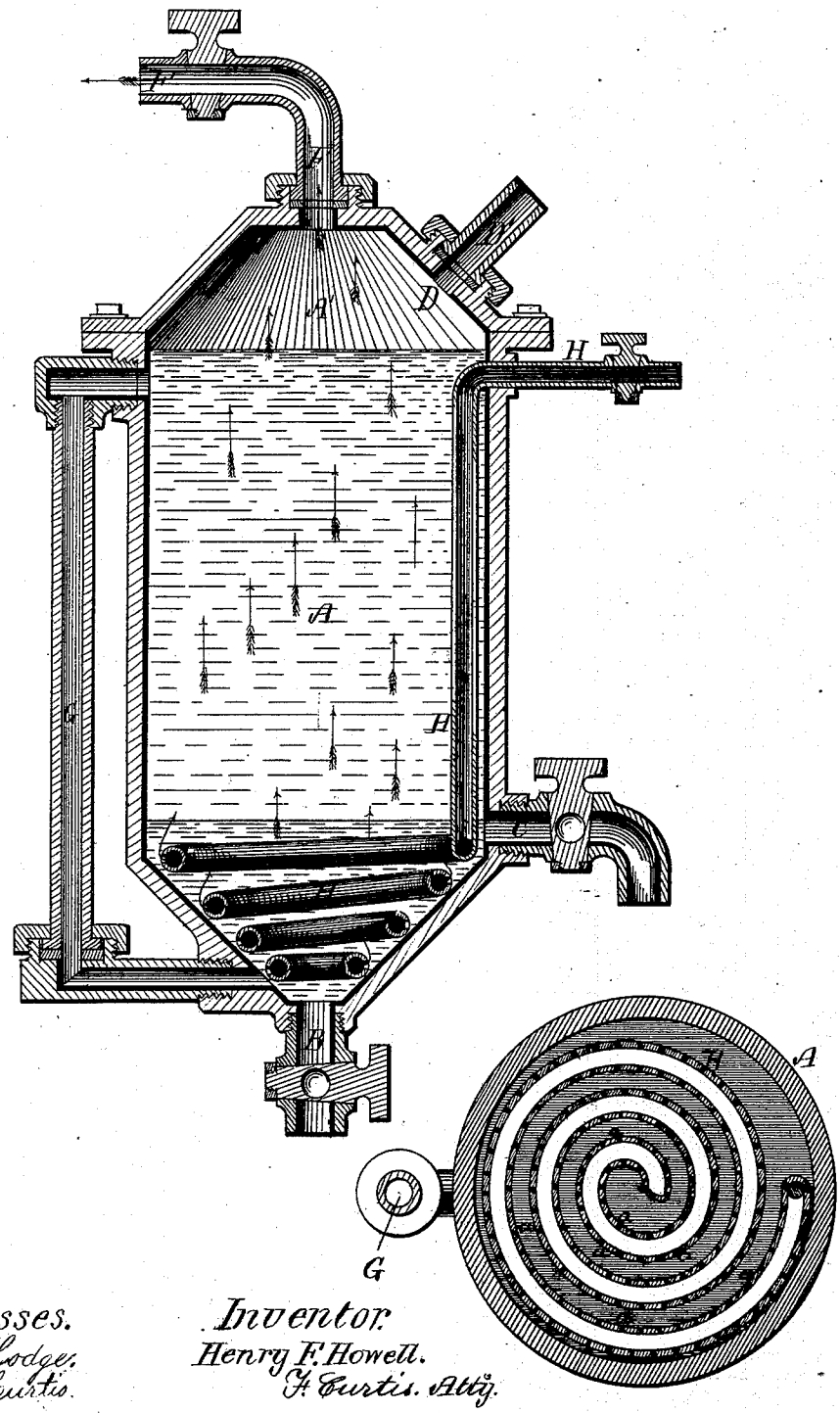
H. F. HOWELL.

Process of Converting Crude Petroleum, without Practically Changing its Volume, into a Uniform, Purified and Deodorized Oil, which may be Distilled without the Coming Over of Naphtha, &c.

