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O. HUBMANN

APPARATUS FOR DISTILLING SOLID COMBUSTIBLE CARBONACEOUS MATERIAL

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2 Sheets-Sheet 1

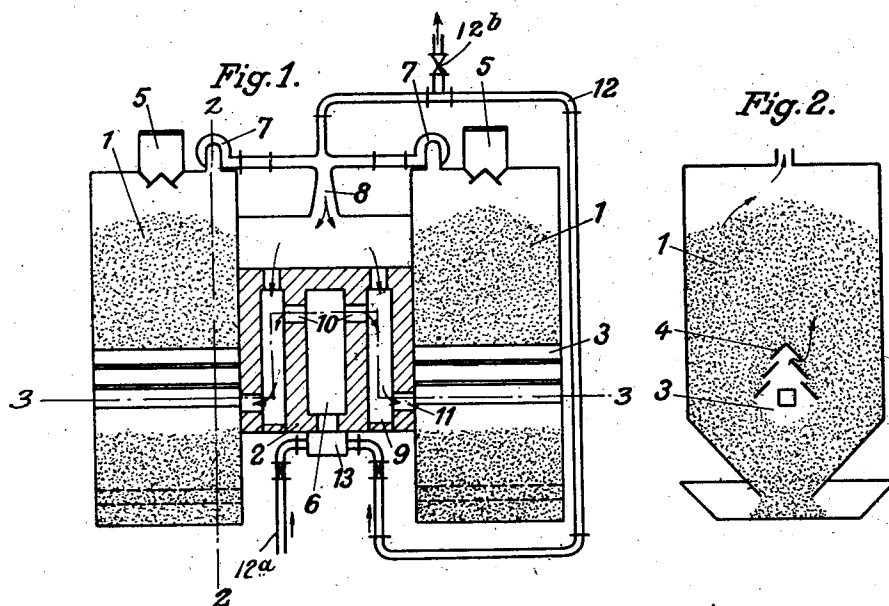
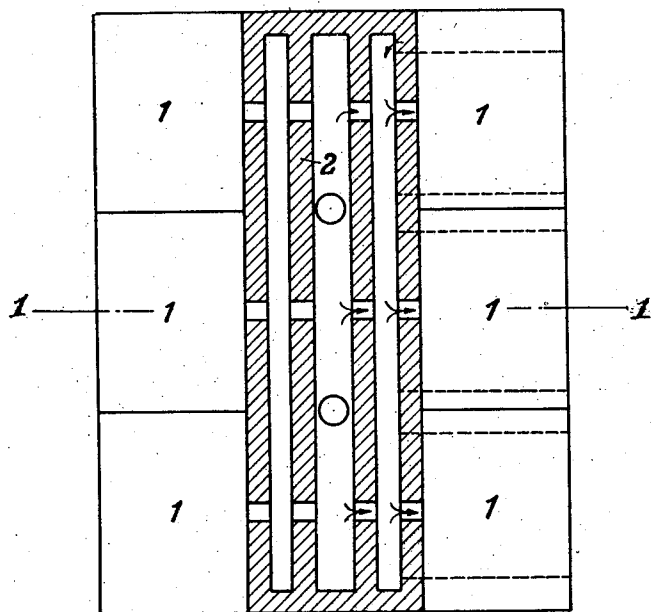


Fig. 3.



Inventor:
Otto Hubmann,
By *Byrne Townsend & Bruckenstein*,
Attorneys.

