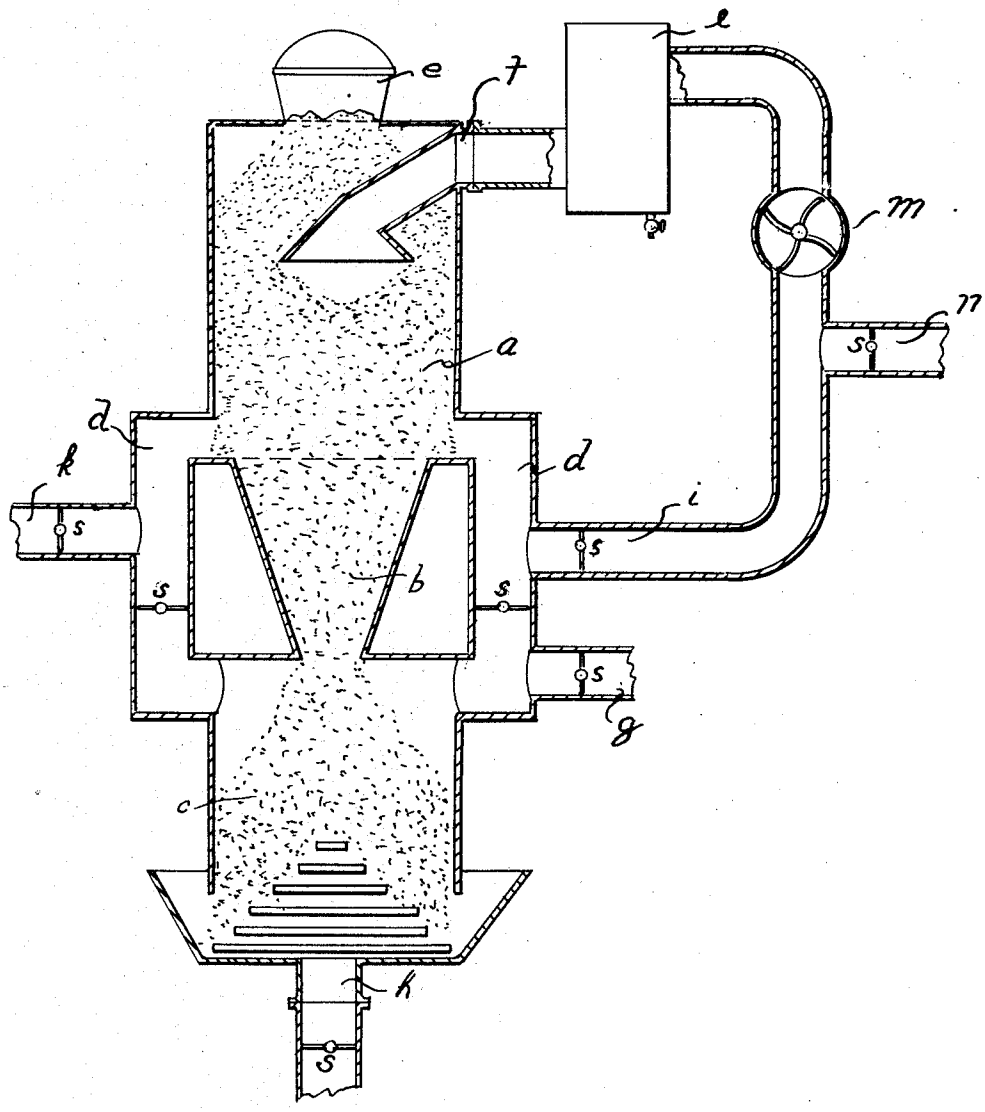
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PROCESS FOR THE DISTILLATION OF SOLID BITUMINOUS FUELS

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UNITED STATES PATENT OFFICE.

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PROCESS FOR THE DISTILLATION OF SOLID BITUMINOUS FUELS.

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The present invention relates to a process for distilling oil shale and like bituminous fuels, and consists of the details hereinafter more fully described.

The invention has the purpose of utilizing to the fullest extent the combustible substance in distilled shale and comprises operations which are carried on in the lower portion of the distillation apparatus with such a high temperature that the fixed carbon of the shale is gasified (that is burnt by air or steam passed through same), and the temperature and the amount of distillation medium is regulated between the gasifying or burning zones on the one hand and the distillation zone on the other hand.

