No. 728,854. Patented May 26, 1903.

# UNITED STATES PATENT OFFICE.

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## EMULSION FUEL COMPOUND.

SPECIFICATION forming part of Letters Patent No. 728,854, dated May 26, 1903.

Application filed January 23, 1901. Serial No. 44,340. (No specimens.)

*To all whom it may concern:*

Be it known that I, WILLIAM FRANK BROWNE, a citizen of the United States, residing at New York city, in the county and State of New York, have invented certain new and useful Improvements in Emulsion-Fuel Compounds; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an emulsion-fuel compound composed of peat and water emulsified together to form a homogeneous liquid or semiliquid compound adapted to be forced into heated conduits wherein a gas is generated which is continuously discharged for either heating or illuminating purposes.

The object of this invention is to provide a suitable liquid or semiliquid homogeneous emulsion fuel adapted to be transported and delivered to customers to be made into gas for heating and illuminating purposes.

This emulsion fuel made from peat and water can be manufactured at or contiguous to the place or places where the peat is mined, or the peat in its wet or in a partially or wholly dried state can be transported to some central station where the emulsion fuel can be manufactured and from thence distributed to customers.

In the manufacture of the emulsion fuel it is important that the solid carbonaceous material, such as peat, be reduced to a finely-divided condition. The cellular structure of the peat or other solid material must be broken up and reduced to a state of molecular division in order to secure the best results in the production of a homogeneous undepositable emulsion and the best results in the rapid generation of a combustible gas therefrom in a comparatively small extent of heated conduits. The breaking up of the cellular structure of the peat is done by grinding the peat-and-water mixture together in a mill which is especially adapted for the purpose. If the peat and water are merely mixed by stirring them in a vessel, the peat after the agitation ceases will deposit or separate from the water, and when done in this or any other analogous manner the product falls far short of the purpose for which the emulsion is intended for the reason that the cells of the peat are unbroken. The vegetable fiber and small roots and decayed wood, which occur more or less in all peat-beds throughout the country, will not be broken up by any device such as a clay-mill or other analogous mixing device.

It has been found by actual experience and after repeated trials that it is not practical to obtain a complete and continuous combustion from an emulsion of peat and water without first breaking up the cellular structure of the peat. The generation of gas and the combustion thereof cannot be made continuous unless the peat is reduced to a finely-comminuted state or to a state of molecular division. This has been discovered to be the only true condition in which the peat can be utilized for combustion when combined with water and manufactured into an emulsion fuel, as herein described. It has also been discovered that the peat emulsion will not clog the heated generating coils or conduits, as will be the case when a too high percentage of petroleum or other liquid hydrocarbon is used with water. The reason for not clogging the pipe is that the peat has chemically combined therewith a large percentage of oxygen, and therefore on being heated to incandescence by the heat of the coil will readily decompose and its constituent elements will be recombined into fixed gases, which pass out of the heated coils. This has been found to be true after repeated trials. The discovery of this feature is of vital importance, for without the chemical action—decomposition and recomposition—which takes place and continues in the heated coil or conduit this method for the production of combustible gases would be of no value. The more finely the cellular structure of the peat or other vegetable matter is divided the more rapid will be the action of clearing the coil of all matter after the pump used for forcing in the emulsion is stopped and the fires are out in the furnace, the heat of the coil being sufficient to continue the evolution of the gases

until the last vestige of the emulsion fuel has been discharged in the form of gas from the coil. There will therefore be no coking of residual carbon and clogging of the pipes. The fine ash of the peat being small in quantity and light and fine in quality will pass along and be discharged with the gases into the fire-box or furnace, from which it will pass off through the stack or chimney to the open air.

When peat and water are mixed together without breaking up the cellular structure, the peat will deposit in the tank and prevent the pump from drawing it therefrom, thus making it necessary to fix some agitating device in the tank and keep it in motion in order to keep the peat and water thoroughly mixed and in condition to be forced into heated conduits. Moreover, when such a mixture of peat and water is used it will be necessary to use a great length of heated coil or conduit in order to thoroughly decompose the peat and make a combustible gas therefrom. This operation cannot be effected in the short length of conduit or coil limited to the fire-boxes or furnaces of boilers, limekilns, and analogous structures. It is therefore necessary for all classes of furnace-work to break up the cellular structure of the peat and reduce it with water to a state of molecular division, whereby the molecules of peat and water become a homogeneous compound that will not stratify or separate into zones with fixed lines of demarcation between the different substances.