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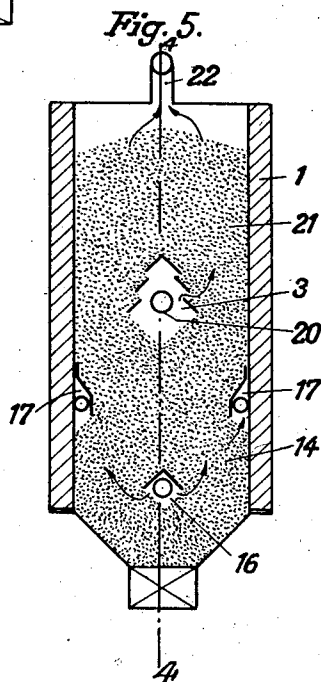
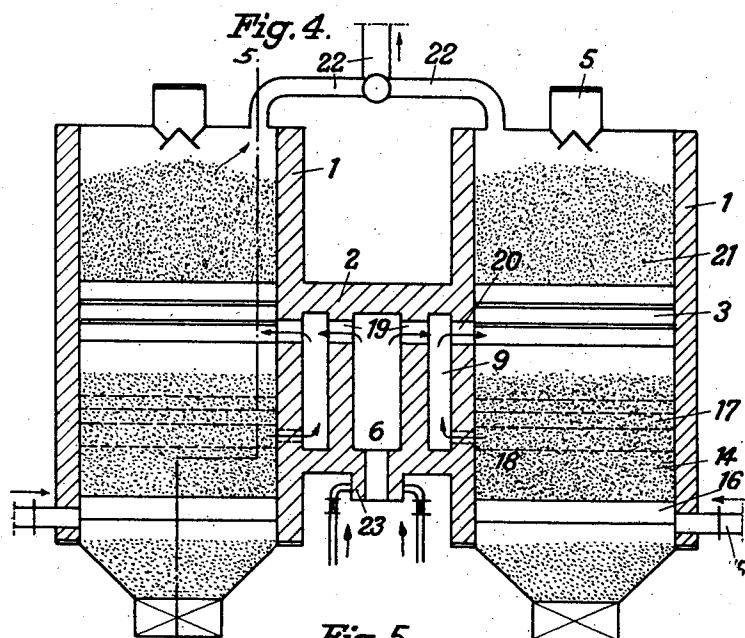
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Inventor:
Otto Hubmann,
By *Rymond Townsend & Bruckenstein*,
Attorneys.

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UNITED STATES PATENT OFFICE.

OTTO HUBMANN, OF FRANKFORT-ON-THE-MAIN, GERMANY.

APPARATUS FOR DISTILLING SOLID COMBUSTIBLE CARBONACEOUS MATERIAL.

Application filed October 8, 1925, Serial No. 61,342, and in Germany November 4, 1924.

This invention relates to the distillation of combustible solid carbonaceous, such as coal, lignite, brown coal, oil shale, peat and wood material at relatively low temperatures.

It is the general object of the invention to provide apparatus of the class referred to which combines simplicity of construction with high economy in operation.

For a full understanding of the principles of operation on which the invention is based and the advantages resulting therefrom, reference is made to the accompanying drawings in which

Fig. 1 is a central sectional view on the line 1—1 of Fig. 3 through an apparatus embodying the invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1, through a part of the apparatus;

Fig. 3 is a more or less diagrammatic plan view, partly in section on the line 3—3 of Fig. 1, of a special form of apparatus generally similar to the form shown in Fig. 1;

Fig. 4 is a sectional view on the line 4—4 of Fig. 5 similar to Fig. 1 of another apparatus embodying the invention; and

Fig. 5 is a section therethrough taken on the line 5—5 of Fig. 4.

Heretofore in distillation apparatus and the like, the distillation chamber and the combustion chamber for bringing the distilling medium to the required temperature were commonly disposed separately and detached from one another. In contradistinction to that, the present invention has as a characteristic feature a direct contact between the distillation chamber or chambers and the combustion chamber or chambers.

Thus, as shown in Fig. 1, the shaft-like distilling chambers 1 and the furnace 2 are in thermal contact with one another through a common wall of refractory material. However, in order to prevent an excessive transmission of heat from the furnace 2 to the distilling chambers 1, there are provided in the common wall between the furnace 2 and the chambers 1 interspaces 9, the outside walls of which are in direct contact with the distilling chambers.

The combustion chamber 6 of the furnace 2 is in communication with the spaces 9 through the openings 10 and has a burner 13.

In the distilling chambers are provided, as is usual, a plurality of slat-like members 4 in cascade arrangement, defining a gas space or passage 3 in the material which passes downwardly through the distilling chamber.

The distilling medium passes through the intake 8 into the interspaces 9, then downwardly through the same and through passages 11 into the gas spaces 3 from which it passes up through the material to be distilled and is withdrawn together with the gaseous products of distillation by exhaust devices 7. The exhaust devices 7 are interconnected with the intake 8 and a conduit 12 leading to the burner 13 or through the branch conduit 12^b to a storage not shown.

The material to be distilled enters through the intake 5 and passes out of the chamber at the bottom where it may be continuously or intermittently removed. The distilling gas is continuously circulated through distilling chambers as mentioned, its distilling temperature being maintained by the admixture of the hot gases of combustion passing from the combustion chamber 6 through the openings 10 into the interspaces 9 through which the distilling gas returns to the distilling chamber.

