

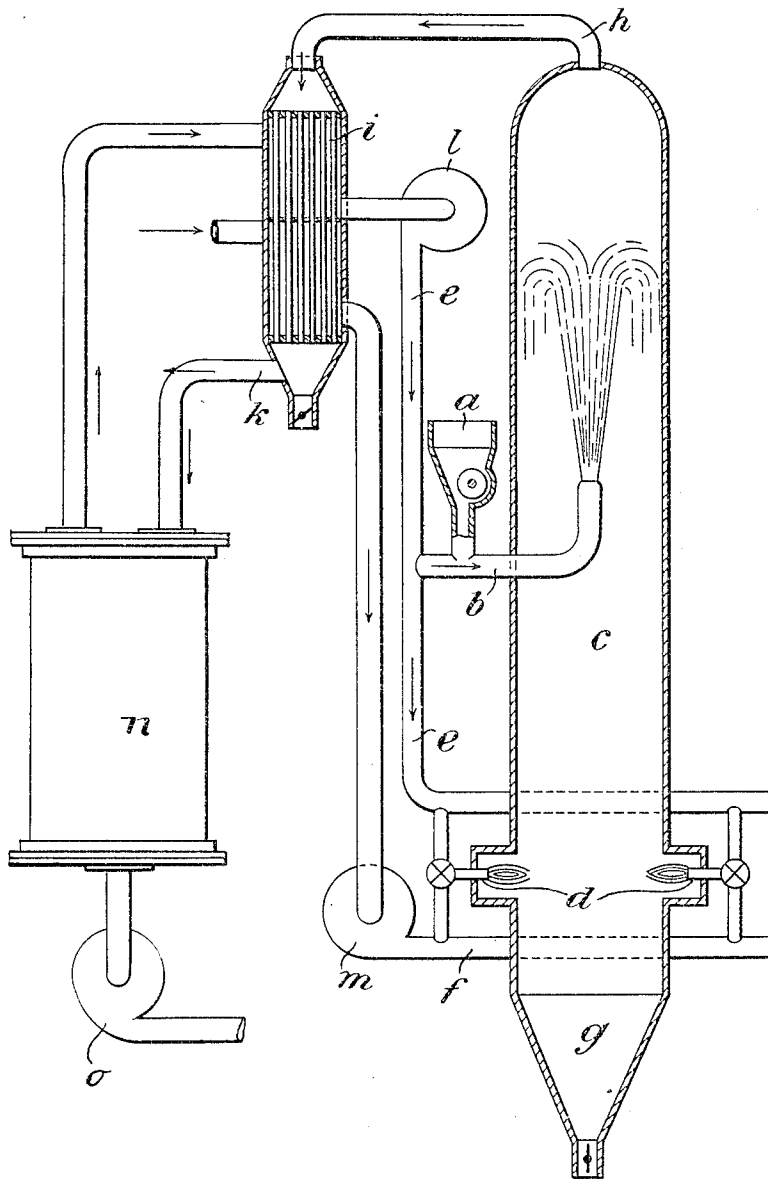
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METHOD AND APPARATUS FOR CARBONIZATION OF SUBDIVIDED FUEL

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METHOD AND APPARATUS FOR CARBONIZATION OF SUBDIVIDED FUEL.

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This invention relates to improvements in processes of carbonizing finely subdivided fuel so as to obtain a comparably subdivided coke or semi-coke and oils, and is an improvement in or modification of that described in my United States specification Serial No. 389399 now Patent No. 1,481,140, granted January 15, 1924. In that specification I have described a method of effecting this object by burning, in close proximity to the carbonizing zone, some of the gas produced so as to heat the elastic fluid which circulates through the chamber and which carries the subdivided fuel in suspension. In the particular operation described in that specification, the circulation is arranged with a view to retaining within the system as much of the heat as possible, the chief loss of heat being that due to radiation; on this account the circulating system does not include a condenser, and it follows that oil vapour, which should not be heated for a longer period than is absolutely necessary, remains for some time in the system, becoming deteriorated.

