

THE MANUFACTURE OF PAPER PULP, PAPER AND CARDBOARD FROM PEAT.

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The most recent discovery for the use of peat is the manufacturing of paper from its fiber. This has been so perfected that paper of almost every variety, weight, and quality is produced, while the strength and durability of such is quite equal to that of paper made from any kind of vegetable pulp.

Among all the inventions in the art of paper making there is probably none of such eminent reach and importance as the one reported by this article. Peat, the raw material used, is probably the cheapest possible substance and effectually substitutes almost any of the raw stuffs at present used for the manufacture of paper.

From geological reports which we have at hand we learn that there are immense deposits of peat existing in the United States, especially in the Northern and Western States.

Apparently little attention has been paid to the various uses of peat in this country, and the swamps and bogs in which it occurs are at present almost worthless, but, undoubtedly, this invention will give to them a value never before dreamed of.

A study of the peat itself shows it to be composed very largely of fibrous material.

These fibers come from the remains of moss and grass which growing and decaying in successive generations form the peat. In this submersion and decay, the reeds and grass undergo physical and chemical changes. The organic matter of the vegetation becomes changed, so that little possibility of any fermentation or decay remains, but the fibrous structure is preserved intact. These fibers are found to possess unusual physical properties, being very durable, elastic and non-conducting.

There are various kinds of peat, but it is only the more fibrous grades, which show great strength and resistance on account of their elasticity and immutability, which are used for the production of paper, and the paper itself shows these same properties. While the peat bogs of the United States seem to have attracted little attention, even scientific works making but casual reference to this subject, in European countries peat has been used for various purposes for many years—notably for stable bedding and for fuel. For fuel the peat is subject to high pressure and formed into small briquettes, which have proved a good substitute for coal, possessing almost as high a heating power and being produced at about one-half the cost of coal.

Mr. Karl A. Zschoerner, an Austrian gentleman, who has been interested in the peat business for many years as an owner of large estates covered with peat, recognized the specific properties of the peat fiber, and after numerous experiments was ultimately enabled to turn his investigations to good account by perfecting a process for the manufacture of paper pulp, paper and cardboard from the peat fiber, thus opening up a large new field of industry. This process has been patented in the United States, Canada, British Columbia, Japan and all the European countries.

Already there are in operation several factories in Europe, which are producing large quantities of all kinds of paper from this material and which have proved highly profitable.

From a national economical standpoint, this invention will be of great value, as it will be the means of developing a new field of industry, and lands and territories formerly worthless are now becoming valuable.

The opening of the peat fields and the development of this industry will furthermore retard, in some measure, the destruction of our forests and woodlands, which have, during recent years, become steadily decreased an account of the enormous drain for various purposes, not the least being that of making pulp from wood for the manufacture of paper.

Of peat there are inexhaustible deposits, and statisticians claim that there is sufficient to cover the consumption of paper for about three centuries, so that notwithstanding the naturally increased value of peat lands, now that a use has been found for them, it is impossible that this raw material will attain the value of the present paper stuffs.

The method of making paper pulp from the peat fiber is a simple one, being a cold process. By Zschoerner's method an apparatus called a disintegrator, consisting of five compartments, in which the peat fiber is successively treated by a chemical process and which is at the same time adapted as an hydrostatic pressure apparatus, is used. In these compartments the fibrous peat is subjected to a process which consists mainly of three treatments, as follows:

1. Treatment of the fibrous peat by means of an alkali solution of a concentration not higher than 2 per cent Baumé and gradually decreasing in strength by means of the addition of water—this operation carried out under a high atmospheric pressure, but at a normal, even below normal, temperature. The first step of the treatment is intended to prepare the extraction of the soluble vegetable and earthy matters of the peat fibers.

2. The fibrous material after this treatment is then

exposed to a kind of oxidizing process, which acts at the same time as a bleaching agent, for the purpose of opening the fiber and the cleaning of it. At this point a solution of calcium or sodium hypochlorite is used at a normal temperature, but under a still higher pressure.