Such a plant may be operated in different ways and methods according to the condition of the shale and the kind of gas to be obtained.

(1) For example, cold or pre-heated air or steam, or a mixture of both, or a mixture of either or both with carbonaceous gases is led directly from below into the glowing and already distilled shale in order to gasify the fixed carbon present, at the high temperature there prevailing. The gas obtained or the waste gas generated therefrom by partial or complete combustion with air is mixed with cold gas of substantially the same quality as the hot gas in order to obtain the necessary temperature and amount of gas for maintaining a uniform temperature in the distilling zone, and hence to give a good distillation process. The gas mixture thus obtained is fed into the distillation shaft distils the shale by delivering its own sensible heat to the shale. The feeding of the hot gas mixture into the distillation shaft may be effected through the connecting shaft through which also the shale reaches the gasifying shaft from the distillation shaft, or through a special hot gas conduit.

(2) The glowing and already distilled shale is gasified as before, the gas obtained is drawn off from the gasifying chamber, burnt in a special gas pre-heater of the circulation type (recuperator or regenerator), and the heat obtained given off to gas or steam which is thereby heated to the temperature required for the distillation of the shale and passed to the distillation shaft. By discharging its sensible heat the gas distils the shale and is then freed from the distillation products capable of being easily liquefied. The freely disposable portion of the gas is then conducted away and the remainder again heated as circulation gas in the gas pre-heater of the circulation type, in order to be led again into the distillation shaft. This circulation gas is pure high-grade distillation gas not contaminated by nitrogen of the air.

By proper regulation of the pressure a mixture of the hot gas escaping from the gasifying chamber and the hot circulation gas passing into the distillation shaft is prevented.

If so desired the distillation of the shale and the subsequent combustion of same may be effected in two apparatus arranged at some distance from each other. If the fixed carbon does not suffice to sufficiently heat the circulation gas in the pre-heater a portion of the distillation gas produced, or other fuel, may be burnt in addition in the pre-heater.

The process can be carried out in an apparatus such as is shown in the accompanying drawing the said drawing representing a vertical section of a suitable apparatus.

In said drawing *a* represents the distillation zone, *b* represents the neutral zone, and *c* represents the gas producing zone. From the gasifying zone, pipe connections *d* lead to the bottom part of the distillation zone by passing the neutral zone. *h* represents an inlet for air, steam, or gas, or a mixture of these, for the purpose of producing gas, (water gas or producer gas) in the gasifying zone.

When it is desired to cool the gases from the gasifying zone before they enter the distillation zone, cold gas can be introduced through the pipe *i*. When it is desired to increase the heat in the distillation zone a regulated amount of air can be introduced through the pipe *k*. When more gas is made in the gasifying zone than what is required in the distillation zone a portion of this gas can be withdrawn through the pipe *g*. Also at other times a portion of the generator gas can be withdrawn through the pipe *g*, which can be used for pre-heating air or steam, or gases, which are to be introduced through pipe *k*. Valves *s* are inserted in appropriate places in the various conduits for control of the gases introduced or withdrawn from the system. *e* is a hopper for feeding in shale and the like which is provided with a suit-

able cover and *f* is an outlet for vapors and gases, leading to condenser and washer for the recovery of oil, ammonia and the like shown schmetrically at *i*. Part of the gases issuing from *l* are withdrawn at *n* and part re-circulated by means of the pump *m* through *i* as stated above.

It is to be understood that the process can be carried out with various apparatus different from that illustrated in the drawing.

I claim as my invention:—

1. A process for the distillation of solid bituminous fuels by means of a stream of hot gases comprising distilling a bituminous fuel to form a distilled vapor and a combustible residue, gassifying the said residue to form a hot gas, introducing into said hot gas a regulated amount of a gas of substantially the same composition as said hot gas and introducing the said mixed gases into said bituminous fuel to perform the distillation.

2. A process for the distillation of solid bituminous fuels by means of a stream of hot gas comprising distilling a bituminous fuel to form a distilled vapor and a combustible residue, gassifying the said residue to form a hot gas, introducing into said hot gas a regulated quantity of cool gas of substantially the same composition as the said hot gas to obtain a desired gas temperature and volume, and introducing the said mixed gases into said bituminous fuel to distill said fuel.

In testimony whereof I have affixed my signature.

HANS ROSENTHAL.