Sept. 23, 1924. 1,509,196

C. DRESSLER

DISTILLATION APPARATUS

Original Filed Nov. 14, 1919

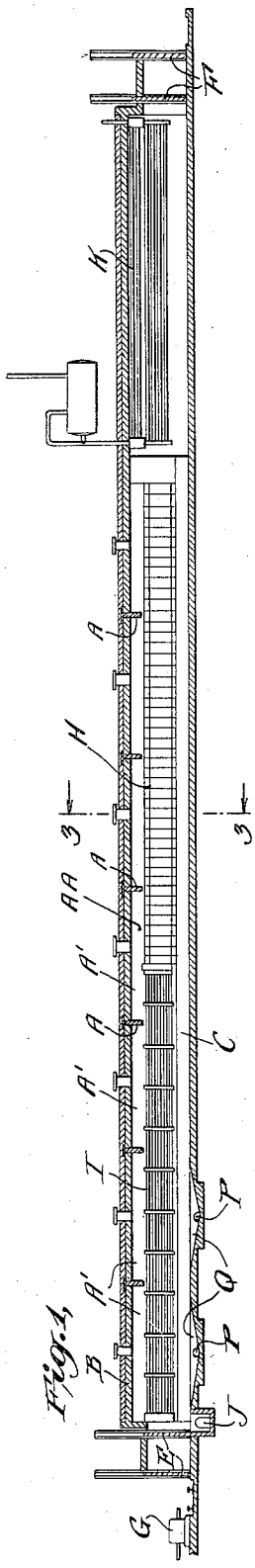


Fig. 1.

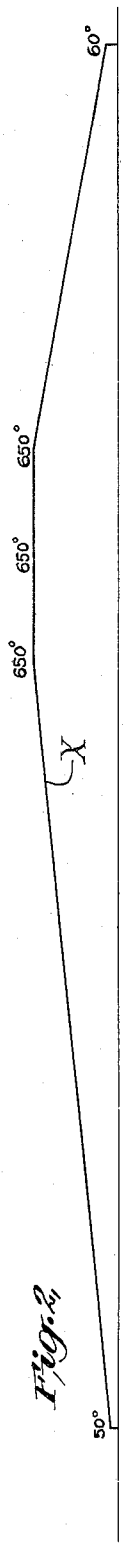


Fig. 2.

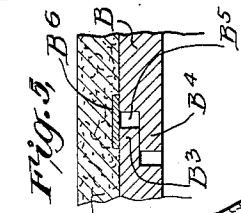


Fig. 5.

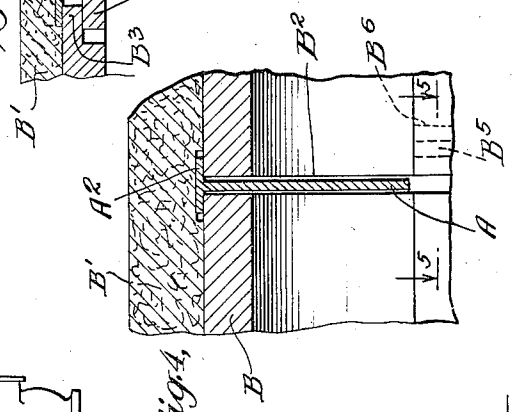


Fig. 4.

