

UNITED STATES PATENT OFFICE.

FRIEDRICH BERG, OF CLEVELAND, OHIO, ASSIGNOR TO JOSEPH B. MERIAM, OF SAME PLACE.

REFINING PETROLEUM OR HYDROCARBON OILS.

SPECIFICATION forming part of Letters Patent No. 560,463, dated May 19, 1896.

Application filed May 31, 1893. Serial No. 476,112. (No specimens.)

To all whom it may concern:

Be it known that I, FRIEDRICH BERG, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Processes of Refining Petroleum or Hydrocarbon Oils; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to use the same.

My invention relates to improvements in refining petroleum or hydrocarbon oil, especially that obtained from what is known as the "Trenton-rock" formation, which contains more or less of sulfur compounds of a complex nature. I have experimented several years with a view to remove the sulfur compounds from the distillates of said oil; but I have found that the amalgamation of the vapors of said sulfur compounds with the vapors of the hydrocarbon oil in the process of distillation is so close and their alliance so tenacious that no treatment heretofore practiced has been practically successful. The treatment heretofore generally practiced is that known as the "litharge" or "lead" treatment; but that treatment is objectionable, first, in that it does not remove all the sulfur compounds, but only neutralizes many of them, and, secondly, a portion of the lead usually remains in the oil, which impairs the burning quality of the oil. After several years of experimenting in the direction of more thoroughly purifying the oil of the sulfur compounds contained therein I have concluded that the sulfur compounds are largely mixed mechanically with the oil—that is, are held in solution by the native oil—and that therefore the sulfur compounds could be more easily separated before than after the distillation of the oil. The temperature at which distillates for illuminating-oil have heretofore been treated ranged from 60° to 70° Fahrenheit, and that for paraffin lubricants from 70° to 80° Fahrenheit, the lower temperatures always having been preferred. My experiments have resulted in the discovery that a treatment of the sulfurous crude oil with sulfuric or other suitable acid and a suitable alkali or base (employed in the purification of the oil) at the above temperatures rendered

the oil still more sulfurous and the distillates obtained afterward more refractory; but I have found that a similar treatment of the oil—that is, the treatment of the oil with a suitable acid to precipitate the sulfur compounds and the subsequent treatment of the oil with a suitable alkali or base to neutralize the excess of acid remaining in the oil after the acid treatment at a considerably higher temperature, say 110° or more Fahrenheit—showed a marked improvement in the result, and I have obtained the best results by treating the oil at a temperature of about 140° Fahrenheit, although the temperature may be greatly varied, according to the quality or character of the crude oil.

In carrying out my process I have been successful in applying the acid to the crude oil in the agitator at ordinary temperatures and then raising the temperature during the treatment to, say, 140° Fahrenheit, either permitting the light vapors to escape or collecting and condensing them, in which case the naphtha products were also quite sweet. Inasmuch as a slow distillation of the crude oil at the lower temperatures yields a naphtha when distilled sweet enough for many practical purposes I have found it sometimes more convenient to distil off and condense the light vapors, while raising the crude oil under agitation to the desired temperature before applying the acid and alkali treatment. At the comparatively high temperature to which the oil is subjected by my improved process I have found that the acid used will combine with the sulfur compounds in the oil and all be precipitated together, leaving the oil comparatively free and clean. The oil is maintained at the temperature indicated until the acid sludge resulting from the action of the acid upon the oil shall be duly precipitated and drawn off, whereupon it will be found that said precipitation has carried with it the sulfur compounds which were contained in the crude oil before treatment. The sulfur-freed oil is then treated with a suitable alkali or base (preferably in another agitator to which it may be removed) for the purpose of neutralizing the excess of acid remaining in the oil after the acid treatment, the oil during the alkali treatment being subjected, preferably, to

the same degree of heat or temperature to which it was subjected during its treatment with the acid. The sludge thrown down during the treatment of the oil with acid at the temperature employed by me carries with it much other foreign matter, thus leaving the oil, after the alkali treatment, sweet and clean, resembling that obtained native from the sandstone series.

- 10 Crude oil treated by my improved process can at once be used for lubricating purposes or be still further reduced in gravity, as may be desired, or it can be distilled and the distillates treated as those obtained from Pennsylvania petroleum, with approximately the same results so far as the quality or purity is concerned.

In practice I have used dry steam heat to raise the temperature of the oil, secured either by a steam-coil in the agitator or preferably by jacketing the agitator, and the range of temperature necessary for the most refractory oils may doubtless be limited to what may be obtained from steam of seventy pounds pressure applied as above. It would rarely be necessary to carry the temperature above 150° Fahrenheit.

What I claim is—

1. In refining crude Ohio petroleum or other like sulfurous hydrocarbon oils, the process herein described consisting in treating the crude oil prior to the distillation of the illuminating-oil products, first, with a suitable acid, and secondly with a suitable alkali or base, all at a temperature of at least 110° Fahrenheit, substantially as set forth.

2. In refining sulfurous Ohio or similar crude petroleum or hydrocarbon oil, the process herein described consisting in distilling off the more volatile portions of the oil and then treating the remainder of the crude oil at a temperature of at least 110° Fahrenheit, prior to any further distillation, first, with a suitable acid, and secondly, with a suitable alkali or base and maintaining the oil at a comparatively high temperature during the entire process, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 19th day of May, 1893.

FRIEDRICH BERG.

Witnesses:

C. H. DORER,
WARD HOOVER.