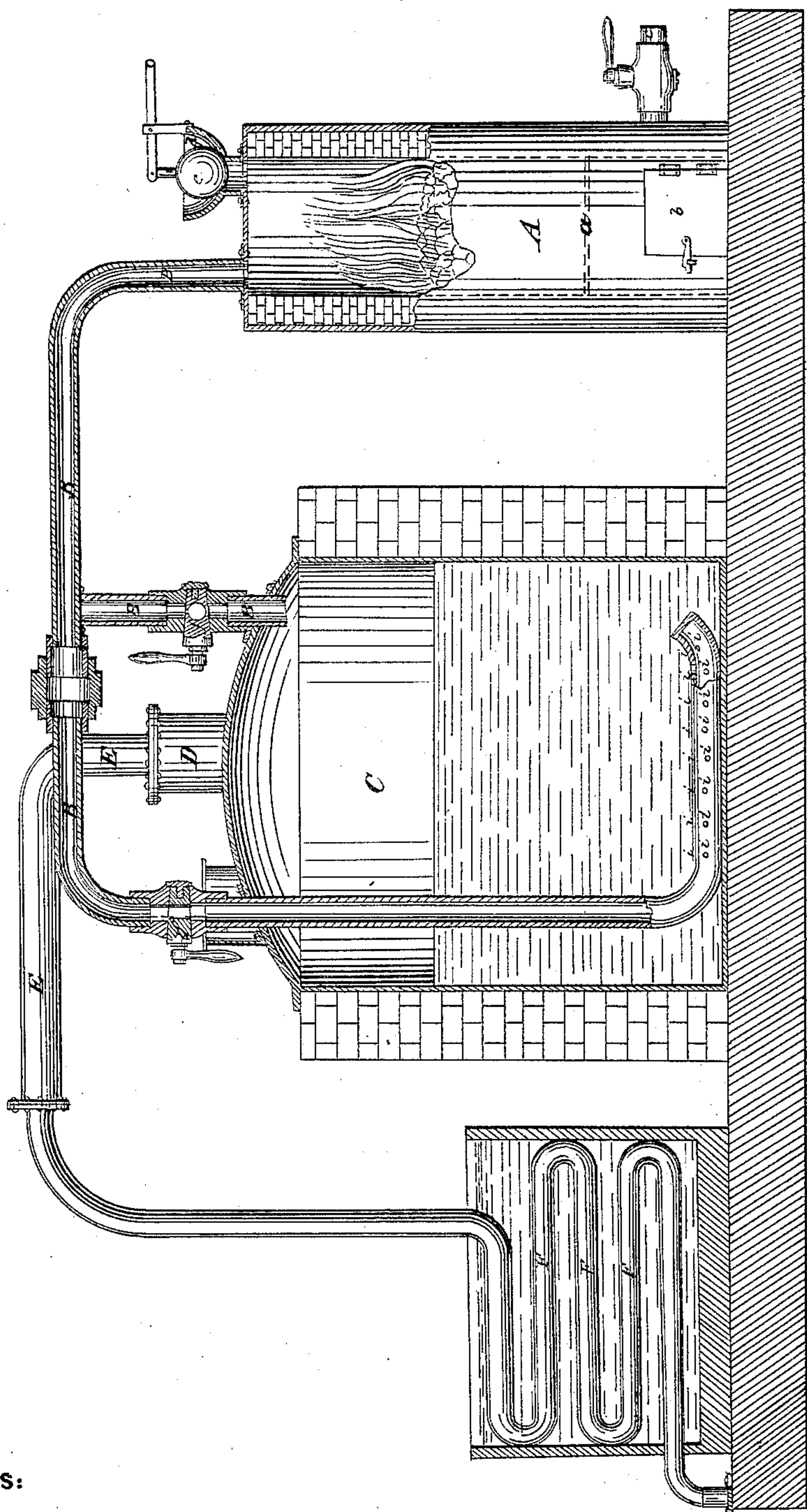


ADAIR & TWEDDLE.

Oil Still.

No. 56,343.

Patented July 17, 1866.



Witnesses:

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UNITED STATES PATENT OFFICE.

JAMES ADAIR AND H. W. C. TWEDDLE, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN EVAPORATING AND DISTILLING LIQUIDS.

Specification forming part of Letters Patent No. 56,343, dated July 17, 1866.

To all whom it may concern:

Be it known that we, JAMES ADAIR and HERBERT W. C. TWEDDLE, of the city of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improved Mode of Evaporating and Distilling Liquids; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing, forming part of this specification, which is a vertical section of the apparatus which we employ in the practical application of our improvement.

Our invention consists in passing hot carbonic oxide or carbonic-acid gas, alone or admixed with other gaseous bodies, through or over the liquid to be evaporated or distilled, and is designed chiefly to be applied to the distillation of hydrocarbon oils and to the generation of steam.

The advantages which we secure by our invention are, in the distillation of petroleum, for example, that the hot vapor used for evaporating the oil, being charged with carbon, (as CO or CO₂,) does not combine with the carbon of the oil, and neither burns it nor does it cause the deposit of solid carbon and the elimination of hydrogen gas, which is done to a greater or less degree in the ordinary mode of applying heat for distillation, and in the generation of steam a saving of fuel is effected, our process being a cheaper and more efficient mode of application of heat for that purpose. There are also other practical advantages which will appear when we shall have more fully described the manner in which we carry our invention into practice.

