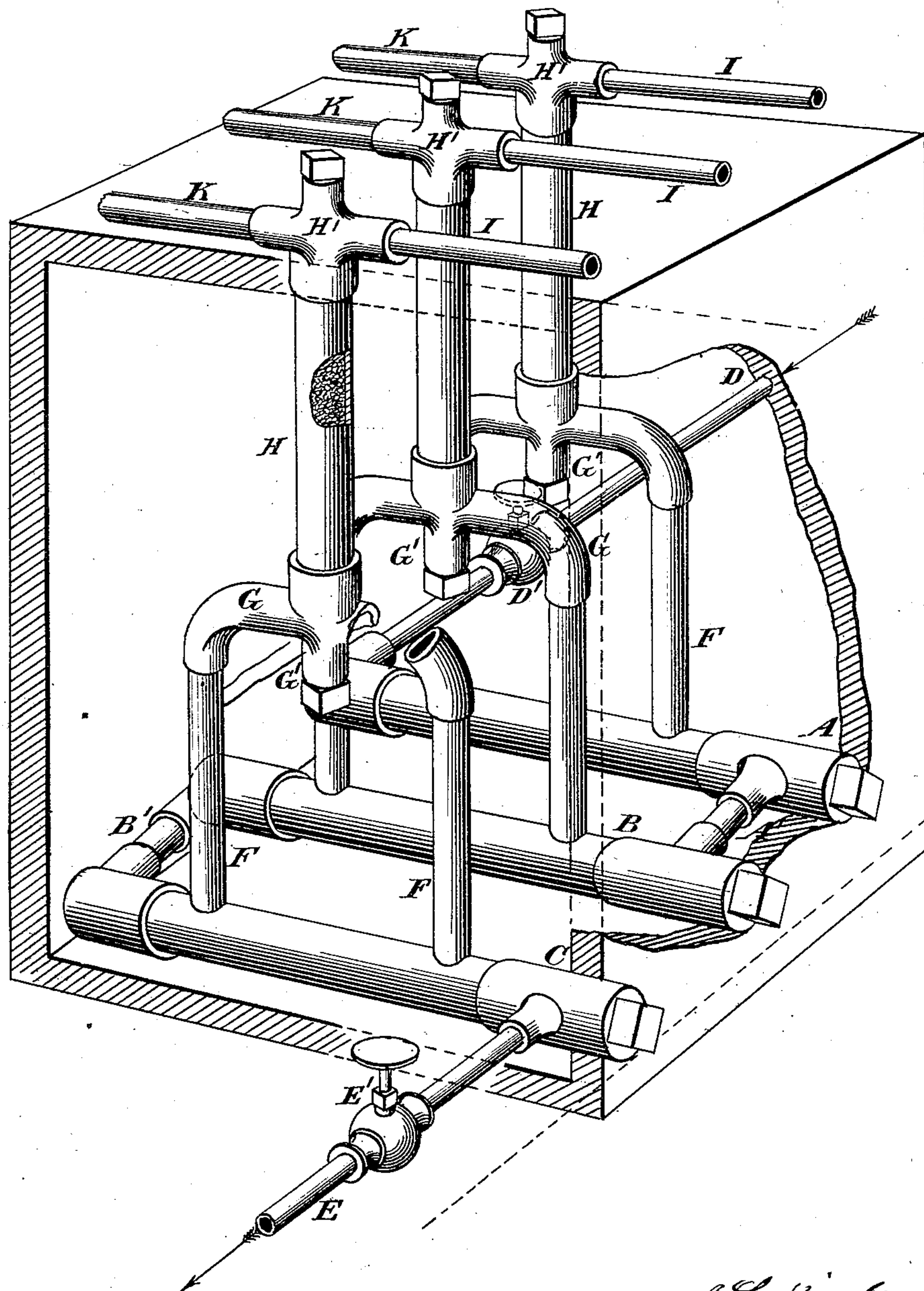


J. L. KIRK.
Process and Apparatus for Distilling Petroleum.

No. 215,756.

Patented May 27, 1879.



Witnesses.
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JOSEPH L. KIRK, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN PROCESSES AND APPARATUS FOR DISTILLING PETROLEUM.

Specification forming part of Letters Patent No. **215,756**, dated May 27, 1879; application filed December 28, 1878.

To all whom it may concern:

Be it known that I, JOSEPH L. KIRK, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in the Distillation of Petroleum; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention relates to the distillation of petroleum or crude hydrocarbon oil; and it consists in a series of retorts acting independently of but in connection with each other. They are formed of a combination of cylinders or pipes, into which the crude oil continually flows, where it is evaporated and the different grades of oil separated, filtered, and bleached while in a vapor state, and from the retorts the residuum is continuously flowing while the apparatus is in operation. These retorts are constructed either of wrought or cast iron or copper, properly connected, and all but the bleaching-pipes inclosed in a suitable furnace.

A, B, and C are a series of evaporating-cylinders, which receive and contain the oil undergoing distillation, supplied continually through the pipe D, which is the induction or feed pipe, that admits the crude oil into the evaporating-cylinders A, B, and C. These evaporating-cylinders are placed on an inclination, B being lower than A, and C lower than B, and they are connected by the pipes A' and B' in such a manner that the oil, or what may be left of it after the different stages of evaporation, will flow of its own gravity through from the induction-pipe D to the eduction-pipe E, and will have passed through the entire length of all the evaporating-cylinders.

I do not wish to confine myself to the use of three evaporating-cylinders, as it may be convenient or necessary for perfect evaporation or distillation to employ more or less than that number.

There are also connected with the evaporating-cylinders A the pipes F, which are vertically located inside of the furnace. The up-

per ends of these pipes by proper connection open into horizontal pipes G, from which rises a filter, H. There are flanged openings G' located in these pipes G, underneath and opposite the connections of the filter, for the purpose of allowing the same to be cleaned. The evaporating-cylinders extend beyond the furnace, and are also provided with suitable means of cleaning.

