H. KOPPERS.

METHOD OF DISTILLING COAL.

APPLICATION FILED MAY 20, 1909.

956,371. **Patented Apr. 26, 1910.**

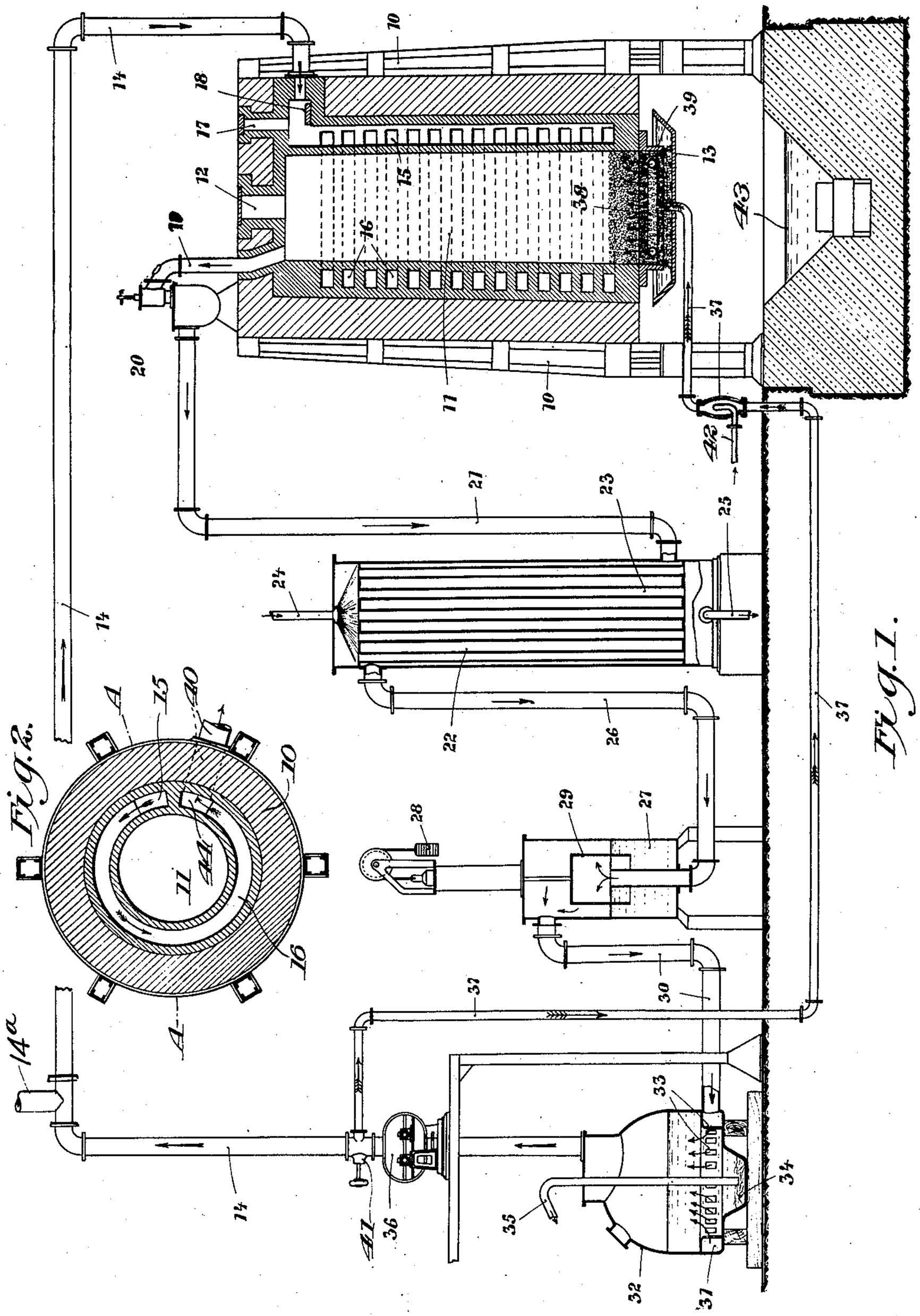

Fig. 1.

Fig. 2.

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METHOD OF DISTILLING COAL.

956,371. Specification of Letters Patent. Patented Apr. 26, 1910.

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To all whom it may concern:

Be it known that I, HEINRICH KOPPERS, a citizen of Germany, residing at Essen-on-the-Ruhr, Germany, have invented new and useful improvements in methods of distillling coal and preventing the decomposition in the distillation-chamber of gaseous products of distillation derived from combustibles, of which the following is a specification.

This invention relates to a novel method of distilling coal or other fuel and has more particularly for its object to prevent the decomposition of the gases generated while the latter rise in the retort within which the coal is distilled. Any decomposition of this kind reduces the output of by-products. The method adopted for this purpose, according to the invention, consists in returning part of the distillation gases to the distillation chamber, under pressure, for the purpose of expelling the freshly generated gases and cleansing or scavenging said chamber. No reaction takes place between the freshly generated gas and the gas returned to the chamber, so that whatever quantity of gas is required for effective scavenging can be used. If the distillation gases are cooled, and the by-products are obtained therefrom, the further advantages are obtained that the space above the charge is kept cool and there is no risk of deposits from the gas. To assist the cooling action, water in any desired state may be added to the scavenging gases. The scavenging gas, being derived from the process itself, has no material effect on the distillation, and may be regarded as indifferent.

