(No Model.)

C. A. SMITH.

PROCESS OF REFINING OIL.

No. 558,747. Patented Apr. 21, 1896.

Fig. 1.

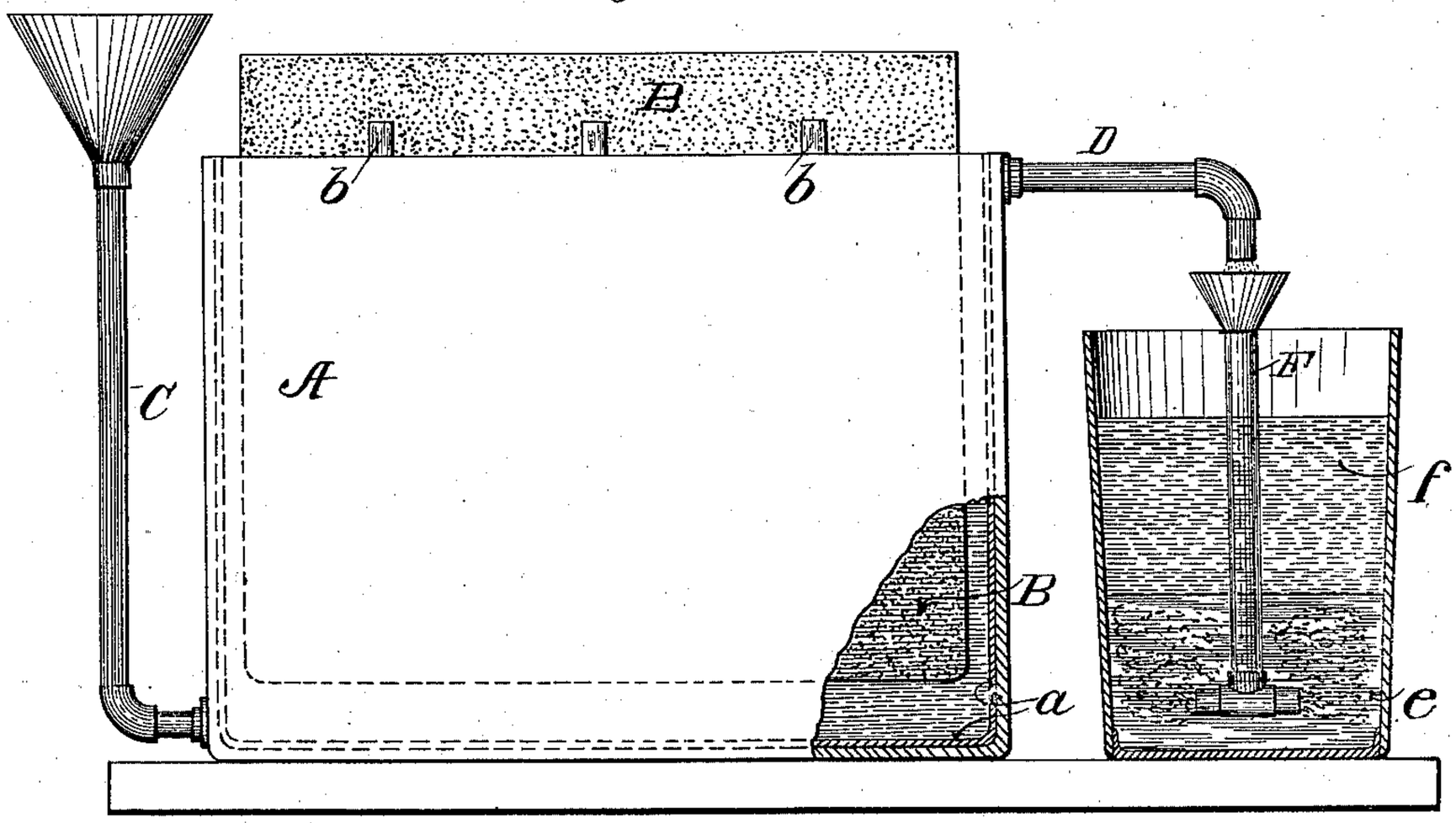
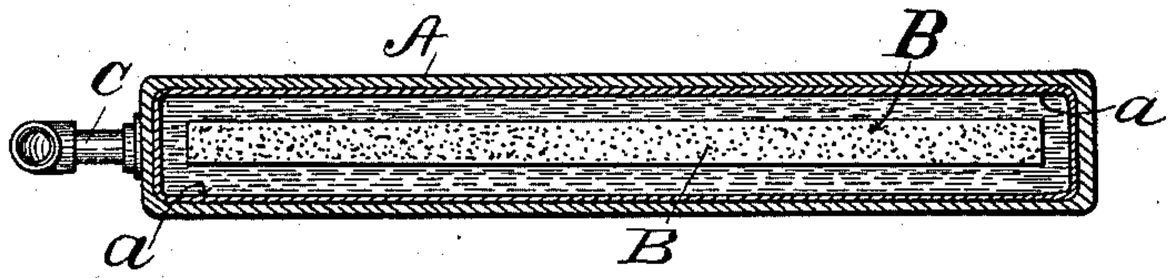


