

UNITED STATES PATENT OFFICE.

THOMAS PARKER, OF LONDON, ENGLAND.

FUEL.

No. 865,724.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, THOMAS PARKER, M. I. C. E., a subject of the King of Great Britain and Ireland, residing at 1b Chapel street, Edgware Road, London, W., England, have invented certain new and useful improvements in and Relating to Fuel, of which the following is a specification.

This invention relates to processes of preparing fuel and consists in a method of partially distilling away volatile bodies from coal by heating to a comparatively low temperature and arresting the distillation at a point where gases burning with luminous flame cease to be evolved but where the coal still contains volatile matter, all as more fully hereinafter set forth and as claimed.

I am aware that it has before been proposed to produce by a process of partial destructive distillation fuel resembling coke and to secure thereby a considerable yield of tar, as well as an illuminating gas of high candle power; but it has not heretofore been practicable to produce in a simple process of destructive distillation without some preliminary or after treatment a flaming fuel of substantially constant and uniform character which while being capable of practically smokeless combustion with the production of a high temperature in an ordinary fire grate and being readily ignitable is still of sufficient hardness to stand handling, stacking and carriage.

After very careful research I have determined the conditions under which such a fuel of substantially constant and uniform character can be produced in the use of bituminous coal of different quality. I have found on the one hand that if the temperature of distillation be excessive the product is hard and varies very much in character and quality owing to the difficulty of arresting the process at the particular point short of complete carbonization, beyond which it is difficult to retain in the fuel treated sufficient hydrogen to insure a flaming combustion with high temperature, while on the other hand if the temperature of distillation be too low the product is soft and the duration of the process is considerable and not easy to determine rendering it very difficult to produce in a practical and commercial way a fuel of uniform character and homogeneity that is sufficiently hard to withstand handling, stacking, and carriage or that will not require further treatment to render it fit for commercial use.

Now according to the invention I effect the destructive distillation of coal within a closed retort, and I maintain the temperature within the retort at about 800° F. during the process of distillation, arresting the heating of the material at the point where the evolved gases cease to burn with a brilliant flame like that of illuminating gas and when the coal itself becomes hard, and free from tarry matter while still capable of burning with flame.

I have found that when the process of distillation is conducted at about 800° F. as indicated within the retort, and the process arrested at the point described the fuel produced has still a relatively high content of hydrogen, and has sufficient hardness to withstand handling, stacking and carriage.

On heating coal at the described low temperature the soft bituminous constituents are carbonized, producing tar and gas and the tarry bodies are again decomposed with the production of rich illuminating gas. As long as any tarry bodies remain, gas burning with a luminous flame is produced and the coal itself is more or less plastic, both hot and cold. But as the tarry bodies decompose they produce a hard tough carbon or hydrocarbon which cements the mass into a hard tough body as distinguished from the hard brittle body, or coke, formed by pushing the carbonization further and at a higher temperature. At high temperatures the carbon produced from the hydrocarbons tends to be of very hard or "graphitoidal" consistency. The fuel produced in the described manner is hard enough to stand carriage and handling but is somewhat porous and for this reason and also because it still retains flame producing hydrogenous bodies it is easy to ignite. In burning it burns with a distinct flame of non-smoking characteristics with production of a very high temperature.

I have obtained very good results in the use of a D-shaped metal retort 16 inches high 5 feet wide, and 7 feet long and by charging the fuel into the retort to a height not exceeding 6 inches to insure even and uniform heating. I have however found that in cases of very bituminous coals that the crystalline structure of the fuel produced is not sufficiently and uniformly close and dense so that the fuel easily breaks into small pieces and easily crumbles into dust but I find that this may be obviated by effecting the distillation under pressure that is to say it may be effected within closed receptacles into which the coal is introduced and packed tightly so that the distillation may be effected under the pressure consequent upon the expansion of the coal in the cylinders, which precludes the formation of a weak sponge like and irregular crystalline structure of the fuel. When utilizing such receptacles I prefer to provide sheet iron cylinders slightly tapered and of a diameter of from 10 to 12 inches with an outlet at one end formed as a series of perforations through which the gases may find egress into the retort and I may provide a number of such cylinders within each retort. It will however be understood that the distillation may be effected under pressure in the use of vertical retorts or furnaces in which the burden will insure sufficient pressure on the mass during the process of distillation to prevent the formation of a weak spongy and irregular crystalline structure of the fuel. When effecting the distillation in such vertical retorts or fur-

naces I provide that one of the cross sectional dimensions of the retort shall not be less than 6 inches and that preferably the retort shall be so set as to be heated all round.

5 I find that the fuel produced from all classes of coal is improved in quality when the distillation is effected under pressure or in such closed cylinders or within vertical retorts or furnaces as aforesaid.

10 I lead away the gases evolved and pass them through a condenser, scrubber and purifier and otherwise deal therewith substantially in the same manner as is usual in the ordinary method of manufacture of coal gas.

Distillation in the manner described results in the yield of a gas of great illuminating power as it is not 15 diluted by the gas which would result from pushing the heating to the true coking stage. All the tar, ammonia and other valuable by-products which are yielded in the ordinary gas making operation are also yielded in substantially the same amount in this.

20 Towards the end of the process I admit steam into the retort to insure the final temperature being slightly lowered thereby assisting in arresting the carbonization and to cleanse the fuel from sulfur, and I draw the fuel from the retort immediately on illuminating gas 25 ceasing to be evolved.

I quench the fuel either before or after being drawn from the retort, but I prefer first to draw the fuel into a receptacle where it is no longer subjected to heat, and after its closure I then quench the fuel by admission of 30 steam so that thus the fuel may not re-ignite.

A hard fuel results capable of use without any further treatment and which in burning in an open grate develops more heat than ordinary coal, lasts longer in

burning and is moreover practically smokeless in combustion. 35

What I claim as my invention and desire to secure by Letters Patent is.—

1. The herein described process for the production of fuel from coal which consists in subjecting the coal in a closed retort to a comparatively low gas evolving temperature, maintaining it at this temperature while illuminating 40 gas continues to be evolved and cooling when illuminating gas ceases to be evolved and when the mass is substantially free of tarry components so that the product shall be hard, of uniform character, homogeneous and capable of withstanding stacking, handling and carriage without further treatment. 45

2. The herein described process for the production of fuel from coal which consists in subjecting the coal in a closed retort to a temperature of about 800° F., maintaining it at about this temperature while illuminating gas 50 continues to be evolved, and then cooling and removing the fuel from the retort.

3. The herein described process for the production of fuel from coal which consists in subjecting it in a closed 55 retort under moderate pressure to a temperature of about 800° F., maintaining it at this temperature while illuminating gas continues to be evolved and cooling and withdrawing the fuel when illuminating gas ceases to be evolved.

4. The herein described process for the production of 60 fuel from coal which consists in subjecting the coal in a closed retort to a temperature of about 800° F., maintaining it at about this temperature while illuminating gas continues to be evolved and then suddenly arresting the heat by introduction of steam and removing the fuel from 65 the retort.

In testimony whereof I have hereunto signed my name to this specification in the presence of two subscribing witnesses.

THOMAS PARKER.

Witnesses:

WILLIAM EDWARD EVANS,
FREDERICK COLLINS.