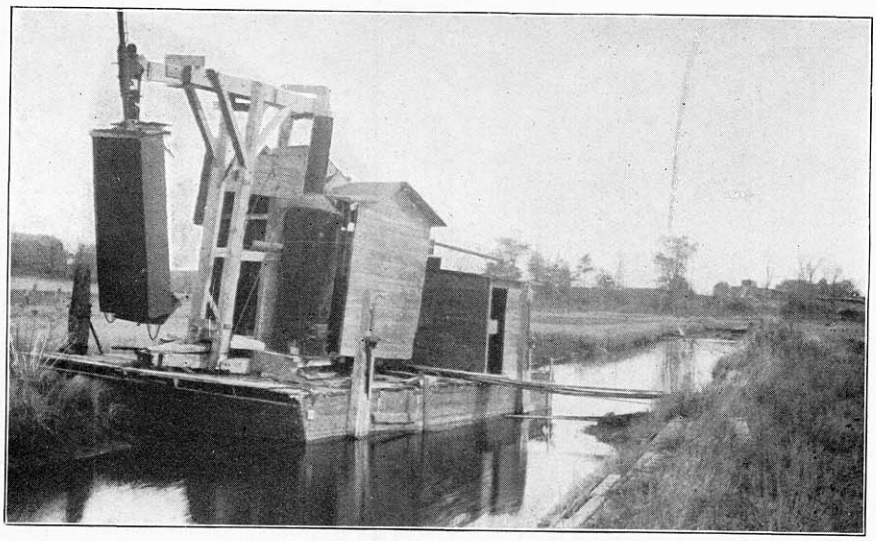
by means of wire ropes, to a windlass or winding drum. The winding drum is geared to a two cylinder, reversible Crane steam engine which is supplied with steam by a vertical tubular boiler. This train of apparatus is mounted upon a 15′ x 30′ floating barge so that the scoop can be swung to either side of the barge and over to the banks of the ditch. Also, mounted upon the barge, there is a fuel shed for storing the dried peat which is used for fuel in the boiler. This peat was obtained from the marsh.

In operation, the scoop was forced straight down into the bog about 6 feet, a slab of peat 1′ x 3′ x 6′ in dimensions being cut out in this manner. The loaded scoop, next being raised, was then swung into the desired position, a trip device released, and the load deposited. A flat-bottomed, wooden scow, (see Plate XVIII) approximately 3′ deep, 8′ wide and 50′ long, was brought alongside of the dredge to receive the dug peat. When loaded, the scow was moved to the loading dock at the factory end of the ditch. Here the peat was removed from the scow and loaded upon small cars which were then hauled to the factory over a system of narrow gauge tracks. A track also passes along the south side of the main ditch. It was therefore possible to load the cars directly from the dredge and avoid the rehandling of material. This track was also used to bring supplies and machined peat from the factory to the dredge.

The Factory

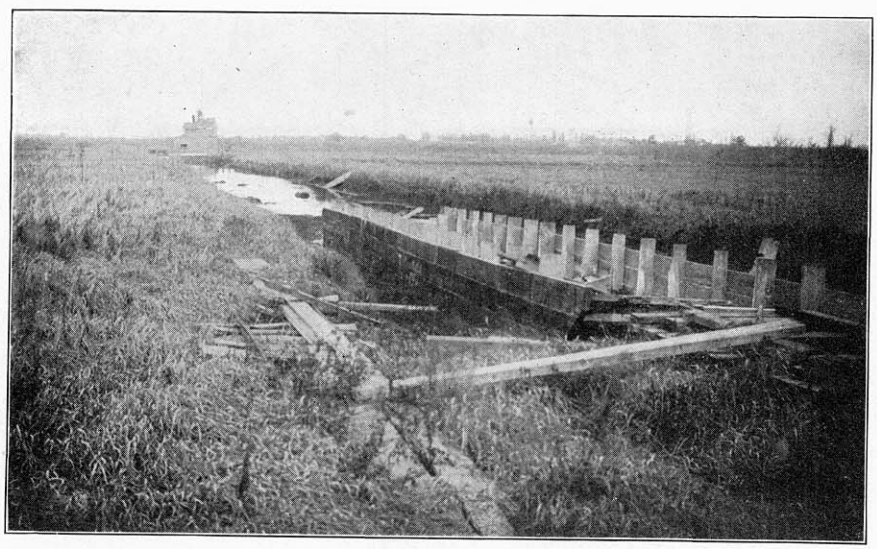
As already mentioned, the factory and drying sheds are located on a high point of land about 800 feet east of the marsh. The general features of the factory may be seen from Plate XVII and Fig. 18 prepared from photographs and approximate data taken in the course of field investigations.