Fig. 2.



Witnesses.
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UNITED STATES PATENT OFFICE.

CARLOS A. SMITH, OF CLEVELAND, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE OHIO OIL IMPROVEMENT COMPANY, OF SAME PLACE.

PROCESS OF REFINING OIL.

SPECIFICATION forming part of Letters Patent No. 558,747, dated April 21, 1896.

Application filed September 25, 1895. Serial No. 563,621. (No specimens.)

To all whom it may concern:

Be it known that I, CARLOS A. SMITH, of Cleveland, Ohio, have invented new and useful Improvements in Processes of Refining Oil, which are fully set forth in the following specification.

The present invention has reference more particularly to the refining of a certain class of mineral oils known as "Lima" or "Ohio" oils, which are heavily charged with sulfurous impurities of an obscure character, the composition of which has not been determined. Oils of a similar character are found in Canada and elsewhere and are designated under the general name "sulfur petroleums," and it is to be understood that my invention applies generally to the treatment of oils containing the sulfurous compounds referred to, of which the Lima or Ohio oil is an example. On account of these impurities, and of the great difficulty and expense attending the removal of them by known methods, the oils referred to are of little commercial value. They are distinguished by a strong and offensive sulfurous odor, and when burned give off disagreeable fumes and produce a dark deposit on lamp-chimneys or other exposed surfaces. I have found that these oils may be refined in a simple, expeditious, and economical manner by a mode of treatment herein set forth, and which constitutes the present invention.

This process consists in bringing the crude distillate of an oil of the class referred to into contact with an active element or agent, such as lead, and an inactive element or agent, such as carbon. The two specified substances—to wit, lead and carbon—are those with which the best results have been obtained. These materials may be arranged in various ways, but the simplest and best mode of procedure which I have found up to this time is to cause the oil to flow slowly between plates arranged in close proximity, but not touching, thus obtaining effective exposure of the oil to the surfaces of said plates, and also rendering the operation continuous, since the dimensions of the plates and the speed of flow of the oil can be determined, so as to secure the desired period of exposure.

The invention may also be carried out by agitating in a vessel containing pieces of lead and carbon, the shape and size of the pieces being subject to variation.

It is not possible to state with certainty the nature of the action which occurs in the oil when treated in the manner stated above. All attempts heretofore made to determine by analysis the character of the impurities contained in oils of the class referred to have met with no success. In order, therefore, that the explanation may he made as clear as possible, and that those skilled in the art to which the invention relates may be able to understand the process fully and to practice it with certainty, I will state the principal discernible effects that occur at various stages of the treatment.

After exposure, say from half an hour to an hour, to the action of the plates the distillate (which originally is clear and colorless) turns a dark or brownish red color and becomes nearly opaque. When then treated with an acid, (as sulfuric acid,) a liquid mass settles to the bottom, out of which a whitish powder is precipitated, from which the clear product may be separated by decantation. This precipitate, which does not yield readily to analysis, manifestly contains the source of the offensive odors characteristic of the specified oils, and which distillation and the ordinary refining operations do not remove. In this treatment lead appears to be the principal or active agent in bringing the oils to such a condition that the subsequent action of acid and alkali effectually purifies and refines the oil. When lead alone is used, I have observed that the oil, instead of turning a dark red or mahogany color, as stated above, simply becomes cloudy, and that the resulting product, while commercially useful, is not so good as when lead and carbon both are employed.