3. The substance, after being twice treated, is subjected again to an alkali solution, but this time of a strength of about one per cent Baumé at a normal temperature and still under high pressure. By this last step all the earthy and decomposed vegetable matters which have been rendered soluble by the oxidizing process compound with the alkali and are drained off as a colored lye. After this the material is thoroughly washed and can be worked into paper either alone or mixed in percentage with any other paper stuffs with any of the machinery at present in use for paper making, no other special machines being necessary.

The bleaching and even the alkali process may be repeated without any injury to the strength and elasticity of the fiber.

The method described being a cold process also effects considerable saving in fuel, at the same time being very cheap in consequence of the low concentration of the solutions used, and furthermore the whole process is rapidly completed, accelerated as it is by the use of hydrostatic pressure.

Only the more fibrous grades of peat are of value in the manufacture of paper, not those which are commonly called muck and sometimes used as fertilizer, which represent the most decomposed state of peat, being in some instances almost a true coal. Peat beds vary considerably in area and depth, some running as much as 60 feet deep, and of course the deeper the layer the more decomposed is the vegetable matter; but even these lower layers are of value to the manufacturer of peat paper, as they furnish the fuel for the engine of a factory and effect, it is claimed, a saving of at least 70 per cent as compared with coal.

The raised bogs usually produce the most suitable peat for paper making, their accumulation being due to the growth and decay of certain kinds of swampy vegetation of the genus *Sphagnum* and its numerous varieties.

This plant forms a loose turf and has the property of dying at the extremities of the roots as it increases above, thus gradually forming beds of great thickness. In some localities the *Sphagnum* moss is replaced by species of *Hypnum*. The roots and leaves of other plants, trees or their stumps or any other vegetation present may contribute to the accumulation.

Zschoerner's invention is liable to cause changes in the paper market, for it must be admitted that it would be difficult to imagine a cheaper material than peat, which hitherto had little or no value in this country.

THE NEW SMOKELESS POWDER FACTORY.

A new navy smokeless powder factory will shortly be in operation at the Indian Head Proving Grounds, near Washington, and will be capable of furnishing about 2,000 pounds a day. It is now in course of construction, and will be ready for service some time this autumn. The designs were drawn by the Bureau of Ordnance, and Lieut. Bernardou has had charge of the work in the main. With the completion of this factory, says *The Army and Navy Journal*, the navy will have plants capable of furnishing the service with about four or five thousand pounds of powder a day. This will hardly be sufficient for the service, but the navy does not intend to compete with private firms; still it wishes to have plants which will enable the government to have a source of supply in case of any emergency. A number of buildings are now being completed, including an electric light plant. The buildings, as a rule, are widely scattered, so that an explosion in one would not destroy the others, and there is no large central building. One building is to be used for the picking process, another for the mixing and a third for the dangerous acids. A complete electric car service connects most of the buildings, so that the manufacture of the powder will be greatly expedited. Commander Cowden is in charge of the proving station and the factory.

COMPRESSED PEAT FUEL.

Compressed peat fuel is being made in Canada at Stratford in the Province of Ontario. The peat is obtained from a swamp near by which has an area of 40,000 acres, and the peat bed is from 1 to 20 feet thick. The peat is cut and dried in the air, is then pulverized, passed through a picker and to a hopper which automatically feeds into a 2-inch steel tube 15 inches long. The pulverized peat is forced through this tube by pressure and formed by dies into cylinders three inches long which are almost as dense as anthracite coal. It weighs 83 pounds per cubic foot, weighing 10 pounds less than anthracite coal and being 10 pounds heavier than bituminous coal. It has been tested in locomotives, showing the thermal value of 100 pounds of peat equal to 95.15 pounds of coal. The cost of manufacture is 60 cents per ton. It is said that there are 1,000,000 acres of peat bog in Ontario alone.

