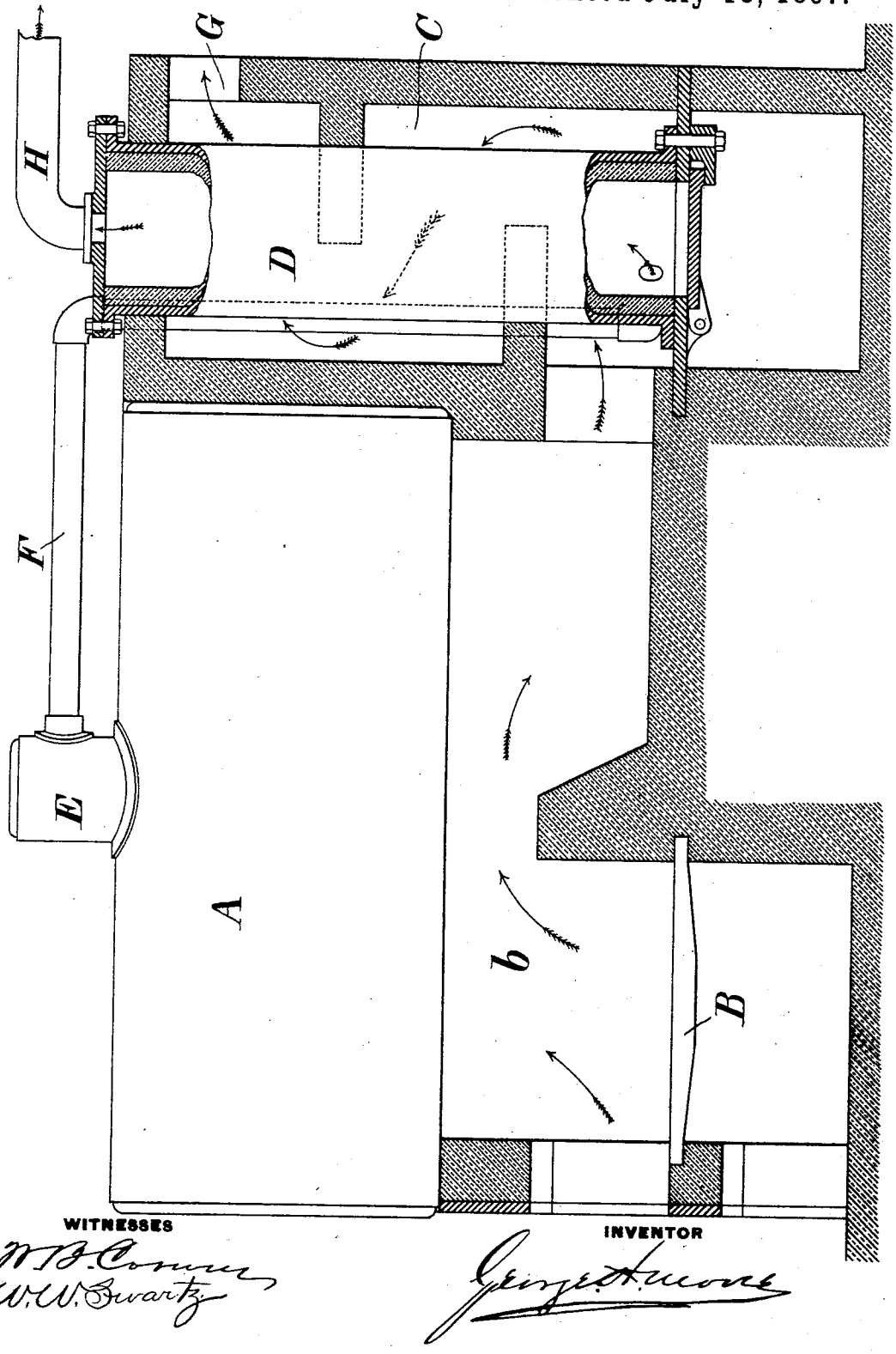
(No Model.)

