

(No Model.)

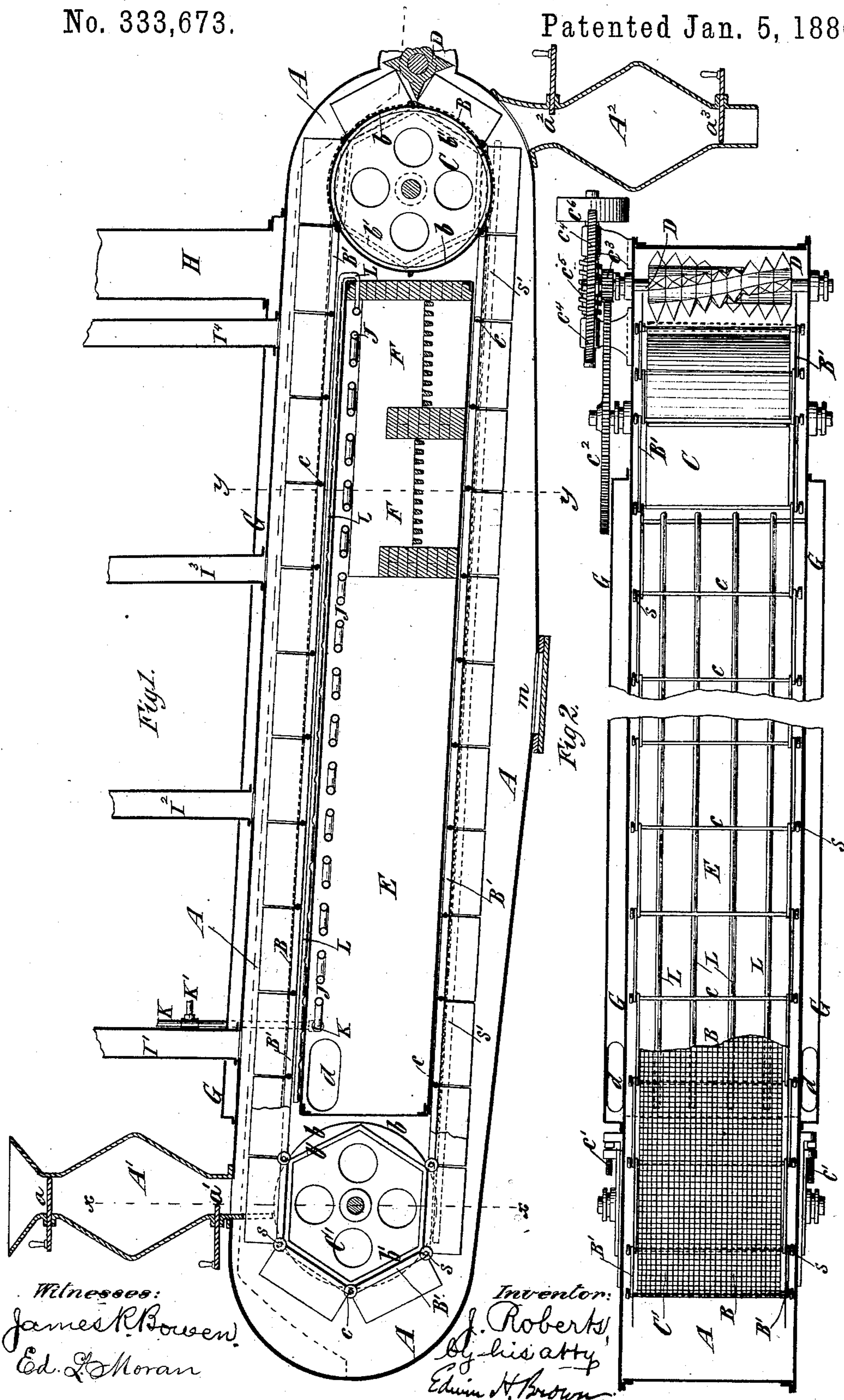
2 Sheets—Sheet 1.

J. ROBERTS.

APPARATUS FOR DISTILLING WOOD, &c.