There is reason to believe that the result produced is not due to the corrosive action on the lead, since by weighing the lead before and after an operation resulting in the

removal of four ounces of sulfurous impurities no appreciable loss of lead was detected. The change is therefore believed to be the result of oxidation; but whatever be the nature of the change, or of the force producing it, the fact remains that by exposing the oil in thin strata to the influence of surfaces, such as lead and carbon, a change in the oil is effected of such character that upon addition of acid a precipitate is formed, as already described. The carbon appears to be and is herein termed the "inactive" element, its presence or the presence of an equivalent being necessary to bring about the action of the active agent or element upon the impurities in the oil.

The object of the process is to convert the sulfur compounds in the oils into such a form that the acid afterward applied can act upon them. It is therefore to be understood that in specifying lead and carbon as the active and inactive elements, respectively, with which the best results have been produced in practice it is not intended to limit the invention to those materials to the exclusion of other equivalent bodies, whereby the same or substantially the same results may be obtained.

It is preferred, in carrying out this invention, to discharge the oil from the vessel in which it receives the described preliminary treatment into a vessel provided with a water bottom. The oil rising through the water deposits therein some of the impurities that have been disengaged in the previous treatment. With some of the oils referred to a quantity of whitish substance is deposited in the water of the receiving vessel. I have also in place of lead used iron plates with good results, but not equal to those obtained when lead is used.

In the accompanying drawings, Figure 1 represents in side elevation a simple form of apparatus that may be used in practicing my invention, and Fig. 2 is a cross-section of the tank or vessel.

A represents a tank having a lining *a* of lead, and B represents a carbon plate a little smaller than the interior of the tank, so as to leave thin spaces for the flow of oil between the adjacent walls of lead and carbon, the carbon plate being hung by supports *b* from the top of the tank and not allowed to touch the latter. The oil after distillation is fed into the tank A through pipe C, which, as shown, is connected to the bottom of the tank, through which the oil rises and finally overflows through spout D.

E represents the receiving vessel, provided with a certain quantity of water *e*, constituting a water bottom. Preferably a pipe F is provided to conduct the inflowing oil beneath the surface of the water, through which it rises, lying on the top, as indicated at *f*. The oil should be fed slowly into the tank, so as to insure a sufficiently long exposure to the influence of the lead and carbon plates. Of course the flow may be made faster when the size of the plates is increased. Observation will furnish a guide to regulate the flow, since if the oil issuing from the outlet does not show a decided change of color the flow is too rapid. The color of the oil, however, issuing at the outlet is not the deep mahogany referred to, but a lighter shade, which intensifies after lapse of an hour or two.

It should further be noted that the carbon plates should have clean surfaces, and even when perfectly clean plates are used the first run of oil sometimes for half an hour does not exhibit the characteristic change of color. Longer contact therefore is desirable in beginning an operation; but after the change of color is observed the operation may be carried on continuously.

The length of exposure to the action of the plates should also be governed by the quantity of sulfur in the oil. In treating Lima distillate half an hour's exposure has ordinarily been found sufficient, but a longer exposure increases the amount of sulfur removed. The best indication by which to regulate the length of exposure is that afforded by observation of the change of color of the oil, as already stated.

In the subsequent treatment of the oil the ordinary commercial method is followed. Sulfuric acid is used of commercial strength, and it is removed by washing with water and caustic soda, as usual. The treatment of the oil is then continued according to the usual methods, which require no explanation.

It will be observed that the described treatment is very simple, consumes but little time, and involves no expense for chemicals.

I claim as my invention and desire to secure by Letters Patent—

1. In the process of refining sulfur petroleums, the improvement consisting in exposing the crude distillate of such sulfur petroleum, to the influence of an active plate or element, such as lead, and an inactive plate or element, such as carbon, and then treating with an acid in the usual way, substantially as described.

2. In the process of refining oils containing sulfurous impurities, the improvement consisting in first distilling the oil, then bringing the distillate into contact with metallic lead and carbon, and then treating with an acid, in the usual way, substantially as described.

3. The process of refining oils such as specified consisting in distilling the oil, then causing it to flow slowly over carbon and lead surfaces and subsequently treating with an acid in the usual way, substantially as described.

4. The process of refining oils containing sulfurous impurities, said process consisting in exposing the crude distillate in thin strata to the influence of carbon and lead plates,

until it changes color, as specified, and then treating with an acid, substantially as described.

5. The process of refining oils of the specified character by causing the distillate to flow over carbon and lead surfaces and discharging it into a receiver containing a water bottom, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CARLOS A. SMITH.

Witnesses:
H. L. SMITH,
H. B. GRAVES.