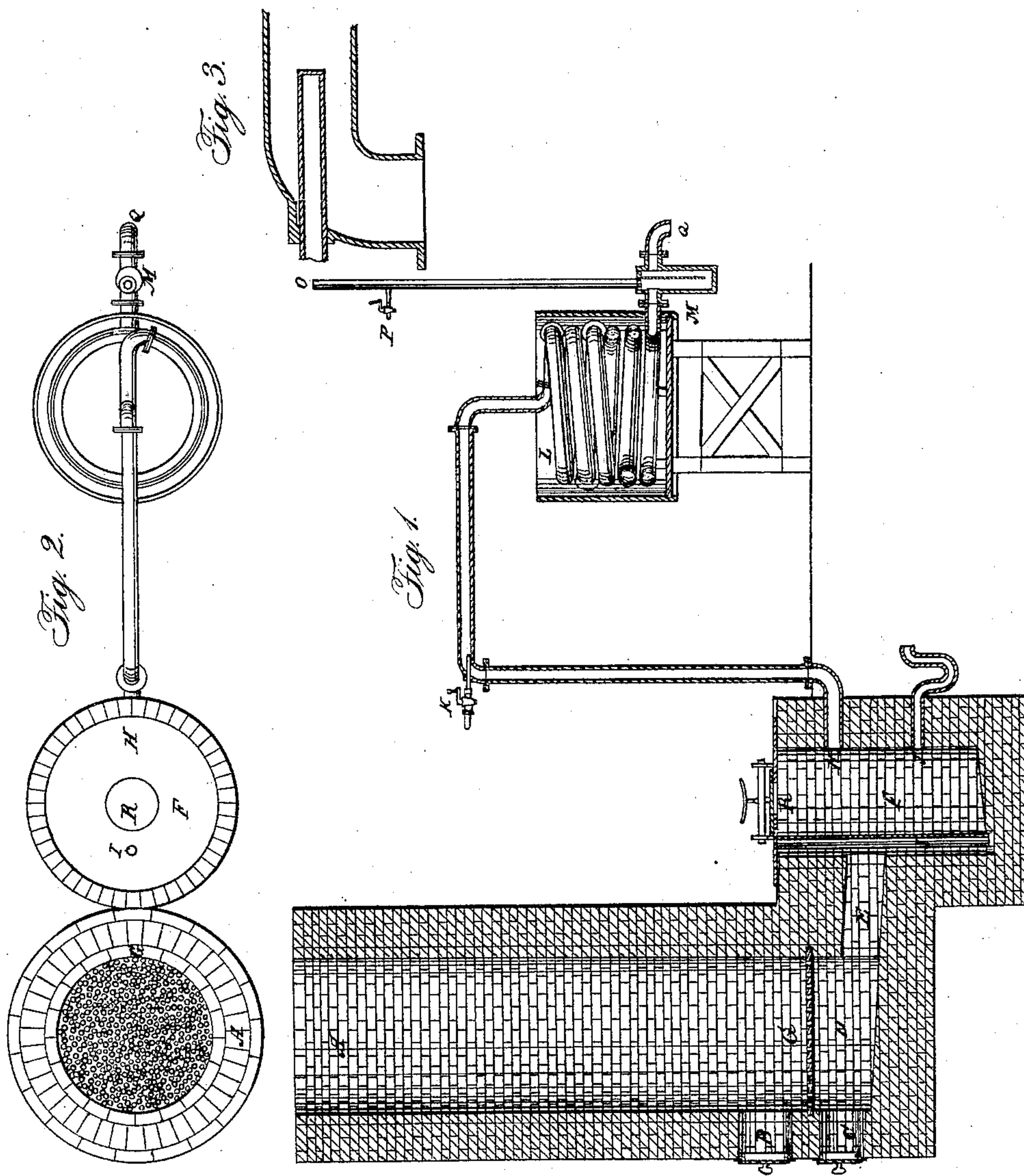


L. ATWOOD.

Oil Still.

No. 22,407.

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Witnesses:

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# UNITED STATES PATENT OFFICE.

LUTHER ATWOOD, OF BROOKLYN, NEW YORK.

## IMPROVEMENT IN APPARATUS FOR DESTRUCTIVE DISTILLATION.

Specification forming part of Letters Patent No. 22,407, dated December 28, 1858.

*To all whom it may concern:*

Be it known that I, LUTHER ATWOOD, of the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful improvements in apparatus for destructive distillation and carbonization at comparatively low temperatures, which is applicable to the distillation of solid bituminous substances, such as bituminous coals, bituminous shales, and schistus, also to the carbonization of wood, bones, and other solid substances that maintain their figure sufficiently during decomposition to permit of the free circulation of a current of products of combustion through a mass of moderate-sized fragments; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and the letters of reference thereon, forming a part of this specification.

My invention consists in the arrangement and combination of a vertical distilling-tower or fire-place and a receiving-vessel, both hereinafter more particularly described, with an exhausting steam-blast or its equivalent, in the combination, substantially as hereinafter described, and in such manner that a continuous and controllable current of air enters the top of the distilling-tower (which is open) by reason of the pressure of the atmosphere induced by the exhaustion produced by the action of the steam-blast, maintaining the combustion of ignited fuel placed in the upper part of the distilling-tower over the substance acted on, the products of combustion passing downward upon and through the said substance acted on, which is thereby progressively decomposed, the products of decomposition passing downward through the cooler portions of the mass, imparting heat thereto, and the liquids condensed in the lower part of the distilling-tower flowing into the receiver, with which the exhausting steam-blast is connected; but more particularly to describe my invention, I will refer to the drawings, of which—

Figure No. 1 represents a vertical longitudinal section of the apparatus, showing a worm-condenser and appurtenances combined therewith; Fig. No. 2, a plan view, and Fig. No. 3, a detached view on a larger scale, showing more perfectly the steam-jet pipe.