Capping the filter and located upon the outside of the furnace is a cross or four-way connection, H', in the upper end of which is inserted a plug, which can be removed for the purpose of filling the filter.

Into one of the horizontal arms is inserted the induction-pipe I, for conveying the bleaching-gases to the vaporized oil, which, with the bleaching-gas, passes through the cylinder K.

Each of the evaporating-cylinders in the series is provided with the same pipes, supply-pipes for bleaching, and discharge-cylinders, as hereinabove described, and connected with the evaporating-cylinder.

There may be two or more filters, H, or three or more pipes, F, constructed and connected as described, for each evaporating cylinder or retort; or instead of the pipes F and G, suitable chambers may be substituted. Outlets and plugs may be placed at the intersection and ends of all pipes, chambers, or cylinders, to facilitate the cleaning of the same.

Such pipes or cylinders may be protected from the corrosive action of the bleaching gas or gases by enameling them; or they may be made of or lined with lead or other suitable material.

The operation of my invention is as follows: After the retorts above described have been charged, the furnace properly heated, and the imperfectly-distilled oil drawn off, the proper distillation begins by opening the stop-cock of the induction-pipe D, which is properly connected with a reservoir or pipe-line of crude oil. As this crude oil flows through the evaporating-cylinders the lighter oil is vaporized by the heat. The vapors arise through the pipes or chambers F, and pass through the filters H, which are filled with non-combustible material, such as fibrous asbestos, pumice, or other finely-divided or porous material, such as may serve as proper filters. The heat ex-

pels these vapors, and the filter retains any foreign substances which may arise with the vapors, and the heavy oils flow downward into the following series of evaporating-cylinders. These filters, being located in the furnace, and subjected to its regulated heat, contribute to the purification of the vapors passing through them.

The vapors having passed through the filtering material come in contact with the current of bleaching-gas, which may consist of sulphurous-acid gas, (SO_2) or the vapors of sulphuric acid, (SO_3) diluted with steam, which is conducted thereto by the pipes I. These bleaching-pipes K conduct the vapors to a proper receptacle to complete the bleaching. They are then condensed and washed.

I do not wish to limit myself to the use of the gas or vapors herein specified for bleaching or clarifying purposes, as other known gas or vapors may be applied advantageously.

The introduction of oil into the evaporating-cylinder A will cause the temperature in this cylinder to be lower than in the remaining cylinders. The lighter gases, such as benzene, &c., will be evolved in the cylinder A, which can pass to the condensing-receptacle without filtration or bleaching, if desirable, and may be returned, if desired, to the furnace for fuel. If the operation has been properly conducted, the benzene and lighter gases will have been eliminated from the crude oil in the evaporating-cylinder A.

In this case the vapors arising in the evaporating-cylinder B will be convertible, as hereinbefore described, into illuminating-oils, and the vapors of the evaporating-cylinder C would in like manner produce the heavier oils. The residuum or tar, which the retort refuses to distill, would pass out of the lower discharge-pipe, E.

By means of the evaporating-cylinders and the retorts and parts, as hereinbefore described, I am enabled more accurately and economically to separate the noxious gases from the illuminating-oils.

I am aware that heretofore in the distillation of crude oils or petroleum it has been vaporized in a retort charged with large or certain quantities of oil, and the vapor condensed, and the fluid subsequently treated with acids and alkalies and washed, and this process repeated. By this means large amounts of refined oils are exposed to the atmosphere for completing the refining. The gases arising are in danger of fire by lightning or other causes, involving destruction of life and property.

By means of my invention the supply to the retort is continuous, and the residuum is constantly flowing out.

The lighter gases and benzene may be used as fuel as they are discharged.

The oil as it comes from the washing-tank

is free from the lighter hydrogen compounds, that are generated by exposure to a humid or warm atmosphere into obnoxious and explosive gases, as in the common method of manufacture.

The filters are placed within the furnace in order that they may be kept at the same temperature as the vapors, thus preventing condensation at this stage of the distillation. In this position they act as an absorbent, and speedily remove the vapors as they are generated.

The advantages of filtering the vapors of petroleum before condensing are, that the molecules composing them are more finely subdivided than when condensed, and deleterious substances can be separated from the vapors that could not be removed from the liquid. When in a state of vapor the atoms do not have so great an affinity as when liquefied, and consequently permit the bleaching agent to disseminate freely, and are more susceptible to their action.

I claim—

1. In an apparatus for distilling crude petroleum, the combination, within the furnace, of a series of pipes, A B C, placed on an incline and joined at alternate ends, forming a continuous pipe, through which the petroleum flows and in which it is evaporated, a series of pipes, G G G, opening successively out of the evaporating-pipes A B C, for taking up the gases evolved, and a series of filters, H H H, connected successively with the vapor-pipes G G G, for clarifying the gases of different densities as they pass from A, B, and C through the pipes G G G, and then through the filters, substantially as set forth.

2. In an apparatus for distilling crude petroleum, the combination of a continuous pipe through which the petroleum flows and in which it is evaporated, a series of pipes successively arranged for taking up the gases as evolved, a series of filters for purifying the gases of different density, and a series of branch pipes for mingling bleaching-gases with those evolved and purified gases of petroleum, substantially as set forth.

3. In the distillation of petroleum, the process of clarifying and bleaching the same, which consists in vaporizing the petroleum by heat, and then passing the vapors through a filter, and subsequently mingling the vapors with the vapors of sulphuric acid or other bleaching vapors, and then condensing the petroleum vapors, substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

JOSEPH L. KIRK.

Witnesses:

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W. N. SEVERANCE.