Main Building. The main building lies parallel to the road. Its dimensions are approximately; length, 250 feet width; 35 feet; height in front, 38 feet to tip; height in rear, 30 feet to tip. The western section of the building (about 65 feet in length) is a four-story enclosed structure, containing living rooms for the men employed at the plant and also containing the necessary machinery for manufacturing peat blocks. The eastern section (about 185 feet long) is a three-story open, though roofed, structure, used for the storage of the moist machined blocks while drying, and for the storage of the blocks when ready for market. The lower floor



MARSH OF THE LAMARTINE PEAT, LIGHT AND POWER CO., FOND DU LAC, WISCONSIN

This picture shows peat dredge, ditch, rail tracks (partially obscured by grass) to the right of ditch, and factory in the right background.



MARSH OF THE LAMARTINE PEAT, LIGHT AND POWER CO., FOND DU LAC, WISCONSIN

The characteristic meadow type of marsh, with its flat basin, the absence of trees or tall vegetation, and the abundance of grass and sedge, are plainly shown here. Note the dredge in the distance, the ditch ,the scow and track terminals in the foreground. A narrow gauge railroad track runs along the left side of the ditch to and beyond the dredge.

of the western section of the building is built upon the ground level and has masonry walls extending up about 10 feet. Above this is a framed super-structure consisting of three floors. The eastern section is entirely of wooden construction. Four rows of 30-foot telephone poles, extending the entire length of the building, support

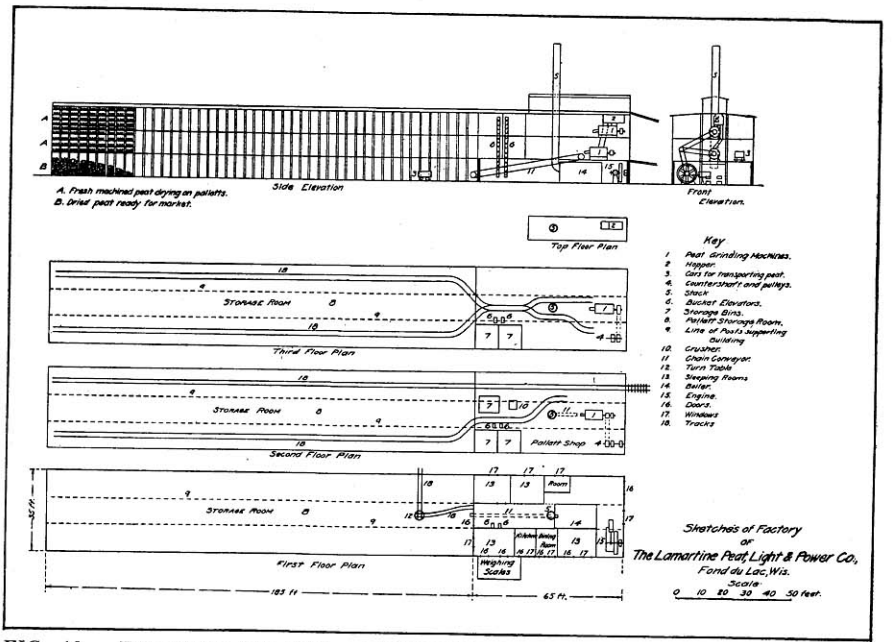


FIG. 18. FACTORY OF THE LAMARTINE PEAT, LIGHT AND POWER CO., FOND DU LAC, WISCONSIN

the floor and roof timbers of the eastern section. The poles in each row are approximately four feet apart and the rows of poles are about 12 feet apart.

A kitchen, a dining room, and several sleeping rooms for accommodating the employees, are found in the lower or first floor of the western section of the building. Here, also, are located the boiler and engine used to drive the peat machinery. In the second and third stories are the peat cutting and moulding machines and necessary countershafting and pulleys. Here also, are several storage bins. A hopper, for the reception of the raw peat received from the marsh is located on the fourth floor. Cars, tracks, bucket elevators and a chain conveyor, shown in the diagram, are employed for transporting the peat material from point to point. A peat crusher is located on the second floor.