No. 333,673.

Patented Jan. 5, 1886.



Witnesses:
James R. Bowen.
Ed. J. Moran

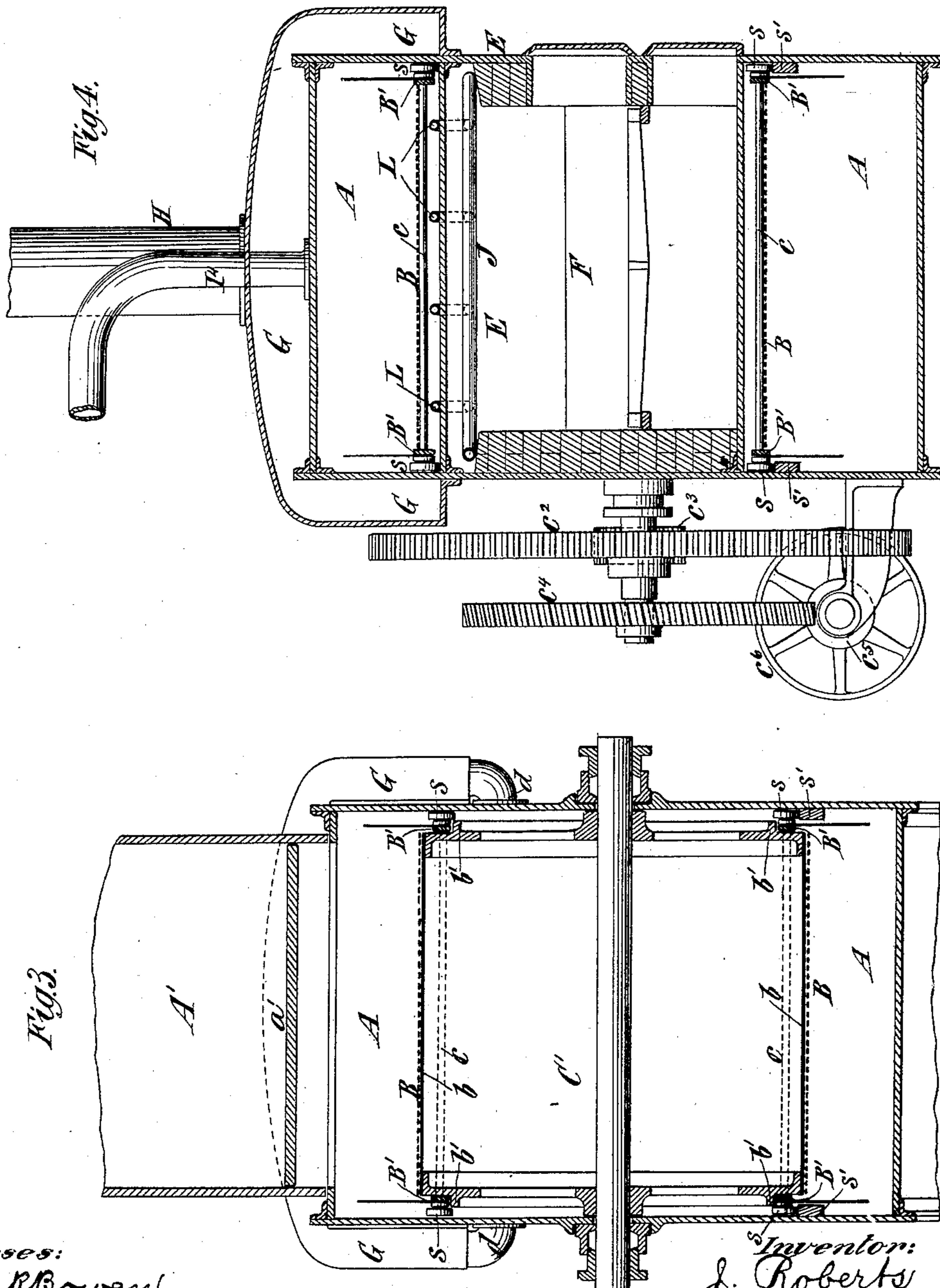
Inventor:
J. Roberts,
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UNITED STATES PATENT OFFICE.