When a mixture of peat containing vegetable fiber and water is forced into a heated conduit, the unbroken cells which are in small lumps of varying sizes will not wholly decompose while passing through the heated conduit. Consequently the small lumps of carbonaceous matter are forced into the fire-box, where they are seen to burn in finely-diffused incandescent sparks, thus permitting aqueous molecules to pass off occluded in the products of combustion, involving the loss of a great many heat units. These aqueous molecules are derived from the water of the emulsion fuel, and they should be broken up on their passage through the heated coil or conduit, thereby forming by decomposition and recomposition new combustible gases. In this decomposition and recomposition in the heated coil the carbon element of the peat combines with an equivalent of the oxygen element in the aqueous molecule forming carbon monoxid gas, thus setting free two equivalents of the hydrogen element, which when the gas is discharged into the furnace and during combustion combines with another equivalent of oxygen supplied by air, thus generating heat instead of absorbing it, as will be done when the aqueous molecule is discharged into the furnace, where the heat of combustion is greater than that within the coil, but not sufficiently high to decompose the aqueous molecule unaccompanied by the carbon element. Now as the decomposition of the aqueous molecules in the presence of carbon in the heated coil is effected at a much lower temperature than is required to decompose such molecule in the absence of carbon it will be readily perceived that the heat resulting from complete combustion of the combustible elements or gases constantly being discharged into the furnace must be greater than it is in the coil or conduit. Consequently a loss of heat must occur from absorption by the aqueous molecule on its discharge from the coil into the furnace. If the cellular structure of the peat is thoroughly broken up and reduced to a molecular condition, so as to form with water a homogeneous and undepositable emulsion compound or so that the different substances are occluded one within the other, then the molecules of the peat and water will be so intimately mixed or emulsified that on being forced into the heated coil decomposition of the contained compounds will be rapidly effected and a recomposition of the elements will take place, forming new compound gases prior to their discharge into the furnace. On discharge of these hot combustible gases into the furnace complete combustion is effected and the highest heat obtainable from the elements is produced.

In the manufacture of the new emulsion fuel compound the cellular structure of the peat is best broken up by grinding the peat with water in a mill which is especially adapted for the purpose, the peat and a stream of water being fed together into the mill. A perfectly homogeneous and undepositable emulsion is formed in which the peat molecules are uniformly suspended in and among the molecules of water.

The emulsion fuel may be manufactured at or contiguous to the place where the peat is mined, or the peat may be transported to a central station, where the emulsion is manufactured and from which it may be distributed through pipes or other means to customers. The peat can be mixed and dried and then ground to a dust prior to its mixture with water. This dust can be prepared at the peat-bed and transported to the manufacturing-station and there be emulsified with water in a suitable grinding-mill, or the dried peat in a crude condition can be ground with water in a suitable mill into an emulsion-fuel compound.

If the peat is ground and emulsified with water at or near the place where it is mined, the emulsion may be forced through pipes extending from the place of manufacture to a suitable distributing-station, or the pipe with connecting branch pipes may extend directly to the manufacturing plant, where the emulsion can be discharged into tanks for use, the supply being controlled and regulated by a suitable valve or valves. This regulating-valve may be caused to work automatically, the flow of emulsion being made

continuous by the constant pressure exerted at the pumping-station and while the emulsion fuel is being manufactured.

When the emulsion fuel is to be forced through pipes laid long distances from the point of manufacture to the places of use, it should be made into practically an undepositable compound wherein the peat is reduced to a molecular condition and the molecules of the water and peat are in occlusion with each other, whereby the peat will not separate from and deposit in the water, as it would if only mechanically mixed therewith. The cellular structure of the peat must therefore be thoroughly broken up and emulsified into a homogeneous compound with water.

This new emulsion fuel compound will not burn except under certain conditions, such as to preclude all possibility of fire originating from incendiarism and spontaneous combustion wherever and however long a time it may be stored for future use. The invariable condition under which the emulsion can be used as a fuel is that in which it is first decomposed into combustible gases, the emulsion being forced by a pump into suitably-heated receivers or coils wherein chemical changes take place resulting in the production of fixed gases, which on their exit from the receiver or coil undergo the chemical change called "combustion."

All fuel should be changed to a fixed gas prior to its entering into a furnace for combustion, and this gas should be intimately mixed with a controllable supply of oxygen necessary for the combustion of all the combustible elements contained in the gas. This mixture of all the elements required for combustion should be simultaneously discharged into the furnace, wherein a perfect combustion of the elements will be effected and the highest heat attainable from the gaseous element produced. No other method of combustion can equal this in its quality and quantity of heat units produced, weight for weight, of any given combustible material.

In consequence of the reduction of the cellular structure of the vegetable compound to a molecular condition, as herein described, it has become practical and economical to utilize for fuel what has heretofore been considered to be a worthless substance, and, furthermore, this substance cannot be made available in an economical sense without the herein-described mechanical treatment for its reduction to a homogeneous and undepositable or inseparable emulsion fuel compound.

This new method of treating an emulsion fuel compound composed of peat and water by first reducing the peat and water to a condition of molecular division is a desideratum which has for a long time been sought in the solution of the problem of an economical utilization of peat for fuel.

The peat and water may be emulsified together to make an effective emulsion fuel compound in the proportion of dry peat ten per cent. and water ninety per cent. or dry peat fifteen per cent. and water eighty-five per cent. or a still greater per cent. of dry peat and a smaller per cent. of water. When the emulsion fuel is to be packed and shipped in vessels, I prefer that it shall contain still larger percentages of peat. The emulsion could then be reduced with water to the proper semifluid consistency at the place of use.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A fuel compound consisting of peat, reduced to a state of molecular division, and water, the peat being emulsified with the water in the condition of a homogeneous, undepositable emulsion compound.

2. An emulsion fuel compound consisting of peat and water emulsified together, the peat being in a state of molecular division, and the mixture being a homogeneous compound, in a liquid or semiliquid condition, adapted to be forced into heated conduits, substantially as described.

3. The herein-described method of preparing an emulsion fuel compound, which consists in reducing the peat to a state of molecular division, emulsifying such finely-divided peat with water to form a liquid or semiliquid homogeneous compound adapted to be forced into heated conduits for making fuel-gas, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM FRANK BROWNE.

Witnesses:
HERBERT C. EMERY,
EUGENE B. CLARK.