I have now found that, by suitable recuperation of the sensible heat in the elastic fluid leaving the carbonizing chamber, it becomes possible to pass the whole of this fluid through the condenser, the only circulation through the system being that of the portion of gas produced which is used for heating the carbonizing chamber, or as a carrier for the pulverized fuel to be carbonized.

The improved method consists, therefore, in causing the whole of the hot elastic fluid from the carbonizing chamber to pass first through a heat recuperator and then through a condenser, the gas which is to be burnt in the chamber being returned from the condenser through the recuperator. Or the gas may be returned from the condenser directly to the chamber and the air for burning it may pass through the recuperator, or both the said gas and air may pass through the recuperator.

It has also been found that there is considerable difficulty in obtaining a satisfactory suspension of the powdered fuel in the elastic fluid when the former is merely fed by gravity into the latter, although this is in rapid movement. By the present improvement the powdered fuel is blown into

the carbonizing chamber by some of the gas produced.

The accompanying diagram shows in sectional elevation a convenient apparatus for this method.

The powdered fuel is fed from a hopper *a* into a pipe *b* through which it is blown by gas, as hereinafter described, into the chamber *c* at about the middle part thereof. It ascends in the chamber and then falls in the manner of a fountain into the lower part of the chamber where it meets the hot products of combustion from the burners *d* which are fed with gas from the pipe *e* and air from the pipe *f*. The fuel is thus carbonized and collects in the hopper *g* to be removed continuously or intermittently by any suitable device.

The volatile products of the carbonization pass through the pipe *h* to the heat recuperator *i* through which they pass and thence by way of pipe *k* to the condenser *n* under suction of the fan *o*.

The recuperator chamber, so far as the space surrounding the tubes through the said products pass is concerned, is divided by a horizontal partition into two compartments. Through the upper of these some of the combustible uncondensed gases from the condenser are drawn by a fan *l* which delivers them to the pipe *c*. A portion of these gases serves to blow the pulverized fuel through the pipe *b* as aforesaid, while the rest supplies the burners *d*. Another fan *m* draws air through the lower compartment of the recuperator and supplies this air to the burners *d* through the pipe *f*.

Having thus described the nature of the said invention and the best means I know of carrying the same into practical effect, I claim:—

1. A process of carbonizing powdered fuel which consists in causing the fuel to be fed, while in suspension in hot elastic fluid of the process, into a carbonizing chamber, withdrawing elastic fluid from said chamber, imparting some of the sensible heat of the elastic fluid being withdrawn to the previously withdrawn elastic fluid, a portion of which is returning to the carbonizing chamber and another portion of which is to form a constituent of a combustible mixture of gases, mixing the latter portion of the elastic fluid thus heated with a gas suitable

for burning the said constituent, and burning the mixture in the carbonizing chamber, whereby the said powdered fuel is carbonized.

2. A continuous process of carbonizing finely sub-divided solid fuel which consists in causing the fuel to be fed into and suspended in an elastic fluid of the process which has been re-heated, causing the fuel while in suspension in the hot elastic fluid to be conveyed into a carbonizing chamber, withdrawing elastic fluid from said chamber, and imparting some of the sensible heat of said withdrawn elastic fluid to the previously withdrawn elastic fluid for re-heating the latter, a portion of the elastic fluid thus reheated returning to the carbonizing chamber, also imparting some of the sensible heat of the elastic fluid being withdrawn to a gaseous supporter of combustion, mixing a portion of the reheated elastic fluid and the gaseous supporter of combustion, and burning the mixture within said chamber and carrying out therein a carbonization of the fuel thus fed into it.