JACOB ROBERTS, OF BROOKLYN, NEW YORK.

APPARATUS FOR DISTILLING WOOD, &c.

SPECIFICATION forming part of Letters Patent No. 333,673, dated January 5, 1886.

Application filed June 15, 1883. Serial No. 98,178. (No model.)

To all whom it may concern:

Be it known that I, JACOB ROBERTS, a citizen of the United States, and a resident of Brooklyn, in Kings county and State of New York, have invented a certain new and useful Improvement in Apparatus for the Distillation of Coal, Wood, &c., of which the following is a specification.

The improvement will be fully described, and then pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal section of an apparatus which is to be used in carrying out my improvement. Fig. 2 is a horizontal section of the same. Fig. 3 is a transverse section of the apparatus, taken at the plane of the dotted line $x x$, Fig. 1, but on a larger scale, and Fig. 4 is a transverse section of the apparatus, taken at the plane of the dotted line $y y$, Fig. 1, but on the same scale as Fig. 3.

Similar letters of reference designate corresponding parts in all the figures.

A designates a distilling chamber, which may be made of sections of cast-iron bolted together, or in any other suitable manner. It has, as here shown, semi-cylindric ends. Near one end, on the upper side, it is provided with a feed-hopper, A' , and near the other end, on the lower side, it is furnished with a delivery-hopper, A^2 . The feed-hopper is provided with a slide or valve, a , near the upper end, and a slide or valve, a' , near the lower end. By opening the upper valve, a , and closing the lower valve, a' , a charge of wood, coal, or other substance may be admitted into the feed-hopper, and then by closing the valve a and opening the valve a' this charge may be fed into the distilling-chamber, while there is no communication through the hopper between the distilling-chamber and the external atmosphere.

In the delivery-hopper A' there are likewise two slides or valves, $a^2 a^3$. The upper valve, a^2 , will be opened and the lower valve, a^3 , closed while the coke or charcoal is being delivered into this hopper, and then the lower valve will be opened and the upper valve closed, so that the coke or charcoal will be discharged. It will be observed that the distilling-chamber slants downwardly from the end where the feed-hopper is located to the

other end, where the delivery-hopper is arranged. In this distilling-chamber is situated an endless carrier, $B B'$, for the material from which the distillation is to be made. This carrier consists, essentially, of an endless band, B , of perforated or reticulated material—such, for instance, as wire-gauze—forming its bottom, and endless chains B' , provided with plates, forming the sides. This carrier travels around rollers $C C'$, arranged in the distilling-chamber near the ends of the latter. These rollers have cylindric bodies b , around which the endless band B , forming the bottom of the carrier, passes, and polygonal end portions, b' , around which the chains B' pass. The length of the sides or plane surfaces of these polygonal end portions corresponds to the length of the links of the chains. The chains are connected by rods c , extending between them, and also serving to connect the links composing each of the chains together. These rods support the endless band B . It will doubtless have been understood that the endless band B and the chains B' have no connection, but are moved along together by their passage around the rollers. The bearings of the roller C' , which is the nearer to the feed-hopper, are preferably adjustable for the purpose of producing the tension of the carrier, which is necessary to keep it from sagging. The bearing may be adjusted by means of screws c' , or in any other suitable manner. The roller C , which is the nearer to the delivery hopper, is the driving-roller whereby motion is imparted to the carrier. It has on one journal a large gear-wheel, c^2 , which engages with and derives motion from a pinion or small gear-wheel, c^3 , on the adjacent journal of a roller, D , whereby particles of the material to be distilled adhering to the carrier will be detached, and all large lumps of the material be broken up into small pieces. This clearing-roller derives motion through the agency of a worm-gear wheel, c^4 , with which it is provided. A worm, c^5 , engaging with the worm-gear wheel c^4 imparts motion to the latter, and may derive motion from a belt on a pulley, c^6 . Thus a very slow motion will be imparted to the clearing-roller D , and a still slower motion will be imparted to the rollers $C C'$ and carrier. The clearing-roller is composed of a number of collars fitted to