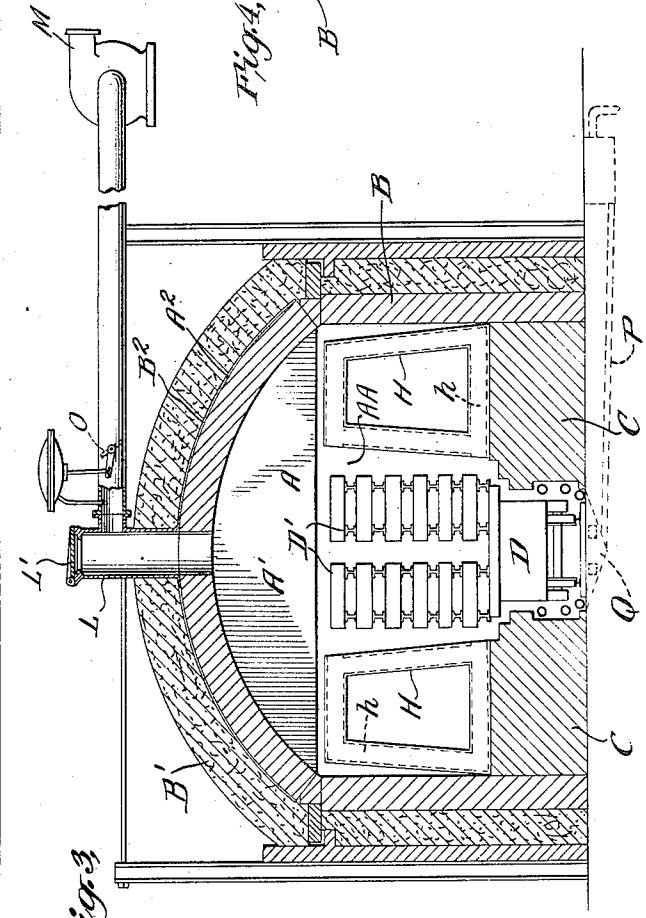


Fig. 3.

Inventor
Conrad Dressler
By his Attorney
John E. Hubbell

Patented Sept. 23, 1924. 1,509,196

UNITED STATES PATENT OFFICE.

CONRAD DRESSLER, OF CLEVELAND, OHIO, ASSIGNOR TO AMERICAN DRESSLER TUNNEL KILNS, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

DISTILLATION APPARATUS.

Application filed November 14, 1919, Serial No. 338,008. Renewed March 8, 1924.

To all whom it may concern:

Be it known that I, CONRAD DRESSLER, a subject of the King of Great Britain, and resident of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Distillation Apparatus, of which the following is a specification.

My present invention comprises improved distillation apparatus. The general purpose of the invention is the provision of simple and effective apparatus for the treatment of coal, peat and other substances, hereafter generically referred to as coal, capable of being distilled, vaporized or decomposed by heat, so as to progressively increase the temperature to which the coal is subjected and thus fractionally distil or vaporize the volatile constituents of the coal with a segregation and separate recovery of volatile fractions driven out of the coal at different temperatures. In carrying out my invention I distil the coal in a tunnel kiln of the muffle type and preferably of the well known Dressler type.

The various features of novelty which charaterize my invention are pointed out with particularity in the claims annexed to, and forming a part of this specification but for a general understanding of the invention, its advantages, and specific objects obtained with its use, reference may be had to the accompanying drawings and descriptive matter in which I have illustrated and described a preferred embodiment of my invention.

Of the drawings:

Fig. 1 is a somewhat diagrammatic longitudinal sectional elevation.

Fig. 2 is a temperature curve.

Fig. 3 is a cross section of the kiln, taken on the line 3—3 of Fig. 1

Fig. 4 is a longitudinal section of a portion of the kiln, the section being taken similar to Fig. 1 but on a larger scale, and

Fig. 5 is a partial section taken on line 5—5 of Fig. 4 and illustrating an expansion joint construction.

In the drawings I show a kiln of the well known Dressler type as shown for example by my prior Patents, #1,023,628 and #1,170,428 but having certain special constructive features. As shown the kiln comprises a kiln chamber AA with refractory walls of masonry B and kieselguhr insulation B' and formed with benches C throughout the major portion of its length which are located at opposite sides of the pathway for the trucks D or other carriers for transporting the coal through the tunnel. Preferably the trucks are provided with shallow trays or shelves D' on which the coal is placed. The kiln is provided with double doors E, at its entrance end, and double doors F at its exit end, to permit the periodic insertion and removal of trucks without any appreciable influx of air or escape of distillation gases. On the benches C are mounted the combustion chambers H in which combustion is initiated and through which the products of combustion travel, issuing from the combustion chambers proper into pipes I through which the products of combustion pass to a flue J at the entrance end of the kiln leading to a stack or other draft producing device, not shown. Between the exit end of the kiln and the ends of the combustion chambers adjacent thereto, is a goods cooling system K which may be of the usual type employed in Dressler kilns, but preferably is of the special water heating and steam generating type described in detail, and claimed in my copending application, Serial No. 338,009 filed of even date herewith.

