

THE USE OF PEAT AS FUEL.

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Peat is that product of vegetable decay which we find composing the soil of most of the swamps of temperate zones. We may expect to find it any place where bog conditions exist. Europe, Asia and America contain extensive bogs and it is estimated that the total area covered by peat is many times greater than the total area of all known coal fields.

The peat bogs which occupy over 15 per cent. of the area of Ireland have for centuries been the main source of fuel in that island. In fact the term "peat" has become so intimately connected with Ireland that popular fancy has imagined it to be characteristically and exclusively an Irish product. As a matter of fact, a most incomplete survey indicates that the peat fields of America exceed not only those of Ireland, but are larger by nearly a hundred times than the combined bogs of all Europe. Thousands of square miles of peat of the finest quality exist throughout the Northern States and Canada. New England has whole counties of it. The Great Dismal Swamp of Virginia is one continuous peat bed. New York, Ohio, Indiana, Illinois, and the Great Northwest contain deposits of peat, the value of which is as yet almost unsuspected. In the bogs where it occurs it is a closely matted, felt-like substance, very fibrous and usually very wet.

Just as coal and wood exist in many varieties, we find similar variations in peat. In general all peat may be classed under one of two varieties: The black peats, which are composed of the bodies of grasses, sedges, and other large plants, and the brown peats, formed from sphagnum and other mosses. It is the latter variety which forms the immense beds of North America, and for the purposes of this paper it will be understood that we refer only to this brown form.

In its pure state peat contains only such inorganic matter as was present in the bodies of the plants from which it was formed. Impure peat may contain other inorganic matter, as sand, clay, silt which has been washed in from adjacent hills, or deposited by the overflow of streams, as the location of the swamp would indicate.

The use of peat as a fuel by no means limits its range of useful application: ardent experimenters have found many ways of utilizing this humble stuff.

Where thorough drainage is possible, peat lands have proven excellent for agricultural purposes, though in most cases requiring the addition of considerable quantities of potash. As a fertilizer peat has been demonstrated to possess decided value and is so used extensively today. From the more fibrous peats an excellent paper is prepared, large works in Germany being devoted to its manufacture. As a disinfectant



A typical Peat bog.

and deodorizer, powdered peat has been sold, under an assumed name, for some years, and most excellent results have been obtained from it. Indeed the range of possible use of this remarkable substance seems almost limitless. It has been used as a substitute for charcoal in the manufacture of fireworks, coarse heavy cloth has been prepared from it, a recent patent claims its successful use as a substitute for papier-mache, a serviceable cement has been made from its ashes, and within the past year the agriculturists at an Indiana college have suggested the possible value of peat as a stock food.

While the work of demonstrating these possibilities was necessarily very great it has not been so extensive as the experiments which have been made along the line of developing its use as a fuel.

Crude peat, cut from the bogs with spades and piled in the open to dry, has fed the fires of peasantry in Europe for centuries. Extremely light and spongy in character, burning slowly, with only a moderate amount of heat and considerable smoke, it made a very poor fuel



The crude process of Peat mining as practiced in many European countries.

indeed. Its great bulk, its friable character and the readiness with which it absorbed water, made the problem of transporting it almost insurmountable, even had there been a market for so crude a fuel.

As the European forests were destroyed or protected from further destruction by the governments, wood as a fuel became scarce and the price of coal arose accordingly.

As early as 1821 we find that German inventors had directed their attention to the problem of compressing peat. It no doubt seemed a simple problem to those first experimenters, as it has to most of the investigators of more recent times, but it was nearly three-quarters of a



Block of Peat from the surface of a bog, showing the Sphagnum Moss.
(Natural size.)

century before any practical process of briquetting peat was devised. Early inventors, not unlike some later ones, thought that peat could be condensed and dried by simple pressure. Hundreds of thousands of dollars were spent in demonstrating the fallacy of this theory, a fallacy that is self-evident when once the character of the material is fairly understood.

As it comes from the bog, peat contains from 75 to 80 per cent. water. The fibrous character of the substance prevents the removal of this water by direct pressure and also accounts for the difficulty experienced in drying the crude material by exposure to the air. Not only is the moisture held between the fibres of the peat but it is contained in the capillary spaces running through the fibres, and any successful process of fuel making must contemplate the destruction of the fibrous nature of the material.