3. A process of carbonizing finely sub-divided solid fuel which comprises causing the fuel to be carried in suspension by hot elastic fluid, which is a previously produced gas of the process, while said fluid is below the carbonizing temperature, feeding said hot elastic fluid with fuel suspended therein into a carbonizing chamber which is at a temperature higher than that of said fluid and fuel, carrying out a carbonization of the fuel within the carbonizing chamber while the fuel is suspended therein, withdrawing elastic fluid from the carbonizing chamber, imparting sensible heat of the elastic fluid being withdrawn to elastic fluid previously withdrawn from the carbonizing chamber to reheat the latter fluid, and condensing the volatilized portions of the elastic fluid being withdrawn prior to reheating it.

4. A process of carbonizing powdered fuel which consists in causing the fuel to be carried, while in suspension in hot elastic fluid of the process, into a carbonizing chamber, withdrawing elastic fluid from the carbonizing chamber, imparting some of the sensible heat of the elastic fluid being withdrawn to the elastic fluid previously withdrawn from the carbonizing chamber and some of which fluid is on its way to said chamber for the purpose of conveying fuel in suspension therein into the carbonizing chamber, and some of which fluid is on the way to a mixing means, and also imparting some of the sensible heat of the elastic fluid being withdrawn to air, mixing the air thus heated and some of the elastic fluid re-heated, introducing the mixture into said chamber, and burning the mixture in said chamber, whereby the said powdered fuel is carbonized.

5. A process of carbonizing powdered fuel

which consists in causing the fuel to be carried, while in suspension in re-heated gases of the process, into a carbonizing chamber, withdrawing gases of the process from said chamber, and passing them into heat-interchanging relationship with the gases being fed into the carbonizing chamber, thus transferring sensible heat from the gases being withdrawn to the gases returning to the carbonizing chamber to reheat said returning gases, condensing a portion of said withdrawn gases after said transfer of heat therefrom, causing the uncondensed portion of said withdrawn gases after being reheated to inject powdered fuel into said chamber, and carrying out a carbonization of the fuel in said chamber.

6. The process of carbonizing powdered fuel which consists in causing the fuel to be carried, while in suspension in hot gases of the process, into a carbonizing chamber, withdrawing gases of the process from said chamber, imparting sensible heat of these withdrawn gases to a portion of the gases previously withdrawn from said chamber, and returning thereto, causing some of said portion of the gases thus heated to inject powdered fuel into the carbonizing chamber, mixing the rest of said portion of said gases with air, and burning the mixture of air and gases in said chamber, whereby the said powdered fuel is carbonized.

7. A process of carbonizing powdered fuel which consists in causing the fuel to be carried, while in suspension in re-heated gases of the process, into a carbonizing chamber, withdrawing gases of the process from said chamber, imparting some of the sensible heat of the gases being withdrawn to gases previously withdrawn from said chamber to reheat said previously withdrawn gases, after such gases have passed through a condensing operation to condense and remove volatilized matter therefrom, also imparting some of the sensible heat of the gases being withdrawn to air, causing some of said reheated gases to inject powdered fuel into said chamber, and mixing the rest of the portion of said re-heated gases with said air and burning the mixture of air and gases in the carbonizing chamber, whereby the said powdered fuel is carbonized.

8. Apparatus for carbonizing finely sub-divided fuel comprising a vertical chamber, an upwardly projecting pipe extending into the said chamber, burners at the lower part of the said chamber, means for withdrawing gas from said chamber and causing a portion of said gas to inject finely sub-divided fuel through the said pipe, means for supplying another portion of said gas to the said burners, a heat recuperator, a condenser, means for passing volatile products of carbonization from the chamber through the recuperator and the condenser and means for

passing elastic fluid through the recuperator into the chamber.

9. Apparatus for carbonizing finely subdivided fuel by suspending it in an elastic fluid, comprising a carbonizing chamber, means for injecting the fuel upwardly into the said carbonizing chamber, means at the lower part of the said chamber below the point of injection of the fuel for creating a

zone of high temperature, a recuperator and means for withdrawing elastic fluid from the chamber, passing said fluid through the recuperator, and returning such fluid to said chamber. 10

In testimony whereof I have signed my name to this specification. 15

SAMUEL McEWEN.