Letter A represents the "distilling-tower,"

a vertical hollow cylinder of brick or other suitable material, which may be of any required diameter that will permit of convenient withdrawal of the residue. It is open at the top, and is provided with a perforated diaphragm or grate, G, which extends transversely across it at the bottom. Just above and below the grate are man-holes B and C, for the purpose of discharging residue and ashes, which are closed while distillation is going on by stoppers that are air-tight, or may be made so with luting. Below the grate is a cavity, D, the floor of which is inclined toward the inclined passage E, which, proceeding at the same inclination, enters the receiver F, connecting it with the cavity D. The floor of D, also the passage E and the receiver F, may be lined with metal, or the whole apparatus may be constructed of iron, as may be convenient. The receiver-cover is air-tight and provided with a man-hole and plate, R, secured by a clamp and screw and luted so as to make an air-tight joint.

I is a dip-tube sealed by the fluids collecting in the receiver, in which a lift-pump may be introduced for the purpose of discharging the contents of the receiver below the sealed siphon J, which permits the discharge of fluids from the receiver without allowing air to enter.

H is a draft-pipe leading to the condensing apparatus L, from which the condensed products flow around the separating-diaphragm in the dip-pipe M and out at Q, the draft passing up through and out of the pipe O, on its way being exposed to a shower of water from the nose of the water-jet P, which may be connected with a force-pump or fountain-head in any suitable manner, and which operates to further save what liquid products may have escaped the action of the condenser.

At K a steam-jet pipe, connected in any suitable manner with a steam-boiler and provided with a regulating-valve, is introduced into the draft-pipe H in such manner as to direct the admitted blast of steam, which should be highly elastic, in a direction leading from the distilling tower and receiver, so as to produce a partial vacuum behind it, thereby inducing the current which enters the top of the distilling-tower and passes through the apparatus.

The operation of my apparatus is as follows,



viz: I charge the distilling-tower with the material to be decomposed in fragments of moderate size up to within about two feet of the top. I then fill up the remaining space with a layer of small pieces of coke or charcoal, packing it pretty closely, and light it at the top with kindling stuff, at the same time turning on the steam-jet to induce sufficient draft to support combustion and draw down the heated products of combustion upon and through the mass acted on, which is thereby gradually and progressively decomposed and the products removed downward through the mass, imparting heat thereto, and the liquids formed by condensation in the tower drip down through the grate and pass into the receiver.

In the distillation of bituminous coals the major part of the liquid products are collected in the receiver F, the vapors and volatile matters escaping therefrom passing on into the condensing apparatus L. During the operation care must be taken to prevent air-holes from forming through the bed of ignited fuel, which will permit access of the free oxygen of the atmosphere to the material acted on; and to this end the ignited fuel must be occasionally raked over and pressed down from the top. When the liquid products cease to flow from the receiver, the fire in the top of the distilling-tower may be put out with water and the residue removed, as usual in coking processes.

For some purposes the layer of coke may be dispensed with if the substances acted on are sufficiently combustible to answer for fuel to commence the operation, and if the object be only to carbonize coal or wood without regard, especially, to the character of the liquid products, the distilling-tower may be filled with the wood or coal, taking care to place the smallest pieces on top, and then lighted; and, as the operation progresses, if it be conducted carefully, there will soon be a bed of ignited fuel formed sufficiently compact to protect the remainder of the material from the consequences of contact with the atmosphere.

The steam-jet pipe may be introduced in any convenient place in the line of draft, where it will act to exhaust the receiver and distilling-tower, and, by the proper regulation of the pressure and quantity of the steam used, the temperature at which the process is

conducted may be controlled by the operator within the limits of a blast produced by disturbance of the equilibrium of the atmosphere by an exhausting-instrument.

I have successfully distilled bituminous coal in apparatus substantially as herein described with a distilling-tower twelve feet in diameter, using a steam-jet pipe of one-half inch bore up to the jet-hole, which was one-eighth of an inch in diameter, and the pressure of steam used sixty pounds to the square inch. In this apparatus, which is full as large as I would recommend for use, I have four sets of man-holes, placed at points equidistant from each other around the circumference of the distilling-tower, for the purpose of discharging the residue.

My apparatus is adapted to the manufacture of acetic acid and generally to destructive distillation of solid substances at comparatively low temperatures.

I am aware that heretofore a variety of apparatus have been used and attempted to be used for the carbonization of fuel, at the same time saving a part of the liquid products therefrom, by means of a current of heated products of combustion forced through a mass; but in none of them is the fuel placed directly over and in contact with the mass to be decomposed, and the products of decomposition drawn downward away from the action of the heat of the fuel and condensed in the lower part of the chamber in which they are formed by the action of a controllable continuous exhaust, in combination with a receiving-vessel, into which the liquid products pass.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is, viz—

The combination and arrangement of a distilling-tower and receiving-vessel, substantially as hereinbefore described, with a steam-blast or its equivalent in the combination, for the purpose of producing an induced current, substantially in the manner and for the purposes herein described and set forth.

LUTHER ATWOOD.

Witnesses:

A. H. JOHNSON,  
GEO. DREW.