At present, investigators are working on two general processes for the conversion of peat into a marketable fuel. The older of these methods may be called the wet process and consists in breaking and grinding the wet peat until it loses its fibrous structure and becomes almost like clay in its plasticity. It is then moulded into blocks of convenient size and allowed to dry spontaneously. In drying, the briquettes shrink to about one-third their original size and become very dense and hard, and when thoroughly dry contain only from 5 to 10 per cent. moisture. Crude peat, that is, peat as it comes from the bog, can not be dried below about 20 per cent. moisture, owing to its fibrous nature.

Peat prepared in this general manner has long been a commercial article in many European countries. Germany, Holland and Russia use large quantities of it, and I am told that more than two million tons are marketed yearly in Sweden.

Considering the progress which this industry has made in Europe it is surprising that America is only beginning to utilize the vast stores of this fuel with which she is so richly supplied.

In the natural transformation of peat into coal (for coal is but an advanced condition of marsh mud) three fundamental changes take place: the peat is dried, compressed and carbonized. It was an attempt to imitate this natural process which led to the discovery of another way of making peat briquettes. In this "dry process," as it is called, the peat is first artificially dried and pulverized in machines constructed for that purpose. This dry peat powder is then compressed under heavy pressure into a hard and dense briquette. While this process produces a briquette of excellent quality, no compressor has as yet been patented which is a commercial success. The past few years have seen many dry peat-pressing machines offered on the market, all of which have failed either from actual inability to do the work or from too great cost of operation.

Compared with coal, briquettes made by either of the above processes have many advantages to offer. Calorimetric tests show that condensed peat possesses a fuel value equal to the best coal, and practice proves that this fuel is available under ordinary conditions of burning. The best of coal contains slate, shale, iron and other clinker-producing elements. Clinkers inhibit the supply of oxygen (air) and the carbon, unable to burn, goes up the chimney in the form of smoke. On the other hand, the very nature of its origin prevents the possibility of clinker formation in a peat fire. The ashes of the new fuel, fine and soft as cigar ashes, fall through the grate bars and allow a constant supply of fresh air to pass through the fire, thus securing perfect combustion and practically no smoke.

It has been urged against peat that it contained a high percentage of ash-producing constituents. A marketable peat will contain from two to ten per cent. of ash, pure coal from two to eight per cent. These are the figures of the laboratory. As a matter of fact the average per cent. of ash from a coal fire is from 20 to 35 per cent. and in it is contained not only ashes and clinkers but also quantities of unburned coal—the result of choked grate bars.

The almost universal absence of sulphur in peat renders it a far more wholesome fuel than any of the soft coals. Indeed so mild is the smoke produced from peat that it has been used in emergencies as a substitute for tobacco.

In specific gravity, this condensed fuel will vary from about 1.10 to 1.65. In other words a ton of it will occupy about the same space as a ton of hard coal.

While peat briquettes are not absolutely waterproof, they are relatively so, for when once the fibre of the material is destroyed and it has been allowed to dry, no amount of soaking will reduce it to its original condition.

Recently some attempt has been made to combine peat with various other substances. For one reason or another all of these mixed fuels have failed. One of the most notable of these combinations uses a certain proportion of crude petroleum. As a result a pile of such fuel is constantly liable to spontaneous combustion.

Mixtures of peat and anthracite dust have failed, owing to the necessity of using an expensive "binder" to give the briquettes solidity. Aside

from their high cost, binders in fuel of this type have failed for two reasons. The organic binders (as starch) burn more rapidly than the fuel proper, and as a result much unburned matter falls through the grate bars. On the other hand inorganic binders add so materially to the resulting ash as to render their use impractical.

The most successful process of briquetting peat will be found to be the one which is the least complicated, for simplicity will tend not only to economical production but to practical operation as well.

In conclusion it is not too much to predict that the peat fuel industry in America will rival in magnitude the coal industry of today. It is difficult to conceive of the importance which this industry must have in the development of our great Northwest, but it is there, in a region destitute of coal, though rich in every other respect, that we must expect to find the first and most extensive use of peat fuel.