

UNITED STATES PATENT OFFICE

2,369,024

PROCESS OF TREATING COAL AND
COMPOSITION THEREFORLawrence P. Crecelius, Shaker Heights, Ohio, as-
signor to The Coal Processing Company, Cleve-
land, Ohio, a corporation of OhioNo Drawing. Application September 5, 1941,
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2 Claims. (Cl. 44-4)

This invention relates to a process for the treating of coal and the burning of the same, which coal contains relatively large amounts of iron sulphur compounds, such as iron pyrites, for the purpose of improving the burning of the coal, obviating the effect of deleterious flue gases and tube slagging, and to improve the ash characteristics.

The present invention may be properly considered in the nature of an improvement upon the invention which is set forth in my issued Patent No. 2,089,599, granted August 10, 1937.

In that patent I described the advance in the art of power production in power plants which was signalized by the much higher rates of burning of coal in furnaces than had heretofore been the practice and the accompanying relative diminution of air supply, and I further, in the before mentioned patent, pointed out the fact that the change in the art of power production by the higher rates of burning of coal in furnaces has had the effect of disqualifying and eliminating to a very large extent the use of coals high in iron sulphur compounds due to the fact that such coals, when subjected to the furnace conditions which had been described, break down and melt the iron sulphur compounds at approximately 2140° F., causing same to run down upon the grate surfaces of the furnace, obstructing the passage of air and fusing upon the iron of the grate parts.

In my former patent I pointed out how it was possible to utilize chlorine, present during the burning of the coal, for the purpose of effecting, at furnace temperatures, a decomposition of the iron sulphur compounds and ultimately form a stable compound of both iron and sulphur, to-wit, ferric oxide and sulphur dioxide.

In my prior patent the desired result was accomplished by treating the coal with a composition comprising a suitable deliquescent halogen compound, such as calcium chloride or magnesium chloride or mixtures of the two, together with suitable catalytic material such as manganese dioxide, iron oxide, chromic oxide, using two or more of them together, and I specifically pointed out a composition suitable for the treatment of coal as consisting of

	Percent by weight
Calcium chloride	92
Potassium dichromate	3
Manganese dioxide	3
Tannic acid	2

This composition was designed to be mixed with water which was sprayed upon the coal, so

as to be distributed throughout the mass of coal, either at the mine or at some time prior to the introduction of the coal into the furnace, therein to be burned.

5 The present invention differs from the invention pointed out in my patent to which reference has been made in that a different composition of material is used to be applied to the coal, for the same fundamental purposes as that described in my former patent, except that some additional advantages are gained by the use of the new composition which will be subsequently pointed out.

10 It may be here stated that in connection with the present invention the composition, to be presently described, is mixed with water and sprayed upon the coal, either at the mine or at any time prior to the coal being introduced into the furnace in which it is to be burned. Experience has indicated that the quantity of the composition to be used is approximately five per cent (5%) of the sulphur content of the coal which is to be burned.

15 Speaking in general terms, the materials used in connection with the present invention may be said to comprise a suitable deliquescent halogen compound, such for instance as calcium chloride or magnesium chloride or mixtures of the two, together with suitable catalytic material such as chromic oxide and manganese dioxide, either one of which may be used, but the catalytic effect is enhanced very materially by the use of both chromium oxide and manganese dioxide. In addition, dextrin is employed and potassium acid fluoride.

20 One suitable composition for the purpose is made up as follows:

	Percent by weight
Calcium chloride	92
40 Chromic oxide	3
Manganese dioxide	3
Dextrin	1
Potassium acid fluoride	1

45 The chemical response in connection with the use of calcium chloride, manganese dioxide, and chromic oxide, when utilized in connection with the burning of coal high in compounds of iron and sulphur, is the same as that which has been described in my prior Patent No. 2,089,599.

50 While in my prior patent the suitable composition therein mentioned included potassium dichromate, the subsequent description made it clear that so far as the catalytic function was concerned it was the chromic oxide that was fundamental.

In the present invention, the use of dextrin is desired because of its colloidal property when mixed with water and therefore when the metallic oxides of manganese and chromium (in finely divided condition) are mixed with water in which dextrin is present, the colloidal characteristic of the dextrin maintains the metallic oxides in suspension in the liquid and materially assists in securing a proper distribution of the before mentioned metallic oxides when the mixture of calcium chloride, manganese dioxide and chromic oxide is sprayed upon the coal. Likewise, the matter of maintaining the metallic oxides, above mentioned, in suspension obviates the clogging of pipes and nozzles which may be a part of the apparatus used in spraying the coal.

To some extent, the dextrin functions to retain upon the coal the before mentioned chemical substances.

The potassium acid fluoride is used for the purpose of making more effective the elimination of the tube slagging.

As explained in my prior patent to which reference has heretofore been made, owing to the high temperature of the furnaces, in excess of 2140° F., the ferrous sulphide particles which are carried by the coal, being more or less plastic, in many cases accumulate on the surfaces of the tubes of the boiler. In some instances seemingly a silica film forms upon these iron sulphide particles (the silica coming from silica containing impurities in the coal), which film is not readily attacked by the chlorine. But where potassium acid fluoride has been used in connection with the mixture with which the coal is treated, this potassium acid fluoride, in the presence of the catalysts, which have before been mentioned, liberates fluorine. The quantity of fluorine liberated

is small because the percentage by weight of the potassium acid fluoride which is used is low in the composition. However, the fluorine thus liberated will attack any silica or siliceous film upon the iron sulphur particles that may have adhered to the tube, in effect eradicating the film and exposing the iron sulphide to the action not only of fluorine but mainly to the action of the chlorine, which will be decomposed to the stable oxide of iron and sulphur dioxide.

The present invention is applicable not only in connection with the treatment and burning of coal, but it will be understood that it is also applicable to coke, lignite, peat, and other substances of similar category wherein is involved the same problem of the removal of iron sulphur compounds.

Having thus described my invention, I claim:

1. A composition of matter for the treatment of coal comprising the following substances by weight:

	Per cent
Calcium chloride.....	Approximately 90
Chromic oxide.....	Approximately 3
Manganese dioxide.....	Approximately 3
Potassium acid fluoride....	Approximately 3

2. A composition of matter for the treatment of coal comprising the following substances by weight:

	Per cent
Calcium chloride.....	Approximately 90
Chromic oxide.....	Approximately 3
Manganese dioxide.....	Approximately 3
Potassium acid fluoride....	Approximately 3
Dextrin	Approximately 1

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