and secured upon a common shaft. These collars have teeth, preferably made of pyramidal form, projecting radially from them. The collars are so arranged relatively to each other
 5 that their teeth will be disposed in spiral rows. Their teeth extend close to but not in contact with the endless band B or bottom of the carrier as it passes around the roller C. As this clearing-roller runs in the opposite direction
 10 to the roller C, the adjacent surface of these two rollers run in the same direction; but as the clearing-roller will move faster than the roller C it will break up large lumps of material passing it, and will clear the perforations
 15 or meshes of the endless band B. Material dropping from the feed-hopper falls on the carrier and is ultimately delivered by the carrier into the delivery-hopper.

E designates a fire-chamber. It may be
 20 made in any suitable manner; but, as here shown, its walls are made of masonry and its top and bottom of plates of iron. The top plate I term the "fire-plate." This fire-chamber is to be fitted with furnaces F from end
 25 to end, although I have shown but two in the drawings. The chamber slants downwardly, like the distilling-chamber. It will be observed that it is located between the rollers C C', and also between the upper and lower
 30 portions of the carrier. At its higher end, which is the nearer to the roller C', are openings d, through which the products of combustion pass to a casing, G, extending
 35 distilling-chamber and over the top to near the lower end, whence the products of combustion escape from it through a flue or chimney, H. The top of the distilling-chamber is provided with a number of pipes, I' I² I³ I⁴,
 40 which are separate and unconnected, and which serve to convey away separately the vapors of distillation. The coal, wood, or other material introduced through the feed-hopper is quite cool as it enters, and hence it does not
 45 become very highly heated by the time it arrives at the first pipe, I'. It consequently becomes more and more highly heated as it successively arrives opposite the pipes I², I³, and I⁴. It is, however, heated to a sufficiently
 50 high degree by the time of its arrival opposite the pipe I' for the distillation of naphtha vapors; hence these vapors will pass off through this pipe. By the time of its arrival opposite the pipe I² it will have become heated sufficiently
 55 for the distillation of the vapors of illuminating-oil. At the time of its arrival opposite the pipe I³ its heat will be such that lubricating-oil will be distilled, and on its arrival at the pipe I⁴ paraffine-tar and paraffine
 60 will be distilled from it. The material passed off through the several pipes I' I² I³ I⁴ will be conveyed away separately. The incline of the top of the distilling-chamber is advantageous, because any distilled vapor which may
 65 be evolved after the passage of the material under treatment past the pipe through which

it ought to pass off, its tendency to rise will cause it to pass backward to the proper pipe. If desirable, the top of the distilling-chamber may be transversely arched to direct the vapors from the sides toward the center where the pipes are located. 70

Over the furnaces and within the fire-chamber E a superheater, J, is arranged. It consists of a sinuous or serpentine pipe extending
 75 between the sides of the fire-chamber. This superheater obtains from a branch pipe, K, a supply of steam, and from a branch pipe, K', a supply of carbonic-acid gas, which may be obtained by subjecting ordinary atmospheric
 80 air to the action of a coke fire or in any other suitable manner, the mixture of steam and carbonic-acid gas passing through the superheater very highly heated, and is delivered into distributing pipes L. These distributing-
 85 pipes extend over the top or fire plate of the fire-chamber back to the upper end. They are perforated and distribute the mixture of steam and carbonic-acid gas under the perforations or openings in the endless band or bottom B of the carrier. They rise through the
 90 latter and mingle with the vapors of distillation, thereby rendering them non-combustible until condensation shall effect a separation of them from the carbonic-acid gas and the
 95 water formed by the condensation of steam.

I have found that by mixing steam and carbonic-acid gas much less carbonic-acid gas will suffice to render the vapors of distillation non-combustible, and that the carbonic-acid gas
 100 does not have such an injurious effect upon the vapors of distillation as when the carbonic-acid gas is used alone. The use of the steam with the carbonic-acid gas also conduces to a
 105 greater yield of the vapors of distillation.

