

# UNITED STATES PATENT OFFICE.

HERBERT CHARLES BATH FORESTER, OF SKETTY, NEAR SWANSEA,  
ENGLAND, ASSIGNOR TO THE PATENT AGGLOMENT FUEL SYNDI-  
CATE, LIMITED, OF SWANSEA, ENGLAND.

## ARTIFICIAL FUEL.

SPECIFICATION forming part of Letters Patent No. 630,677, dated August 8, 1899.

Application filed December 28, 1897. Serial No. 664,102. (No specimens.)

*To all whom it may concern:*

Be it known that I, HERBERT CHARLES BATH FORESTER, mechanical engineer, a sub-  
ject of the Queen of Great Britain, residing  
5 at Penybryn, Sketty, near Swansea, England,  
have invented certain new and useful Im-  
provements in the Manufacture of Artificial  
Fuel, (for which I have obtained the grant  
of Letters Patent in Great Britain, No. 682,  
10 dated January 10, 1896,) of which the follow-  
ing is a specification.

This invention is designed to produce an  
artificial fuel having many improvements and  
advantages, an especial object being to pro-  
duce such fuel of the highest or of a very high  
15 calorific power from cheap and easily-pro-  
cured elements, to prevent or reduce smoke  
during combustion, and which will, moreover,  
rapidly generate steam when used under  
20 steam-boilers, &c.

My present invention is as follows: First  
I take coal containing sufficient hydrocarbons  
to effect the result which I hereinafter de-  
scribe or hydrocarbonaceous coal in admix-  
25 ture with anthracite coal or coke, breeze, or  
the like, and crush or otherwise reduce the  
same to a powder or more or less finely-di-  
vided condition suitable for my purpose. To  
this coal, &c., I add, according to the nature  
30 of the coal, &c., employed and the quality  
desired to be imparted to the fuel to be made,  
any of the following elements: petroleum,  
crude or otherwise; tar, such as coal-tar;  
creosote or creosote oils; pitch, such as coal-  
35 tar pitch or wood-tar pitch; naphthalene or  
naphthalene salts; resin or other suitable  
hydrocarbon either in the solid or liquid form.  
The coal, &c., is combined with any one or  
more of these elements in a powdered or other  
40 form. For instance, I may use any of the  
following mixtures in or about the following  
proportions, by weight: (a) coal, eighty-five  
to ninety per cent.; pitch, ten to fifteen per  
cent., or, (b) coal, eighty-five to ninety per  
45 cent.; pitch, four to eight per cent.; tar, one  
to five per cent., or even larger proportions  
of pitch and tar may be used, or, (c) coal,  
eighty-five per cent.; pitch, eleven per cent.;  
naphthalene, one per cent.; resin, three per

cent. Lime (slaked or otherwise) may be 50  
added in any suitable proportion as desired,  
and when employed I find it advantageous to  
use only a very small proportion of lime in  
the fuel—viz., only one to two per cent., as  
this very small proportion gives the best re- 55  
sults. This mixture or compound is now in-  
troduced into a retort or pug-mill or suitable  
chamber wherein same is closely confined and  
subjected to a suitable heat, preferably with-  
out the injection of steam among the fuel ma- 60  
terial—for instance, by a furnace acting on  
the exterior of the retort. This heated retort  
or chamber is sealed up or capable of being  
sealed or kept tightly closed in any suitable  
manner or so arranged that either alone or 65  
acting in conjunction with the fuel material  
thereby escape of volatiles is prevented or  
practically prevented, an essential object of  
my present invention being to prevent or  
practically prevent the volatiles or volatile 70  
matters from escaping in making artificial  
fuel while the mass is being subjected to the  
heat and consequential pressure and to oc-  
clude said volatiles in the made fuel.

In certain cases it may be sufficient to elon- 75  
gate the retort either with or without reduc-  
ing the diameter thereof at the entrance or  
exit, or both, or so design and arrange such  
entrance or exit, or both, and so apply the heat  
that a column of cold or cooler fuel material 80  
will during its passage into or out of the re-  
tort, or both, intervene between the material  
confined in that part of the retort (which is  
exposed to the heat necessary to effect the  
chemical combination or agglutination) and 85  
the atmosphere, the material or mixture itself  
thus forming a seal, preventing the escape of  
the volatile matters which it is my object to  
preserve.

By heating the above materials or certain 90  
of them in the presence of each other in a  
confined space or closed chamber pressure  
is created, and while the escape of volatile  
matter is prevented special combination and  
agglutination results, giving many advan- 95  
tages.

Any suitable machinery or apparatus may  
be used in carrying my present invention into



practice. For instance, the coal, &c., may be mixed with the other elements in any ordinary mixer, which is advantageously not under heat.

5 The material is now passed through the closed heating-chamber or retort according to my present invention in any continuous manner adapted for the purpose advantageously by feeding same continuously to one  
10 end of a horizontal retort or heating-chamber, along which it is forced by an Archimedean screw, and ejecting same at the other end, and on emerging from said retort said material is pressed or molded into the desired  
15 shape or form by any suitable machinery, such as the apparatus described in my application for United States Patent, filed May 18, 1897, Serial No. 637,060, while the escape of the volatiles is prevented, and thus said ma-  
20 terial is pressed up into the solid form in the presence of its own gases or vapors, which are consequently occluded in the fuel.

The aforesaid heated retort or chamber may advantageously be provided with a safety-  
25 valve in the event of excessive pressure arising.

The above-described process of manufacture results in a patent fuel which is not a mere mechanical mixture of coal and agglu-

tinating material, as patent fuels hitherto manufactured have been, but is a new compound in which the coal has either been fused or dissolved in or chemically combined with the added hydrocarbons and all or practically all the volatiles or volatile matters retained and  
35 pressed up into the solid fuel.

The fuel material passed through this process may be used without pressing, if desired. For instance, for cooking anthracite coal a mixture of the latter and tar may be simply  
40 passed through the closed retort and not afterward pressed.

Having thus described my invention, what I claim as new, and desire to secure by Letters  
45 Patent of the United States, is—

The process of manufacturing artificial fuel, which consists in mixing crushed coal with a combustible agglutinating agent, heating the mixture in a closed vessel out of contact with the air or other foreign bodies and under pres-  
50 sure, causing the mixture continually to pass through said heated vessel, and molding the agglomerated fuel into blocks still out of contact with the air, substantially as described.

HERBERT CHARLES BATH FORESTER.

Witnesses:

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I. A. MORRIS.