

UNITED STATES PATENT OFFICE.

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PROCESS OF TREATING PEAT FOR THE PRODUCTION OF FUEL AND THE RECOVERY OF THE BY-PRODUCTS

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To all whom it may concern:

Be it known that I, CARL ADOLPH SAHLSTRÖM, professor, of the city of Ottawa, in the county of Carleton, Province of Ontario, Dominion of Canada, have invented certain new and useful Improvements in Processes of Treating Peat and Like Substances for the Production of Fuel and the Recovery of the By-Products, of which the following is a specification.

My invention relates to improvements in processes for treating peat, sawdust, and other vegetable matter for the production of fuel and the recovery of the useful by-products; and the objects of my invention are to obtain from peat or other vegetable matter with the greatest possible economy a fuel of high caloric value in the form of powder or briquets, and during the process to extract from the peat or other material such by-products as are detrimental or useless as fuel or have an independent commercial value, the various steps of the process being hereinafter described in detail.

The moist peat taken from the bog contains generally three principal ingredients. These are peat fiber, peat-powder and water. The peat fiber is made up of partly-decayed roots, stalks, &c., from which it is difficult to extract the moisture, and, further, they contain in their composition a very small percentage of combustible elements, and hence are of little value for the purpose of fuel. The peat powder, on the other hand, consists of vegetable matter in an advanced stage of decomposition. This powder is less bulky than the fiber and contains a large percentage of carbon and other combustible substances and is consequently of far greater value than the fiber as an economic fuel.

The object of my invention is therefore to separate the fiber from the powder, and, further, to remove from the powder such portions or constituents as are non-combustible or are otherwise invaluable as fuel.

In carrying out my process the moist peat from the bog is treated as follows: The peat is first shredded or teased in order to break up the meshes or intertwining of the fiber. The result of this step of the process is that the moist peat is brought into a condition in which the fibers are more or less parallel, and consequently the moisture may be more readily removed therefrom than when the grain or fiber of the peat is closely packed and running in all directions. The shredded peat

is now subjected in a continuous stream to a gradually-increasing pressure in such a manner that a very large quantity of the water contained is forced out and the peat is left partially dry and closely compressed. The compressed and partially-dried peat is now disintegrated and loosened without the fiber being broken, cut up, or otherwise destroyed. In its disintegrated state the peat is subjected to heat at a comparatively low temperature, and by this means the water which is still held by the peat is driven off in the form of steam and a certain amount of wood spirit or alcohol is also vaporized and driven off from the peat. This wood-spirit is collected and suitably stored for use. The peat is now thoroughly dry, and the next step of the process is to separate the comparatively useless fiber from the powder, which, as above pointed out, contains a large percentage of combustible substances. The separation of the fiber from the powder is effected by screening, and the fiber is carried off to be used as desired. The separated peat powder is now subjected to heat at gradually-increasing temperatures, and it is found that the substances—such as ammonia, acetic acid, and certain gases, all of which are non-combustible—are driven off at the lower temperatures. The ammonia is given off at a lower temperature than the acetic acid, and consequently each of these by-products may be collected entirely separate from each other, so that they may be used without further treatment for the purpose of separation. As the temperature to which the peat powder is subjected increases it will be found that certain tarry vapors and combustible gases are given off. These combustible gases may be used as fuel for the purpose of heating the peat powder, thus effecting a great saving in the course of carrying out the process. A further use for the tarry vapors and combustible gases will be hereinafter described. The peat powder is now practically reduced to carbon. The impurities contained by the carbon are, however, at this stage of the process almost entirely combustible gases, hydrocarbons, and the like, which are valuable as fuel and may therefore be retained without detracting from the calorific power of the fuel. If it be desirable to produce pure carbon, the powder may be further heated, thus driving off the volatile impurities and leaving the carbon almost absolutely pure. The partially or completely carbonized peat powder is now cooled by suitable means. It is preferable, however, to commence cooling

by passing steam through the hot mass, thus producing water-gas, which may be used as fuel to effect the carbonization and to supply power for the various other steps of the process. The carbonized powder is then further cooled by bringing it in close proximity to but not in contact with a continuous stream of cold water. The tarry vapors and combustible gases which were extracted from the peat powder during the carbonizing process may now be added to the partially-cooled carbon. The combustible gases will be absorbed by the carbon as it cools, and the tarry vapors will be mixed with the powder and will serve as a binding material, so that the powder may be pressed into briquets of suitable form. If, however, it is desirable to use the carbonized peat in the form of powder instead of briquets, the tarry vapors need not be added; but the carbon may be finely powdered, and in this state it may be very advantageously employed by blowing it into the fire-grate where it is to be used by any suitable blower.