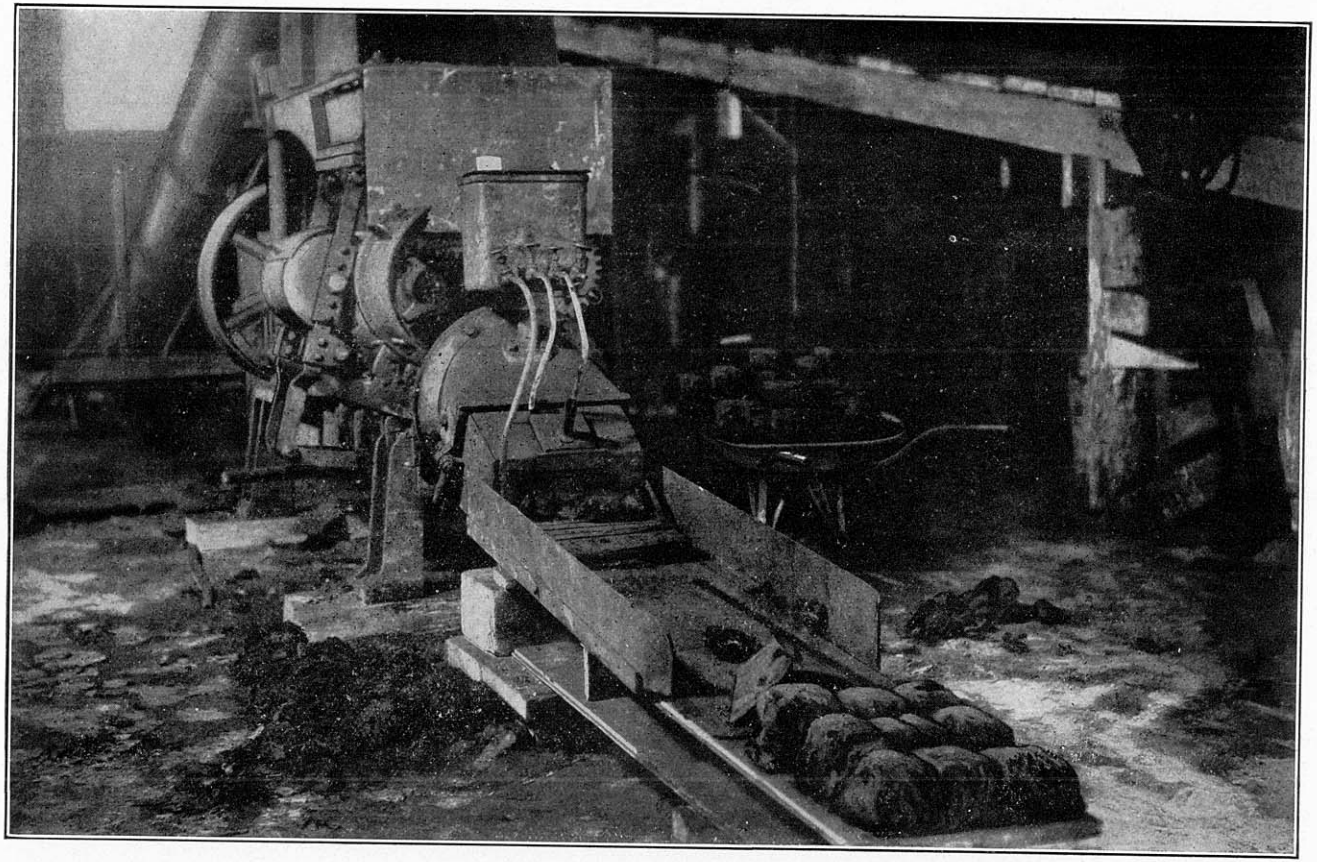
The two upper floors of the eastern section of the building are used for the storage of machined peat as it comes from the presses. After the peat has been dried and is ready for market, it is stored on the ground floor of this section.

Drying Sheds. Immediately south of the factory are five open, roofed sheds in which the peat, after having been formed into blocks and machined, is stored for air-drying. These sheds are about 10 feet high, 12 feet wide, and of different lengths, one shed being about 10 feet long, two about 120 feet long, and two about 160 feet long.

