

# UNITED STATES PATENT OFFICE.

ERNST TRAINER, OF DRESDEN, GERMANY, ASSIGNOR TO GEWERKSCHAFT PIONIER,  
OF WALSUM-ON-THE-RHINE, GERMANY.

## PROCESS OF MANUFACTURE OF FUEL-BLOCKS.

974,001.

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No Drawing.

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*To all whom it may concern:*

Be it known that I, ERNST TRAINER, a subject of the German Emperor, and residing at A. Falkenstrasse 8, Dresden, Germany, have invented certain new and useful Improvements in the Process of Manufacture of Fuel-Blocks, of which the following is a specification.

In the manufacture of fuel blocks with the aid of water-soluble binding agents, various processes have been proposed for rendering such fuel blocks waterproof, both of which processes have for their object to alter the water-soluble binding agent in the fuel block in such a manner that the said binding agent loses its solubility. One of the said processes consists in subjecting the mixture of binding agent and fuel either in the press or at a subsequent stage, or the finished blocks, to a high temperature; and the desired result is effected no doubt by the total or partial carbonization of the binding agent. The said process requires a temperature of about 300 degrees centigrade which in many cases is liable to produce a partial decomposition of the fuel itself. For instance, very fat coals give off gases at the temperature stated which tend to diminish the value of the fuel blocks. Another process referred to above, attempts to render the water soluble binding agent insoluble by chemical means, and has been proposed only in connection with the production of fuel blocks by means of the waste lye from the manufacture of sulfite-cellulose. According to that process the raw waste lye is first mixed with as much sulfuric acid as will raise the gravity of the mixture one degree, and then the mixture is concentrated and used in making the fuel blocks. The fuel blocks when made, are subjected to the action of hot vapors of hydrochloric acid. This process is however attended by some drawbacks from a practical and economical point of view. First, the quantity of sulfuric acid which must be added to the raw lye, is somewhat considerable, and the so highly acidified lye can be concentrated only in apparatus of special construction and therefore very costly.

Now the present invention has for its object to provide an improved process for the more economical and simple manufacture of fuel blocks by means of the waste lye of

the sulfite-cellulose process, without heating the materials to such a high temperature as could tend to decompose fuel containing many volatile constituents, and also without using several acids and whereby the resulting fuel blocks are more weather proof than such as are produced solely with the lye without special after treatment.

The improved process according to the present invention consists in binding the fuel together by waste lye obtained from the sulfite cellulose process and completely gelatinized by being heated with a substance having an acid reaction, and finally drying the block by heat. In order to accelerate the action of the substance having an acid reaction, a small percentage of aldehyde may be added thereto. The fuel blocks thus produced are sufficiently weather-proof to stand handling and transport. They burn with surprisingly little smoke.

The following example is given as one way of carrying out this invention. Waste lye of the sulfite-cellulose process which has been concentrated by other suitable means, is mixed with a small percentage, for instance, 10 to 15 per cent. of sulfuric acid, and this mixture is then heated, whereby soon a kind of gelatinization of the lye is produced. In this form, the binding agent is carefully mixed with the fuel, and the mixture is then molded into blocks in the ordinary way.

Other acids for instance, hydrochloric acid, carbolic acid, or chromic acid, may be used instead of sulfuric acid. Acid salts, for instance, alums, sulfates, or chromates, may be similarly used.

It is not necessary that the mass shall have a uniform shape. The mixture may equally be well passed through a press, similar to clay cutting machines, and be further treated in shapeless lumps. Or the mass may be allowed to fall directly from a mixing or kneading machine in irregularly large and small lumps of any shape. The subsequent treatment of the mixed product consists in heating it to a temperature which need not exceed, say 200 degrees centigrade, but must be sufficient to dry the mass thoroughly.

For the purpose of accelerating the process, or for facilitating the use of acids and salts which would act too slowly by them-



selves it is advisable to add to the mass a small percentage of aldehyde preferably formaldehyde.

If desired the usual mixture of fuel and waste lye may be formed into blocks in the ordinary way, and then either the acid alone or the acid and aldehyde together, may be caused to act upon such blocks during the subsequent heating operation. In the latter case it is advisable to operate in a vacuum, and then after the action has ceased, to subject the blocks to an exhausting operation for the two-fold purpose of freeing them from the excess of reagents, and of recovering the latter for re-use. Instead of acids it is also possible to employ acid containing residuals, for instance, the residuals of oil-refineries, or salts having an acid action, or other compounds of acid nature which are adapted by the addition of aldehydes to produce a gelatinization of the waste lyes.

The improved process may be employed for binding fuels, ores, stones, bricks, etc., and the shaping of the blocks is effected under low pressure up to very high pressure according to the nature of the material in each case.

It is known that precipitation can be produced by adding acids or salts to the waste lyes of the sulfite-cellulose process. It has also been proposed to use gelatin for the purpose of producing a suitable binding agent. In all those cases however it has not been known that the waste lye could be completely gelatinized by treatment with acids or other suitable compounds.

In the previous treatments of the waste lye, either other adhesives have also been used, or only a part of the organic constituents of the waste lye has entered the reaction. Now in the improved process, the

entire mass becomes gelatinized. Further, the addition of aldehyde to the concentrated waste lye of the sulfite cellulose process, is known, but the combination of the addition of aldehyde with the main process is novel. The effects of the aldehyde and the acid substance are not merely cumulative, but are supplementary, that is to say, the aldehyde seems to have an affinity for and to effect the gelatinization or coagulation of certain of the group of complex organic compounds which are found in cellulose lye, and the acid substance to have a similar coagulating effect upon others of that group.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:—

1. A process for the manufacture of blocks, which consists in adding to the concentrated waste lye from the sulfite-cellulose process, an aldehyde and a substance having an acid reaction, heating the mixture to gelatinization of the lye, and adding the mass to the block material and then drying the product thoroughly by heat as set forth.

2. A process for the manufacture of fuel blocks, which consists in adding to the concentrated waste lye from the sulfite cellulose process an aldehyde and a substance having an acid reaction, heating the mixture to gelatinization of the lye, and adding the mass to the fuel, and then drying the product thoroughly by heat, as set forth.

Dated this 26 day of May, 1910.

In testimony whereof, I affix my signature in presence of two witnesses.

ERNST TRAINER.

Witnesses:

PAUL ARRAS,  
CLÄRE SIMON.