G. H. MOORE.

PROCESS OF REFINING PETROLEUM

No. 586,520. Patented July 13, 1897.



WITNESSES

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PROCESS OF REFINING PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 586,520, dated July 13, 1897.

Application filed September 6, 1893. Serial No. 484,891. (No specimens.)

To all whom it may concern:

Be it known that I, GEORGE H. MOORE, a subject of the Queen of Great Britain, and a resident of the city of Cleveland, in the State of Ohio, have invented a new and useful Process of Refining Petroleum, of which the following specification, taken in connection with the accompanying drawing, forms a full, clear, and exact description.

This invention relates to the refining of Lima, Canadian, and other similar petroleum-oils, and oils of that class for illuminating purposes.

As refined by the ordinary processes heretofore known these oils have a great tendency to turn yellow and give off an offensive smell, and also to smoke and give off an offensive smell during combustion, all of which is avoided and completely prevented by using my process.

I am convinced, as the result of experiments made by me, that the objectionable characteristics of the class of oils referred to is due to a great extend to the presence in the oil of nitrogenous compounds and traces of the phenylic and naphthalene series and their modification on the treatment of the oil, and that the difficulty heretofore experienced in removing the offensive odor and other objectionable characteristics from this class of oils has arisen from the fact that the efforts heretofore made, with more or less success, to purify the oil have been based on the supposition that the offensive characteristics above mentioned are due solely to the presence in these oils of refractory sulfur compounds and have been directed to the breaking up of these compounds and the elimination of the sulfur. My invention, however, is based upon the fact that if the nitrogenous compounds and other series referred to are removed the sulfur can be afterward not only more readily and easily but more thoroughly and finally removed than when removed from a product embracing these nitrogenous compounds, &c.; and after treating these oils by my process the sulfur can afterward be completely removed practically by the means ordinarily employed in refining petroleum, because the action upon the sulfur compounds present in the petroleum by the chemical reagents usually employed is much more thorough and final than in the presence of the nitrogenous compounds, &c., referred to. Therefore, the sulfur being more perfectly removed from the oil by first removing the nitrogenous compounds, &c., all sulfur reaction in the refined petroleums of the class referred to, which takes place after an interval of time under the present well-known process of refining these oils, will be avoided and completely prevented by using my process.

My invention consists in the removal and separation from the oil of the nitrogenous compounds and the traces of the phenylic and naphthalene series previous to the removal of the sulfur and previous to the subjection of the oil to redistillation and subsequent treatment of the distillate by the well-known acid-and-soda process and in the use for the removal of these compounds of a particular ingredient for that purpose.

The ingredient which I employ for the purpose of disassociating the hydrocarbon oil of the crude petroleum from its nitrogenous compounds and the traces of the phenylic and naphthalene series is a chemical compound of sodic hydrate, calcic hydrate, and sulfate of soda, the proportions of which may be varied and more or less successfully accomplish the desired result; but from experience I have found the most satisfactory results to be obtained by using about one part by weight of sodic hydrate, two parts by weight of calcic hydrate, and of sulfate of soda twenty per cent. of total weight of the other two ingredients, which compound is heated red-hot to insure the reducing action or for the removal of moisture, so that the driving out by heat of the water of crystallization leaves the compound porous, which compound is by such process of manufacture rendered porous for the purpose of being readily permeable by the vapors of the oil. This compound is then broken into small pieces ready for use.

I will proceed to describe the process which I use for the purpose above stated, and the apparatus employed, premising, however, that any suitable apparatus may be used, and that the apparatus described does not form a part of the present invention, and is here de-

scribed merely for the purpose of enabling those skilled in the art of refining petroleum the more readily to apply my improvement.

The accompanying drawing, forming part of this specification, exhibits the apparatus which I prefer to use in the process which I am about to describe.