SCIENCE NOTES.

A newspaper printed on the excursion steamer "Ophir" published one number in 80° 2' north latitude. It claims to be the paper published farthest north of any on record.

Formaldehyde acts as a poison when taken internally, and if strong enough to act as an antiseptic should be handled with caution and not allowed to get into the hands of children.

A phonograph outfit was taken to Osborne House on the Isle of Wight and a cylinder was put on to it which conveyed a message of greeting from Menelik. The Queen responded, and the cylinder containing her message was sent to Abyssinia.

A series of experiments made by Benno Erdmann and Raymond Dodge show that in normal reading the letters are not spelled out separately and one after the other, but that a short word of not more than four letters can be read off in less time than a single letter.

Prof. A. R. Crook has returned to Chicago with a number of students after exploring the fossil fields of Wyoming since July 17. Among the fossils obtained was the skeleton of a dinosaur. The size of the femur was 5 feet 2 inches long, which indicates that the big saurian was over 15 feet in height.

A well preserved Roman camp has been discovered in Herzegovina; a section 330 feet long by 270 feet wide has been traced. A portion of the walls, the gates and the doors are still standing and many utensils and weapons have been dug up. It is believed that the camp was erected in the time of Nero.

Japan is to have an Arctic expedition. The government wishes to develop in the Japanese the spirit of adventure and discovery which has rendered the English nation so powerful. The only places available for exploration by sea are the Arctic region of the north and the Antarctic region of the south.

Investigations have been made of sewage irrigation on the truck farms south of Los Angeles, Cal. The health officers have recommended the prohibition of the sale of sewage for the irrigation of land where certain kinds of fruits, vegetables and garden products are grown, stating that the use of sewage for that purpose is injurious.

New York was visited by a strange aerial parade of butterflies on September 7. They were first noticed in the downtown districts just before noon. They were very conspicuous in the downtown parts through the Wall Street region. The butterflies were the *Danaus Archippus*. The weather conditions have been very favorable, which is probably the cause of vast numbers being hatched at just the same time.

The New York Zoological Park, which occupies a part of Bronx Park in the borough of the same name, will be opened to the public about the second week of October. The specimens which will be ready for public inspection will form but a small part of the exhibit. They will be very interesting. A number of buildings have been constructed; between two and three miles of walks have been laid, roads have been built and a sewer system has been put in.

The Navy Department wishes a nautical expert for the Hydrographic Office, and the salary is \$1,000 per annum, and the Department of Agriculture desires an ornithological clerk who must have an excellent knowledge of ornithology and mammalogy and his examination will include a practical test in the identification of specimens of birds and mammals. In fact, these two subjects count 70 per cent in the examination to be held. The person who succeeds in passing will be placed on the eligible list, and if selected will receive the munificent salary of \$660 per annum.

The great leisure for research which is made in German universities can be understood by reading the figures published in *Science*: Twenty-two per cent of the professors in the German universities are engaged in lecturing or in laboratory supervision from two to six hours a week, and fifty-one per cent from seven to twelve hours. Of the associate professors sixty per cent are engaged from two to six hours per week, and of the privat-docents eighty-three per cent; only four per cent of all privat-docents are engaged in lecture or laboratory supervision more than twelve hours a week.

The Duke of Abruzzi has found an important mistake in the last map of Franz Josef Land. He says that Cape Flora is really ten geographical miles east of the post assigned on Jackson's map. The map of Payer was riddled by Jackson, who complained of its inaccuracies, but he has himself assigned the wrong position to his own camp. The total expense of the Italian prince's expedition will, it is thought, reach a half million dollars. His baggage is distributed among 1,500 boxes, each weighing about 45 pounds. His belongings are carefully classified, and each variety of apparatus, tools, provisions, etc., has a special color, and each box is painted and numbered according to the class and nature of its contents. The inside of each chest is lined with tin and soldered up to keep out water and dampness.