The mingling of steam and carbonic-acid gas with the material to be distilled is not here claimed; but that process will be made the subject of a future application for Letters
 110 Patent.

It is obvious that the products of combustion heat the distilling-chamber twice—namely, over from the inside by radiation from the top and bottom of the fire-chamber, and a second time over the side and top—also, that the
 115 mixture of steam and carbonic-acid gas is heated twice—namely, first inside of the fire-chamber, and then over the top or fire-plate of the fire-chamber.

The incline of the fire-chamber, distilling-chamber, and carrier is advantageous, because the weight of the material on the carrier tends to propel the carrier in the proper direction, and hence less power is necessary for its propulsion.
 125

I have shown the bottom of the distilling-chamber as provided with a man-hole, m, to facilitate cleaning.

Upon the ends of rods c, which connect the chains D', are rollers s. In the passage of the
 130 carrier over the fire-chamber E these rollers run upon the top of the fire-chamber, and in

the passage of the carrier under the fire-chamber the rollers run upon rails s' , secured to the sides of the distilling-chamber A. By these rollers the carrier is supported between the rollers C C'.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus for distilling coal, wood, or analogous material, the combination, with an endless carrier composed of a perforated or reticulated endless band forming the bottom and chains provided with plates forming the sides, of rollers having cylindrical bodies for receiving the endless band, and polygonal end pieces receiving the chains, substantially as specified.

2. In an apparatus for distilling coal, wood, and analogous material, the combination of a fire-chamber, a carrier adapted to travel over and around the fire-chamber, a distilling-chamber extending over and around the fire-chamber and inclosing the carrier, and a casing inclosing the sides and top of the distilling-chamber and receiving the products of combustion from the fire-chamber, substantially as specified.

3. In an apparatus for distilling coal, wood, and analogous material, the combination of a fire-chamber, a carrier adapted to travel over and around the fire-chamber, a distilling-chamber extending over and around the fire-chamber and inclosing the carrier, and a number of pipes separate from and unconnected with each other extending from the distilling-chamber at different points in its length for carrying off vapors of distillation evolved at different temperatures, substantially as specified.

4. In an apparatus for distilling coal, wood, and analogous material, the combination of a fire-chamber, a carrier adapted to travel over and around the fire-chamber, a distilling-chamber extending over and around the fire-chamber and inclosing the carrier, all arranged on an incline, and a number of pipes for carrying off vapors of distillation evolved at different temperatures, substantially as specified.

5. In an apparatus for distilling coal, wood, and analogous material, the combination of a fire-chamber, a distilling-chamber extending over and around the fire-chamber, and an endless carrier also extending around the fire-chamber and arranged in an inclined position in said distilling-chamber, and constructed to receive and support material to be distilled on that portion which is uppermost as it travels along, whereby the weight of material on the carrier is made to aid in propelling the carrier, substantially as specified.

6. In an apparatus for distilling coal, wood, or analogous material, the combination of a fire-chamber, a carrier adapted to travel over the fire-chamber, a distilling-chamber extending over the fire-chamber and inclosing the carrier, and a roller arranged in the distilling-chamber and serving to clear the carrier, substantially as specified.

7. In an apparatus for distilling coal and wood and analogous material, the combination of a fire-chamber, a carrier adapted to travel over the fire-chamber, a distilling-chamber extending over the fire-chamber and inclosing the carrier, and a roller serving to clear the carrier arranged in the distilling-chamber, and provided with teeth which extend obliquely or spirally on its surface, substantially as and for the purpose specified.

8. In an apparatus for distilling coal, wood, or analogous material, the combination of a fire-chamber, a distilling-chamber, a carrier having a perforated or reticulated bottom, a superheater for a mixture of steam and carbonic acid extending under the fire-plate of the fire-chamber, and a distributing-pipe connected with the superheater and extending over the fire-plate of the fire-chamber, substantially as specified.

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