

UNITED STATES PATENT OFFICE.

JOHN T. DAVIS, OF SAN FRANCISCO, CALIFORNIA.

ARTIFICIAL FUEL.

SPECIFICATION forming part of Letters Patent No. 621,041, dated March 14, 1899.

Application filed November 17, 1898. Serial No. 696,715. (No specimens.)

To all whom it may concern:

Be it known that I, JOHN T. DAVIS, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Artificial Fuel, of which the following is a specification.

My invention relates to artificial fuel; and its object is to utilize for that purpose waste products, such as culm and coal-dust or natural products of low combustible value, such as various grades and kinds of lignite. By combining with such products in proper proportions ingredients of higher combustible value I raise the combustibility of the agglomeration to the proper average and at the same time consolidate the inferior base which forms the greater part of the resulting mass into a firm substantial fuel in the form of briquets, which will stand up in the fire and will be a cheap but efficient substitute for the higher grades of natural coal. Such a binding composition also forms a hard envelop which assists in retaining the volatile gases generated by combustion, a great percentage of which pass away and are wasted in the ordinary use of low-grade fuel. For binding the low-grade material I use asphaltum, crude petroleum of heavy gravity, and bituminous coal. In referring to "asphaltum" I include any natural asphaltum and also manufactured asphaltum, ordinarily produced in different grades of hardness, as a residuum of the distillation of petroleum. Either or both substances can be used, according to the circumstances attending their supply, such as their relative cheapness or the facilities for obtaining them. Under some circumstances I also use a proportion of ozocerite on account of the inflammable nature of the paraffin which it contains. The proportions of my binding composition vary somewhat according to the nature of the material which is to form the base of the ultimate fuel. Ordinarily they will be as follows: With from one hundred to one hundred and seventy-five pounds of asphaltum (natural asphaltum, manufactured asphaltum, or a mixture of both) I combine ten to twenty-five pounds of crude petroleum and one hundred to one hundred and fifty pounds of bituminous coal, which should contain at

least twenty per cent. of bitumen. The asphaltum (natural, manufactured, or combined) is melted in a proper vessel at a temperature of 250° Fahrenheit or more. To it is added the crude petroleum to toughen the bitumen, and finally the pulverized bituminous coal to increase the quantity of bitumen. The combined ingredients are thoroughly mixed and incorporated and while hot are run into molds to form blocks of any shape convenient for transportation. Thus these blocks form a special article of manufacture which can be kept in stock for sale or transported for use elsewhere as a binder to be used with low-grade materials, such as those referred to.

When ozocerite is used, as before mentioned, its melting would form the first step in the process, since its melting-point is above 300° Fahrenheit. In such case the other ingredients would be added to the ozocerite in the order before given and the blocks molded in the same way.

It is not necessary to mix the bituminous coal with the other ingredients of the binding composition at the time those ingredients are incorporated together. In many cases, and particularly where the binding composition is made for use and not for sale or transportation, the bituminous coal can be added to the mixture at the time of its incorporation with the low-grade material. This would be the case ordinarily at a mine producing lignite, for instance, or at works where the preparation of the binder and its incorporation into the fuel are both carried on. In such cases the mixed asphaltum and oil would be melted and combined with the low-grade base and the pulverized bituminous coal. The effect is the same as if the coal had originally formed a part of the binder.

When the coal originally forms a part of the binder, it is preferred to grind the blocks to a powder and mix it with the inferior material, the latter being in small fragments or, in case of coal-dust or culm, in natural form. In either case heat is then applied—say 250° Fahrenheit—so as to soften the binder and allow the combined mass to be molded into briquets, eggettes, or other forms convenient for use as fuel.

The brown lignites, having no coking qualities, will not stand up in the fire when made into briquets; but when combined with this binder that difficulty is entirely overcome.
5 Thus the binder, besides its primary object of increasing the combustible nature of the low-grade base, also gives it the same quality of permanence that is found in high-grade natural coals. It is also to be observed that the non-
10 coking bituminous coals, as well as the brown lignites, have in their composition from thirty to fifty per cent. of fixed carbon and from thirty-eight to forty-two per cent. of volatile gases. In the ordinary use of these coals, the
15 volatile gases not being held in close affinity with the fixed carbon, much of their value passes away without being utilized. This is due to the fact that the oxygen of the atmosphere is not brought into contact with
20 them at such a temperature or in sufficient quantity to convert them into carbon dioxide. By the use of the binding composition they are restrained and held back until the combustion of the binding-envelop, which is necessarily at a temperature to convert the gases
25 into heat units. This brings the heating qualities of the lignites up to a much higher

standard than can be secured without the use of the binding composition.

In the utilization of lignites which contain 30 sulfur I find it of advantage to incorporate with the binder a percentage of lime equal to the amount of sulfur present—that is, the chemical equivalent—for the purpose of preventing the escape of sulfurous-acid gas. 35

What I claim as new, and desire to secure by Letters Patent, is—

1. A binder for low-grade material, such as lignite, culm and the like, composed of asphaltum, crude petroleum and bituminous 40 coal.

2. An artificial fuel composed of a low-grade material such as lignite, culm and the like, combined with a binding composition composed of asphaltum, crude petroleum and bituminous coal. 45

In testimony whereof I have affixed my signature, in presence of two witnesses, this 4th day of November, 1898.

JOHN T. DAVIS.

Witnesses:

L. W. SEELY,
H. J. LANG.