In operation gas or other combustible fuel and air to support combustion are admitted to the combustion chambers at or adjacent their ends remote from the entrance end of the kiln in the usual manner and so as to maintain, in regular use, the desired temperatures at different points along the length of the kiln. The temperature thus maintained may in some cases for example be that illustrated by the curve shown in Fig. 2. With the temperature conditions illustrated in Fig. 2, the kiln temperature rises gradually from a temperature say 50° C. at the entrance end of the kiln, to a maximum temperature of say 650° C. at a point a little beyond the center of the kiln, then remains stationary for some distance along the kiln, and then drops in the cooling zone of the kiln along the cooling system K, to an exit temperature of say 60° C. It will be understood of course that both the temperature limits and the manner which the temperature varies between these limits may be changed to suit the nature of the coal treated or other conditions of use.

As the coal is slowly passed through the kiln on the trucks D, gases and vapors are given off and these vapors and gas sweeping over the pipes I and through the circulation passages *h* in the hollow walls of the combustion chambers H, form the circulating medium for transferring heat generated by the combustion occurring in the combustion chambers H, to the coal. Similarly the gases and vapors transmit heat from the coal to the cooling system K adjacent the exit end of the kiln.

The vapors and gases driven off from the coal vary in composition with the temperature of the coal and to provide for the separate recovery of vapor and gas fractions of different composition, I provide outlets for gases or vapor at intervals along the top of the kiln and connect the different outlets L to separate exhausters M, and to collecting systems not shown. In addition I shape the top of the kiln chamber to provide a considerable gas and vapor collecting space above the coal and divide this space into compartments A by means of transverse partition walls A. To keep the separate fractions apart as far as possible, the lower edges of the partition walls A are arranged to terminate as near as possible to the upper surface of the charge of coal undergoing distillation so as to prevent the fraction distilled within one part of the distillation chamber, at one range of temperature, from mixing with those distilled off within adjacent parts of the distillation chamber at other ranges of temperature. The transverse walls A are so arranged in relation to the combustion chambers as to divide the upper part of the distillation chamber into a number of compartments or collecting spaces corresponding to given ranges of temperature in the distillation chamber so as to collect fractional distillates of approximately definite characteristics. For instance, two of the transverse walls A may be so arranged in relation to the combustion chambers as to form a collecting space over that portion of the distillation chamber, the temperature of which rises to, or is at, a temperature of say 100° C. to 150° C., so that water vapour distilled from the coal will enter the collecting space, the next transverse wall being arranged at such a distance from the one next to it as to form a collecting space for a distillate given off within a range of temperatures of say from about 150° to 200° C. and so on, according to requirement.

The transverse walls may advantageously be arranged to be carried by parts of the wall of the heating distillation chamber where spaces are left or provisions made for longitudinal expansion. All joints should of course be sealed to prevent escape of the distillates except through the draw off outlets of the collecting spaces provided for the purpose. This can conveniently be done by the use of packing material, for instance by the usual kieselguhr insulation B^1. As shown, the partition walls or barriers A are formed with flanges A^2 which rest on the margins of kerfs or slots B^2 formed in the masonry wall. The partition walls may be formed of cast iron in some cases and in other cases of more refractory material. These kerfs or slots B^2 are each initially of a width appreciably greater than the thickness of the corresponding walls A to permit of the free expansion of the sections of the kiln wall at opposite sides of the kerf B^2. Below the bottom level of the partitions A an expansion joint extension of each kerf or slot B^2 is formed in the side of the kiln wall. These expansion joint extensions are preferably formed as shown in Fig. 5 with overlapping ribs or shoulders B^3 and B^4 of the wall sections at opposite sides of each expansion joint. The outer slot B^5 of the expansion joint extensions may advantageously be covered at its outer edge by a strip B^6 of metal or more refractory material as heavy asbestos paper or the like. These strips prevent the kieselguhr or other insulation from entering the slot, and do not take up much space or otherwise prevent the kieselguhr from performing either its heat insulating or joint packing function. To prevent appreciable longitudinal flow along the kiln of the vapors and gases given off in different portions of the kiln the pressures in the various compartments A′ should be carefully balanced. For this purpose the pressure regulation obtained by the exhauster may be supplemented by the use of automatic pressure regulating dampers O of known type. To prevent undue pressures in the compartments A′ in case of any failure of the regulating apparatus, or the explosion of gases in the kiln, the outlets L may be provided with outwardly opening doors L′ forming, in effect, safety valves.