Method of Operating Plant

Operation of the plant was carried out on the following lines. Peat, dug by the dredge, was dumped either into cars directly or first into the scow and then into the cars. Next, over tracks provided for that purpose, the loaded cars were moved up the hill and to the top story of the factory. Here the material was dumped into a hopper. A screw, operating inside of the hopper, fed the raw peat through rectangular chutes into the pug mills which thoroughly cut, ground and mixed it. There were two of these machines, one on the third and one on the second floor, connected to the hopper by the chutes in such a way that the peat material could be guided into either one or both of the mills. These pug-mills had moulding attachments, consequently, the material left the machines in the form of rectangular bricks about 3″ x 4″ x 8″ in size. It was not possible to obtain a satisfactory picture of these machines but they are similar to the one shown in Plate XIX. This plate was reproduced from Bulletin 376 of the U. S. Geological Survey and gives a good idea of the Fond du Lac machines as well as of the peat blocks which the machines turned out.

Bricks manufactured on the third floor were then placed on crate-like, wooden holders called palletts, loaded on cars, and stored in the third floor section devoted to air drying. Some of the blocks issuing from the pug mill on the second floor were handled similarly, having been stored in the second floor drying section. Another portion of this material was placed on palletts and carried to the ground floor by the chain conveyor. When the blocks arrived at the lower end of the conveyor, they were loaded on cars and taken to the sheds, south of the plant, and allowed to air dry for a time. Finished material was stored in piles on the ground floor of the eastern section until required for delivery to consumers.



PEAT PRESS FOR MAKING 50 TONS OF MACHINE PEAT A DAY

In operation at the Fuel-Testing Plant of the U. S. Geological Survey, Jamestown Exposition, Norfolk, Va., October, 1907.
From U. S. Geological Survey.

Some of the dried blocks were run through a crusher and the crushed peat, so obtained, was carried by bucket elevators to bins.

All of the machinery was driven by a steam engine which took its steam from a boiler. Both boiler and engine were located in the lower floor. Water for the boiler was drawn from a well underneath the factory. Peat was used for fuel in the boiler.

MISCELLANEOUS

Dr. C. A. Beebe of Fond du Lac, the chief promotor of this enterprise, supplied the following information.

Capacity of Plant. One hundred and sixty tons raw material in ten hours. The method of digging was not satisfactory. For lack of money, a first class dredge could not be provided, and the makeshift that was used could not get peat out fast enough to supply the capacity of the plant.

Kind of machines. One machine was built after the design of Dr. Beebe and had a capacity of ten tons per hour. The other, operated in connection with a clay pug-mill, was a stiff mud brick machine with modified screw and die. It had a capacity of about six tons per hour.

Size and Kind of Engine. One hundred and twenty-five H. P Reynolds Corliss. Engine was loaded up to about 60 H. P.

Number of Men Employed. Sixteen to eighteen. At times, less.

Cost of Plant and Accessories. Approximately $26,000.

Cost of Manufacture. This must be estimated, as more or less construction work was going on at the same time that plant was in operation. With a good dredge to supply the plant with raw material, it is estimated that the labor cost could be kept below $1.00 per ton.

Selling Price. Air-dried peat sold for $6.00 per ton in Fond du Lac. However, it is thought that this price is too high to make a market for a large output.

Peat fuel was made and sold at Fond du Lac during the summers of 1905 and 1906. But since that time the plant has not been operated. Experiments have been carried on, however, with a view of utilizing the peat in this deposit for paper making, in gas producers, and in various distilling carbonizing and chemical processes for the recovery of by-products from the peat.

Concerning the use of the peat for fuel, Dr. Beebe has to say, "Our peat fuel gave the best satisfaction in cook stoves and grates. We have many testimonials certifying that people preferred peat to any other fuel they ever used. I burned it one winter in my furnace at home with good results. We used it continuously under our boiler at the plant. Dry peat raised steam quicker than any other fuel we tried. The boiler was always clean. At long intervals the form of cleaning was carried out, but it was wholly unnecessary. The greatest criticism of peat fuel is that it burns up quickly. It contains so much oxygen that little draft is required. Consequently, experience and judgment are necessary to get the best results."

Two economic features—or rather defects—of this plant are brought to mind.

1. The plant was located about $\frac{1}{8}$ mile from the marsh. Consequently all the water in the raw peat had to be hauled this distance and a waste of energy was thereby involved. The expense of handling raw material would have been much less had the plant been located nearer the marsh.

2. The plant was several miles from a railroad track and, assuming that the peat could have been manufactured economically, there was too much expense connected in hauling the finished product from factory to nearest railroad line or possible markets.

Gas From Fond du Lac Peat. The experiments described in Chapter X were made upon peat from the Fond du Lac plant. By referring to that chapter additional information concerning value of this deposit for gas making purposes may be obtained.