The accompanying drawing represents an apparatus for applying our invention to the distillation of petroleum, in which A is an air-tight furnace, built of plate-iron lined internally with fire-brick. It is a vertical cylinder having a grating to hold the fuel, (shown by dotted lines at *a*,) with a tightly-shutting door, *b*, below the grate, opening into the ash-pit, and a pipe, *c*, opening into the space below the grate, through which pipe atmospheric air or steam, or a mixture of air and steam, is forced by any suitable means, as by a force-pump, or the air or steam may be drawn through by creating a vacuum in the still.

The fuel used is coke, charcoal, or anthracite coal, or other carbonaceous fuel which will not give out free carbon too largely. This fuel may be inserted through a funnel, *d*, at top of the furnace, which is kept closed, excepting when the fuel is being introduced, by a ball, *e*, or other suitable device.

A pipe, B, which opens into the top of the furnace A, extends to the still C, and has two branches, one of which, B', enters the top of the still C, but does not descend to any depth therein sufficient to touch the oil contained therein. The other branch, B'', descends to the bottom of the still, or at least so far as to pass into the oil, the lower portion of the branch pipe B'' being perforated with a number of small holes, *i i*, and the extremity of the pipe being closed, so that the gas may be forced to escape in small streams into and through the body of the oil. Each of the branch pipes B' and B'' has a stop-cock, *f*, outside of the still C, to admit the gas from the pipe B into the still or shut it off or regulate the quantity admitted.

The still C may be made of metal in the usual manner, and has a head, D, on top, from which a pipe, E, leads the vapor of distillation to the condensing-worm F. The still is encased in brick-work to prevent the loss of heat by radiation.

The operation of our apparatus is as follows: A fire being built in the furnace A of coke, charcoal, or other carbonaceous fuel which will burn without much smoke, and the still C being charged with oil to a proper height, the cock or valve in the pipe *c* is opened, through which atmospheric air or steam, or mixed air and steam, is caused to pass (from a steam-generator or blast-cylinder) into the tightly-inclosed space below the fire-grating *a* of the furnace A. By passage through the fire in the furnace A the air or steam is decomposed and forms other combinations, resulting, if air is employed, in carbonic oxide or carbonic acid and free nitrogen, or, if steam is employed, in carbide of hydrogen and carbonic acid. These gases pass up through the pipe B, being either forced by a force-pump connected with the pipe *c*, or drawn through the apparatus by means of an air-pump connected with the worm F at the other end of the apparatus. They pass thence

either through the branch pipe B', over the surface of the oil in the still, or through the branch pipe B'', in which case they pass below the surface of the oil and escape from the pipe B'' at the apertures *i i*, &c., near the bottom of the still, in small streams, which pass up through the oil and escape with the vapor of distillation at the still-head D.

If desired, the gases from the furnace may be admitted through both of the branch pipes B' and B'' at the same time, so as to pass both over and into the oil in the still. This is regulated by the cocks or valves *f f*. The vapor of distillation and waste gases pass through the pipe E and through the condenser F, where the oil is condensed and the gases escape.

In this operation the gases produced in the furnace become highly heated, and the oxygen and hydrogen, being combined with carbon in passing through the furnace, are thereby prevented from combining with the carbon of the oil to be distilled, the result of which would be the burning of the oil and the elimination of hydrogen in the shape of permanent gas, which is carefully to be avoided.

If heated air alone were used—that is, atmospheric air not thus decomposed—and passed over or through the oil, its oxygen would combine with the carbon of the oil, and would probably result in an explosion, besides causing a great waste of oil.

The advantages of the method of distilling which we have described, especially as applied to carbon oil or petroleum, are that the oil is not burned, and that the deposit of carbon in the still is prevented in a great measure; that the still itself is not exposed to the direct action of the fire and will last much longer, and that the heat is much more economically applied.

It is also very manifest that the process of distillation can be carried on much more uniformly, the application of the heat being entirely under control, being regulated by the

cocks or valves *f f* in the pipes B' B'', whereas by the ordinary mode of applying the fire to the bottom of the still this is not the case.

The process we have described may be readily and advantageously applied to the distillation or evaporation of other liquids than petroleum, and may also be used for the generation of steam for steam-engines, in which latter case the number of pipes leading from the furnace into the steam-boiler might be increased.

Our apparatus may also be employed in chemical operations for the purpose of producing combinations with carbon, as in the manufacture of carbonate of soda and other articles.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The mode of distilling or evaporating petroleum or other liquids by passing through or over the liquid to be distilled or evaporated heated carbonic oxide or carbonic acid, substantially as and for the purposes described.

2. The combination of the air-tight furnace, through the fire in which air and steam, or either of them, are forced, with the still or boiler for holding the liquid to be distilled or evaporated, and the pipes connecting the furnace and still or boiler, constructed and operating substantially as and for the purposes hereinbefore described.

3. The air-tight furnace A, constructed substantially as described, for the production of carbonic oxide or carbonic acid to be used in the making of artificial combinations or mixtures of carbon with other fluid or solid bodies.

In testimony whereof we, the said JAMES ADAIR and HERBERT W. C. TWEDDLE, have hereunto set our hands.

JAMES ADAIR.

HERBERT W. C. TWEDDLE.

Witnesses:

ALLAN C. BAKEWELL,
N. VEEDER.