The tar and oils driven out of the coal and collecting in liquid form in the bottom of the kiln are drawn off thru one or more outlets P for such liquids which tap troughs or channels Q beneath the track rails on which the trucks D run. The coke or partially carbonized coal residue of the distillation process is carried out of the kiln with the trucks D through the exit doors F.

While in accordance with the provisions of the statutes I have illustrated and described the best form of embodiment in my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain

features of my invention may be used to advantage without a corresponding use of other features.

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

1. In distillation apparatus comprising an elongated kiln or retort formed with a pathway there through for the material to be distilled, means for moving said material along said pathway, and means for heating the kiln to a temperature varying progressively at points along the length of the kiln, said heating means comprising combustion chambers and provisions for setting up a directed convection current circulation of the kiln atmosphere in planes transverse to the length of the kiln, the improvement which consists in a gas receiving space above said pathway of substantial volume and divided into a longitudinally extending series of compartments open at their lower ends and having individual gas outlets.

2. In distillation apparatus comprising an elongated kiln or retort formed with a pathway there through for the material to be distilled, means for moving said material along said pathway and means for heating the kiln to a temperature varying progressively at points along the length of the kiln, said heating means comprising combustion chambers and provisions for setting up a directed convection current circulation of the kiln atmosphere in planes transverse to the length of the kiln, the improvement which consists in a gas receiving space above said pathway of substantial volume and divided into a longitudinally extending series of compartments open at their lower ends and separate gas exhausting means for and connected to the different compartments.

3. In distillation apparatus comprising an elongated kiln or retort formed with a pathway there through for the material to be distilled, means for moving said material along said pathway and means for heating the kiln to a temperature varying progressively at points along the length of the kiln, said heating means comprising combustion chambers and provisions for setting up a directed convection current circulation of the kiln atmosphere in planes transverse to the length of the kiln, the improvement which consists in a gas receiving space above said pathway of substantial volume and divided into a longitudinally extending series of compartments open at their lower ends and separate exhausters for and connected to the different compartments and automatic dampers controlling the pressure maintained in each compartment by the corresponding exhauster.

4. In distillation apparatus an elongated kiln or retort, a refractory wall enclosing a kiln chamber comprising a pathway for the material to be distilled and a gas space above said pathway, means for moving said material along said pathway, means for heating said chamber to a temperature varying progressively along said length of the chamber, said wall being divided into sections by transverse expansion joints, and barriers inserted between the sections and dividing said gas space into a series of compartments.

5. In distillation apparatus an elongated kiln or retort a refractory wall enclosing a kiln chamber comprising a pathway for the material to be distilled and a gas space above said pathway, means for moving said material along said pathway, means for heating said chamber to a temperature varying progressively along said length of the chamber, said wall being divided into sections by transverse expansion joints and barriers inserted between the sections and having flanges at their outer edges overlapping the ends of the sections, said barriers dividing said gas space into a series of compartments.

6. An elongated kiln or retort having a refractory wall enclosing a kiln chamber and divided into sections by transverse expansion joints, adjacent sections being formed with overlapping shoulders, strips of refractory material covering the outer edges of said joints and a covering of material as kieselguhr for said wall, adapted to insulate the latter against heat losses and restricting leakage thru the joints thereof.

Signed at New York, in the county of New York and State of New York, this thirteenth day of November A. D. 1919.

CONRAD DRESSLER.

Witness:

WILLIAM A. SHIELDS.