The permanent gas continuously produced by distillation is carried off through the conduit 12 to the burner 13 to be utilized as fuel in the combustion chamber 6.

The distilling gas leaving at the top of the distilling chambers and returning to the gas spaces 3 is relatively cool as it enters through the inlets 8 into the gas space above the furnace 2 and is thus preliminarily heated by contact with the furnace wall, and also as it passes through the interspaces 9 a heat exchange between the walls thereof and the gas causes a rise of temperature in the latter. The hot gas coming from the combustion chamber 6 then determines the final temperature of the gas as it enters into the gas spaces 3.

The heat exchange between the walls of the interspaces 9 and the gas coming from inlet 8 is very important in that it not only takes part in the control of the temperature of the gas, but, what is even more important, effects a corresponding abstraction of heat from the walls of the furnace, and thereby prevents excessive transmission of heat to the material in the distilling chamber in contact with the inside wall thereof. Thus the heat ordinarily dissipated through the furnace walls is saved and made useful without danger of local overheating such as would normally result from direct contact with the hot furnace walls.

Another material advantage is the sim-

plication of the construction itself. As the result of the particular structural relationship between the distilling chamber and the furnace, the space occupied by the unit is
 5 reduced to a minimum. Heat insulation ordinarily necessary or desirable is obviated. Connecting conduits and heat insulation therefor are no longer necessary.

Another advantage of the arrangement is
 10 the possibility of using coal dust as combustible material in the furnace without danger to the walls thereof or heat loss by radiation. It is understood that the use of gaseous products of distillation for combustion in the
 15 furnace is referred to primarily for the purpose of illustration. The heat of combustion may be produced in many other ways. As indicated in Fig. 1, a conduit 12^a represents an independent supply of fuel to the burner.
 20 The burner 13 represents only one form of combustion device.

It is also understood that the distilling chamber 1 may have any desired form and disposition of interior parts without affect-
 25 ing the nature of the invention.

Fig. 3 represents a multiple arrangement including for the sake of example six distillation chambers 1, three on each side of a furnace construction 2. The furnace it-
 30 self may be a large furnace including a plurality of combustion devices, or may be composed of a plurality of furnace chambers.

Although I consider a construction such as illustrated in Figs. 1 and 3, where distilling chambers are disposed on opposite
 35 sides of a furnace, as a preferred embodiment of the invention, a construction according to the invention may include distilling chambers on more than two sides, and also
 40 on only one side.

The arrangement shown in Figs. 4 and 5 includes furnace 2 and two vessels 1, the upper portions of which are used as distilling chambers 21, while the lower portions serve
 45 as cooling chambers 14.

Near the bottom of each vessel 1 is an inlet 15 through which an oxygen-free gas is passed into a gas space or passage 16. The gas then passes upwardly through the hot
 50 solid residue of distillation to gas spaces or passages 17, which communicate through openings 18 with the chamber 9, and flows

into and up through chambers 9 and then through openings 20 into the gas space or passage 3 from where it flows upwardly
 55 through the material to be distilled.

Hot gases of combustion flow from the combustion chamber 6 through openings 19 into the chambers 9 and mingle with the distilling gas as previously described.
 60

In this case the gas while passing through the solid residue absorbs heat therefrom and is thus preheated to a certain point. The contact with the walls of the chamber 9 increases the temperature, and the hot gases
 65 from the furnace chamber bring the temperature of the gas to the final required degree.

The furnace heat may be provided by a burner 23 or any desired source of heat.

The gaseous products of distillation may
 70 be withdrawn through conduits 22, then dewatered in any suitable manner and then returned to the inlet 15.

The apparatus may be readily modified for drying materials or a combined drying and
 75 distilling operation.

I claim:

1. An apparatus for distilling solid combustible carbonaceous material which comprises a shaft-like heating chamber for containing said solid material, a conduit extending into said chamber provided with means for introducing hot gases into said material, a furnace, a wall common to said heating chamber and said furnace having
 80 an interspace formed therein and ports leading from the furnace to the interspace and from the interspace into said passage, and an additional port opening into said interspace and connected to the heating chamber,
 85 and means for introducing gas from the heating chamber into said interspace through said additional port.

2. An apparatus as claimed in claim 1, in which the additional port is connected to a second passage in the lower and cooler
 90 portion of said heating chamber and means for introducing gas into said heating chamber beneath said second passage, whereby said gas passes through the material and into
 95 the second passage.

In testimony whereof, I affix my signature.

OTTO HUBMANN.