It will now be seen that by means of the process above described all the ingredients of the raw peat which are non-combustible or would tend to prevent the perfect combustion of the combustible portions are removed, the resultant product being a fuel which contains nothing but highly-combustible substances and is consequently of great value.

Particular attention may be drawn to the great economy of the process, and it may here be pointed out that the entire process may be carried out without the use of any outside fuel. The water-gas and combustible gases produced as above described are more than sufficient to heat the peat powder during its carbonization, and, further, in drying the peat it is not necessary to use any fuel, the hot gases which are the products of combustion of the water-gas, &c., being used to dry the peat.

I am aware that it is not broadly new to carbonize peat for the purpose of producing fuel, as this has been done to my knowledge more or less successfully on a number of different occasions; but I do claim as new the combinations of steps hereinafter pointed out. Further, it may be particularly mentioned that the partial carbonization of peat whereby the non-combustible and useless substances—such as ammonia, acetic acid, and non-combustible gases—are driven off, while the carbon and combustible substances—such as hydrocarbons, tarry vapors, and certain combustible gases—are retained, is new.

What I claim as my invention is—

1. The herein-described process of treating peat and the like which consists in first shredding or teasing the raw peat; then subjecting the peat in a continuous stream to a gradually-increasing pressure; then mechanically disintegrating the compressed and partially-dried masses of peat without cutting or de-

stroying the fiber; then subjecting the peat to the action of heat whereby the moisture is removed therefrom; then separating the fibrous peat from the peat powder by screening; then subjecting the peat powder to heat at increasing temperatures until the non-combustible ingredients are driven off and the peat is reduced to a partially-carbonized condition in which it contains only the combustible components which are valuable as fuel; then cooling the partially-carbonized peat as and for the purpose specified.

2. The herein-described process of treating peat and the like which consists in first removing the moisture therefrom; then separating the fibrous peat from the peat powder; then subjecting the peat powder to heat at increasing temperatures till the non-combustible ingredients are driven off thereby reducing the peat to a partially-carbonized condition in which it retains all or part of the combustible components which are valuable as fuel; then partially cooling the heated mass of more or less carbonized peat by passing a blast of steam therethrough, whereby water-gas is produced as a by-product; then further cooling the partially-carbonized peat as and for the purpose specified.

3. The herein-described process of treating peat and the like which consists in first removing the moisture therefrom; then separating the fibrous peat from the peat powder; then subjecting the peat powder to heat at increasing temperatures till the acetic acid, ammonia and non-combustible gases are driven off; then subjecting the peat to a still higher temperature whereby tar or tarry vapors and certain combustible gases are driven off; then partially cooling the resultant product by passing a blast of steam therethrough, thereby producing water-gas as a by-product; then further cooling the partially-carbonized peat by bringing it in proximity to but not in contact with a continuous stream of cold water, and simultaneously mixing with the cooling mass a suitable quantity of tar or tarry vapors to serve as a binding material and bringing the unused portion of the previously-separated combustible gases in contact with the cooling mass whereby such gases are absorbed; then pressing the resultant product into briquets of suitable shape and size as and for the purpose specified.

4. The herein-described process of preparing peat and the like for carbonization which consists in first shredding or teasing the moist raw peat thereby breaking up the meshes and intertwining of the fiber whereby the moisture may be more readily extracted; then subjecting the peat in a continuous stream to a gradually-increasing pressure whereby a large portion of the moisture is extracted therefrom; then mechanically disintegrating the pressed and partially-dried peat; then subjecting the mechanically-disintegrated peat to

heat thereby removing the remaining moisture; then screening the dried peat whereby the peat fiber is separated from the peat powder as and for the purpose specified.

5. The herein-described process of treating peat and the like which consists in first removing the moisture therefrom; then subjecting the peat to heat at increasing temperatures thereby driving off and collecting separately various ingredients among which are tar and tarry vapors and certain combustible gases; then cooling the partially or completely carbonized peat and simultaneously adding to the cooling mass a portion of the tar or tarry

vapors previously extracted, to serve as a binding material, and the unused portion of the previously-extracted combustible gases which are valuable as fuel; then pressing the more or less carbonized mass into briquets as and for the purpose specified.

Signed at the city of Ottawa, in the Province of Ontario, this 27th day of November, 1902.

CARL ADOLPH SAHLSTRÖM.

Witnesses:

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