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E. B. G. BASCOU

PRODUCTION OF COKE AND SEMICOKE

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Fig. 1

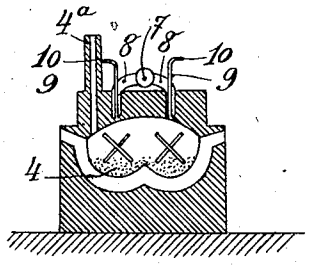
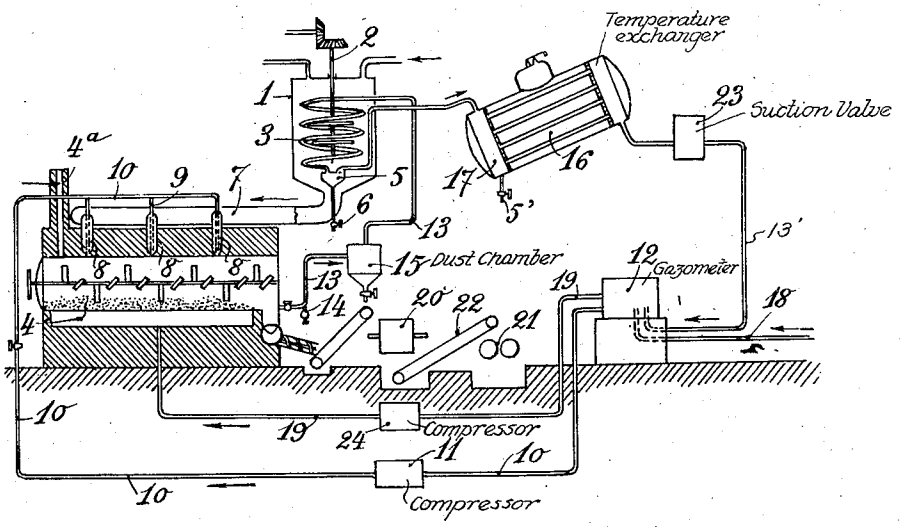


Fig. 2.



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PRODUCTION OF COKE AND SEMICOKE.

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This invention relates to improvements in the production of coke and semi-coke.

Coking or bituminous coal is at present normally subjected to a preliminary distillation. When the distillation temperature does not exceed 650° C., a poor coal known as "semi coke" is obtained as a residue, which contains only 5 to 9% of volatile substances. This product can be agglomerated only with difficulty and recourse must be had to a high percentage of coal tar or pitch (15 to 20%) or to very high pressures. If it contains too much pitch its use is then limited in domestic fires because it evolves too much smoke on combustion.

The coke obtained when coal is distilled at 1000° C. is also difficult to agglomerate in consequence of its low percentage of volatile substance (1 to 3%). This latter coke is usually produced for metallurgical purposes.

At the end of the distillation the coke is generally cooled with jets of water. The waste of heat contained in the coked products involves a considerable loss of calories, in fact it amounts to about 330,000 calories per ton of coke and 160,000 per ton of semicoke. This quantity of heat in the two cases represents about half the heat necessary for distillation.

This invention has for its object improvements relating to the production of semicoke and coke, enabling the following results to be simultaneously attained. The recovery of about ⅔ of the heat contained in the coked parts at the end of the distillation and consequently a reduction in the cost of manufacture. The conversion of the coked products during their production into a condition suitable for their agglomeration.

The improvement in coking quality of coals of different natures and particularly the increase in the hardness for the metallurgical coke.

The invention is substantially characterized by the following features.

First, the injection and spraying at the end of the distillation, onto the coke or semicoke, when at a temperature of 500 to 650° C., of a solution of petroleum oil containing in suspension finely pulverized bituminous coal. The solution is known as "colloidal fuel."

This colloidal fuel is directly injected on to the coked products in a suitable coking apparatus or into a discharge hopper provided for this purpose.

Second, effecting this injection by means of one or more injectors or spraying devices utilizing as motive fluid the non-condensible compressed gas arising from the distillation of portion of the hydrocarbons injected in a previous operation or even from the carbonization of the coal or a mixture of these two gases: the object of the blast of these gases is to cause the atomization of the "colloidal fuel" and at the same time the extinction of the coked products and the easy discharge of the distilled products, while a reheating of the gas results from the extinction of the coked products by the blast of the gas on the said products.

Third, the delivery of the injecting gas together with vapourized petroleum and the gases formed by decomposition of the oils in contact with the incandescent coke or semicoke through condensers of heat exchangers so as to recover the heat derived from the cokefied products. This gas after condensation of its vapours and complete cooling is collected in a gasometer serving to feed the burners of the coke ovens and the injectors or sprayers of the "colloidal fuel."

As an example the preparation of the "colloidal fuel" utilized in this process may be carried out in the following way:

100 parts of mazout rich in asphalts (20 to 30%) and 30 parts of bituminous or coking coal are introduced into a rotary crusher.

After some hours of grinding the product is homogeneous and ready to be employed, its fluidity is increased by heating it to 60° C. or by using for its preparation heated mazout.

When injected on the coked products from 15 to 20% colloidal fuel is added to the semicoke and 15 to 30% in the case of coke.

By the present process the heat contained in the coked products is recovered by the heating of the non-condensible gas blown into the distillation apparatus or their discharge hopper. This gas may be used for free heating of boilers, distilling apparatus, coke ovens, or the like.