In the accompanying drawing: Figure 1 is a sectional elevation through a plant embodying my invention, the section through the retort being taken on line A—A, Fig. 2, and Fig. 2 a horizontal section through the retort on line B—B, Fig. 1.

The numeral 10 indicates an iron frame inclosing a shaft retort 11 which is more particularly adapted for producing coke. Retort 11 is provided at its top with a charging opening 12 through which coal or other fuel to be distilled may be introduced. To the bottom of retort 11 is secured a flanged ring 39 that dips into a pan 13 which is partly filled with water, so as to constitute a water seal. Retort 11 is provided with a series of superincumbent curved heating ducts 16, the ends of which open into vertical flues 15 and 44, respectively. Flue 15 communicates at its upper end with a gas supply pipe 14, the necessary air for combustion being admitted through an opening 17 of the retort, while the quantity of gas and air entering flue 15 may be regulated by a damper 18. The gases of combustion leave the ducts 16 through the flue 44 and duct 40, the latter opening into the chimney, (not shown). The gases generated in retort 11 flow through pipe 19 to the hydraulic main 20 and thence through pipe 21 to the cooler 22, in which they envelop pipes 23, through which water flows, the water being supplied at 24 and discharged at 25. The cooled gases flow through pipe 26 to the tar separator 27, in which they traverse the perforated bell-jar 29, balanced by weight 28. The gases freed from tar flow through pipe 30 to the distributing ring 31 of the saturation vessel 32, and pass through the orifices 33 into the sulfuric acid bath, in which they give off ammonia, which falls in the form of a solid salt into the well 34, and is thence removed through the pipe 35. The main portion of the gases thus cooled and freed from by-products is forced by the blower 36 through the pipe 14, for heating the distillation chamber, but a branch pipe 37, controlled by valve 41, leads to the pan 13, through the bottom of which it passes and is connected to a perforated annular pipe, from which the gas issues. The remainder of the gas which is not used for heating the retort and for cleansing the same, is led off through a branch 14^a, to be used as illuminating gas. If desired, water may be added to the gas passing through pipe 37, for which purpose a water supply pipe 42 enters pipe 37. Below retort 10 is arranged a water bath 43 for quenching the coke, the latter being discharged into said bath after the bottom closure of the retort has been opened.

The operation of the apparatus is as follows: The pan 13 is filled with water to make a water-seal around the annular flange 39 at the base of the retort. The bottom of the retort is then filled, to the level indicated in the drawing, with loose material such as sand, ash or coke. As is well known, it is necessary to introduce neutral material of this kind into upright retorts, owing to the absence of heating at the base. The retort is then charged with coal and the heating started by admitting gases supplied from a provisional heater, (not shown,) into

the heating ducts. The gases generated within the retort flow through the main 20 to the cooler 22, in which they are cooled, and thence to the tar separator, in which the tar is separated. After separation of the ammonia in the saturation vessel 32, the main portion of the gas is led through pipe 14 for the purpose of heating the retort. A portion of the gases flows, however, through the pipe 37 into the lower part of the retort, and is forced through the charge and expels the freshly generated gases, with a velocity depending on the pressure and quantity of scavenging gas introduced. The lingering of gases above the charge, with attendant risk of decomposition, is thus prevented.

The branching off of the scavenging gases from the circuit after they have passed through the cooler, tar separator and saturation chamber insures the low temperature favorable to the process and the absence of matter (tar) liable to be deposited. The amount of gas issuing from the retort is, of course, increased by the use of the scavenging gas, and the whole apparatus must be enlarged accordingly since a larger volume of gas flows through per unit of time. This apparent disadvantage is, however, compensated by the fact that the percentage of moisture in the gas is reduced. This is of importance with regard to the production of solid ammonium sulfate, since, of course, the higher the percentage of moisture the more liable is condensation to take place in the saturation vessel, and the higher is the dew-point of the mixture of gas and steam.

The introduction of the scavenging gases at the bottom of upright retorts has the special advantage that the "dead" lower part of the retort is continuously scavenged and cooled. The formation of deposits by decomposition in the interstices of the filling material is prevented, likewise the "burning" of the filling material, since the continuous inflow of gas counteracts downward conduction of heat. This also renders possible the use of a simple water seal for closing the bottom of the retort, since there is no risk of the seal being destroyed by solidifying deposits.

What I claim is—

1. The process herein described which consists in distilling a fuel in a distillation chamber, withdrawing the gases thus formed from the top of said chamber, cooling said gases, separating by-products therefrom, and returning, under pressure, part of the cooled gases into the distillation chamber at the bottom thereof to expel the freshly generated gases.

2. The process herein described which consists in distilling a fuel in a distillation chamber having a bottom layer of indifferent filling material, withdrawing the gases thus formed from the top of said chamber, cooling said gases, separating by-products therefrom, and introducing part of the cooled purified gases under pressure into the lower part of the distillation chamber, so that the cooled gases sweep through the chamber to cool the filling material and expel therefrom the freshly generated gases.

Signed by me at Joliet, Illinois, this 11th day of May 1909.

HEINRICH KOPPERS.

Witnesses:

LOUIS WILPUTH,

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