The crude oil is placed in an iron still A of any ordinary or desired construction, and which is heated by a furnace consisting of a grate B and fire-chamber *b*, of ordinary construction, under the still. At the rear of the still, or otherwise suitably located in relation thereto, is a vertical flue C, in which an iron cylinder D, preferably lined with fire-clay or other suitable material for the purpose of preventing the contact of the heated vapors with the iron, which would form a ferric compound injurious to the color of the resulting distillate, is so placed that the hot air and products of combustion pass all around the iron cylinder, preferably in a tortuous course. This cylinder D is filled with the chemical compound hereinbefore mentioned, which, as above stated, is broken into small pieces before being introduced into the cylinder D.

E is the dome of the oil-still, and F the vapor-pipe leading from the dome of the still (preferably through the flue C) to the bottom of the cylinder D, so that the vapor shall be compelled to pass up through the fragments of the compound in the chamber D.

G is the exit from the flue of the heated air and products of combustion to a chimney, and H is the vapor-pipe from the top of the chamber D, through which the hot vapors, after passing through the compound, are conducted to the condenser.

The degree of heat to which the contents of the chamber D are subjected for the purpose of disassociating the nitrogen should exceed the boiling-point of the distillate passing over at any given time. Consequently the temperature for the removal of the nitrogenous compounds, &c., from the distillates for illuminating-oils need not exceed 300° centigrade, but for the purpose of producing a larger percentage of distillate of light gravity a higher heat may be employed, which should, however, be below that at which fixed gases would be produced rather than oil-vapors.

After the oil has been thus treated to remove the nitrogenous compounds and traces of phenylic and naphthalene series and condensed in the usual manner the sulfur-bearing distillate is treated for the removal of the sulfur, by the ordinary commercial means, with sulfuric acid, &c. It is then redistilled with a slight trace of hydrate of lime or similar chemical substance. This distillate is then fractionated and treated with a small amount—say one-half of one per cent. to one per cent.—of sulfuric acid, followed by the usual washing and neutralization, which completes the process. The refined oil thus produced has a clear water-white color, has no smell in liquid form, and does not smoke or give off any offensive odor during combustion.

This process also lowers the specific gravity of the total distillate condensed from petroleum to the extent of from .010° to .015° specific gravity, or from 2° to 4° Baumé's hydrometer, as compared with distillates obtained in the ordinary manner.

I do not desire to claim, broadly, as my invention the passing of petroleum-vapors through a purifying agent placed in a heated vessel previous to condensation. Nor do I claim the passing of petroleum-vapors through heated lime as a preliminary step to subsequent treatment of the distillate; but

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

1. The process of purifying Lima and Canadian petroleum-oils, and petroleums of that class, by removing the nitrogenous compounds and traces of the phenylic and naphthalene series by means of a porous compound of sodic hydrate, calcic hydrate and sulfate of soda in about the proportions specified, and which is applied to vapor of the oil previous to the removal of the sulfur, substantially in the manner described.

2. The process of purifying Lima and Canadian petroleum-oils, and similar petroleums, by vaporizing the same, and passing the vapors through a heated chamber or vessel containing a porous compound of sodic hydrate, calcic hydrate and sulfate of soda in about the proportions specified, and condensing the vapor so treated previous to the removal of the sulfur, substantially as described.

3. The process of treating Lima and Canadian petroleum-oils, and similar petroleums, by vaporizing the oil, passing the vapors through a heated vessel charged with a porous compound of sodic hydrate, calcic hydrate and sulfate of soda in about the proportions specified, condensing the vapor so treated, washing the resulting distillate with sulfuric acid, redistilling such distillate with hydrate of lime or its equivalent, and finally treating it with sulfuric acid and alkali and washing with water as and for the purposes described.

4. In the process of purifying Lima and Canadian petroleum-oils, and similar petroleums, the application to petroleum-vapors of a porous compound of sodic hydrate, calcic hydrate and sulfate of soda in about the proportions specified, which porosity admits of intimate mechanical and chemical union with said compound previous to the removal of the sulfur, substantially as and for the purpose described.

In testimony whereof I have hereunto set my hand.

GEORGE H. MOORE.

Witnesses:
W. H. VANTIME, Jr.,
C. S. SMITH.