Further the addition of the colloidal fuel "to the coked products causes the fixing

thereon of the asphaltic products of the solution injected and thus renders them capable of being agglomerated without further additions.

The deposition on the coke of asphalt and carbon particles contained in the colloidal fuel is effected by the heat derived from the cokefied products. The oils and distilled spirits are carried off by the gas and condensed in due course.

In case the coked products have to be agglomerated, their cooling by means of the gas is arrested at about 150° C., so as to enable them to be moulded while hot under compression, their hardening being at a maximum when cold.

The coked products thus prepared have the property of becoming very hard when under combustion and of being converted into metallurgical coke in the course of their descent in the blast furnace.

The invention is more particularly described with reference to the accompanying drawings illustrating as an example a low temperature coal coking plant, employing the above process and in which:

Figure 1 is a transverse section of the coke oven,

Figure 2 is a general view of the apparatus including a longitudinal section of this oven.

The general arrangement comprises a reservoir 1 for the colloidal fuel, provided with an agitator 2 and a heating coil 3. Through this coil pass the hot gases coming from the interior of the coke oven 4 and the coil is connected at its base with a condenser 5 provided with a discharge tap 6.

The reservoir is connected by an insulated pipe 7 with injectors 8 usually mounted within the oven and each injector having a pipe 9 for the admission of gas feed from a supply pipe 10. This pipe 10 has a compressor 11 therein and leads from a gasometer 12.

The upper end of the coil 3 arranged within the reservoir communicates with the interior of the oven 4 by means of an insulated pipe 13 including a sludge tap 14 and a dust chamber 15 and its opposite end is connected to the gasometer 12 by means of the piping 13′ and a temperature exchanger 16, for instance a boiler which is provided with a condensing chamber 17.

A suction valve 23 is included in this piping 13′. The gasometer 12 receives through the pipe 18 connected to pipe 4^a, by a connection (not shown) uncondensible gas derived from the coking of the coal. The coke oven burners are fed with gas from the gasometer 12 by means of piping 19 having a compressor 24 therein.

The apparatus works as follows:

At the end of the coking operation, the semicoke in the oven 4 is at a temperature of about 650° C., whereupon the pipe 4^a for discharging the products of the distillation of the coal, is closed, and the valves (not shown) of the pipes 7 and 10 are suitably operated so as to cause the actuation of the injectors 8 by means of the compressor 11 which latter has been started.

At this moment the "colloidal fuel" contained in the reservoir 1 is sprayed in a given quantity into the oven 4 onto the incandescent semicoke which continues to be acted on by the vanes of the agitating device of the coke oven.

The particles of hydro-carbons and asphalt become fixed on the semicoke while a part of the petroleum oil is distilled and carried off by the gas blown into the oven and by the gases formed by the decomposition of the oils in contact with the incandescent semicoke.

This gas is heated by contact with the semicoke and drawn by the fan 23 through the piping 13 and 13′. On their course the hot gases pass through the dust chamber 15 and coil 3, the latter intended for heating the "colloidal fuel" and then their remaining heat is utilized in the boiler 16 whence they emerge cooled to enter the gasometer 12.

In passing through this pipe 13, sludge taps are arranged as at 14 for collecting the oils condensed during the circulation of the gas, condensed oil collectors are also provided as at 5′ on the heat exchangers, coil 3, boiler 16. When the given quantity of "colloidal fuel" is injected into the oven, the pipe 7 for admitting the asphaltic solution is closed and only the gas blast is allowed to function so as to cause the rapid extinction of the semicoke which allows the moment of recharging the oven to be expedited with a view to a fresh operation for carbonizing the coal.

The blast is operated until the semicoke is cooled approximately to 150° C., which is ascertained by measuring the temperature of the gas on its exit from the oven.

At this moment the compressor 11 is stopped, the oven discharged by the usual means and the product then in a plastic condition is conveyed as rapidly as possible into a mixing crusher 20 and into a ball press 21 by a conveyor 22 for instance.

If the present invention is applied to the production of metallurgical coke, the quenching of the coke takes place preferably in a discharge hopper attached to the coke oven. When the hopper has been flushed with air, the gas blasts act at first alone to cool the coke to about 650° C. At this moment the mixture of colloidal fuel is sprayed and then the blowers alone continue the quenching of the coke. The injector nozzles should be cleaned at intervals either by the admission of live steam or even by a current of compressed gas charged with hard sand

particles. The method of cleaning may be any desired.

It is quite evident that this invention may be employed with various types of coke ovens, fixed retort ovens with internal agitation, rotary ovens with external heating and the injectors may be fed with hydrocarbons which are more or less rich in asphalt and pulverized coal.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. The process of treating coke, semi-coke or metallurgical coke which comprises applying a suspension of finely pulverized bituminous coal in petroleum on the hot coke at the end of the distillation operation.

2. The process of treating coke, semi-coke or metallurgical coke which comprises spraying a suspension of finely pulverized bituminous coal in petroleum on the hot coke at the end of the distillation operation.

3. The process of treating coke, semi-coke or metallurgical coke which comprises spraying a suspension of finely pulverized bituminous coal in petroleum and gaseous products of the coking operation on the hot coke at the end of the distillation operation.

In witness whereof I have hereunto set my hand.

EMILE BAPTISTE GUSTAVE BASCOU.