No. 216,518. **Patented June 17, 1879.**



Witnesses.
H. S. Lodge.
Louis A. Curtis.

Inventor.
Henry F. Howell.
F. Curtis. Atty.

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HENRY F. HOWELL, OF SARNIA, ONTARIO, CANADA.

IMPROVEMENT IN PROCESSES OF CONVERTING CRUDE PETROLEUM, WITHOUT PRACTICALLY CHANGING ITS VOLUME, INTO A UNIFORM, PURIFIED, AND DEODORIZED OIL, WHICH MAY BE DISTILLED WITHOUT THE COMING OVER OF NAPHTHA, &c.

Specification forming part of Letters Patent No. **216,518**, dated June 17, 1879; application filed March 31, 1879.

To all whom it may concern:

Be it known that I, HENRY FRANCIS HOWELL, of Sarnia, in the Province of Ontario, Dominion of Canada, have invented a new and useful Process and Apparatus for Purifying and Deodorizing Crude Petroleum and other Oils, of which the following is a specification.

This invention relates to the treatment of crude petroleum and other oils by substituting chlorine gas for an equivalent quantity of the hydrogen element contained in such oils, this substitution having the effect of converting the entire body of oil, less a very small percentage of absolute impurities, into a uniform fluid of the same homologous series, without changing its volume or raising its temperature, the oil thus treated being purified and deodorized preparatory to being distilled, and avoiding the throwing over of the "by-products," so called, such as naphtha, benzine, &c., which is unavoidable in the present process.

Various devices may be employed for impregnating the crude oil with the gas; but I have shown in the accompanying drawings an apparatus which I have employed with satisfactory results.

This apparatus, as shown in such drawings, consists of a closed cistern or retort of any proper construction which shall adapt it to the purpose intended, and of a size to be determined by the quantity of oil to be treated, the retort in this instance being a vertical cylinder, A, with frusto-conical heads A′ A′ and a central outlet, B, at bottom, for discharge of such impurities as may from time to time collect in the lower part of the retort.

The retort A is further provided with an outlet, C, near its bottom, for drawing off the charge of purified oil, and with an inlet at top, D, for charging or filling the retort with oil, while a third opening, E, in the top of such retort permits of exit of the gas as it rises from the oil, such outlet E being preferably connected with a pipe, F, which leads to and communicates with the gasometer, in order to return the gas to the latter, and thereby avoid waste.

Upon one side of the retort or cistern A, and connecting with its interior in a proper manner, I place a transparent test-tube, G, for enabling the condition of the oil in the retort to be determined at a glance; and, if deemed desirable, a thermometer may be connected with the interior of this tube or of the cistern, to show that the temperature of the oil remains unchanged during treatment.

H in the accompanying drawings represents a pipe leading from a generator in which the gas is produced, this pipe preferably entering the cistern near its top, and thence led downward to its lower part, and being coiled about the latter, to provide a large surface for exposing the body of the oil to the effects of the gas, the sides of the coiled portion of the pipe being perforated, as shown at *a a*, &c., to permit of free escape of gas from the pipe, and direct it in finely-comminuted jets upon the oil above.

A small body of water is placed in the lower part of the cistern or retort A, and so as to submerge the perforated portion of the gas-feed pipe H, the function of this water being to saturate the gas prior to its contact with the oil, as chlorine gas in a perfectly dry state has no effect in producing the desired result.

All parts of the cistern and its connections to which the gas has access not made of lead are to be coated with lead, to resist the destructive effects which chlorine gas has on most metals. This lining of lead is shown by the heavy black lines in the drawings.

The operation of this apparatus is, briefly, as follows: The outlets B and C, as well as the gas-pipe H, are closed, and the crude oil is fed to the interior of the cistern or retort through the feed-pipe D′ and inlet D until the tank is full, (or as nearly so as may be desired, according to the quantity of oil to be treated,) when the cock of the gas-feed pipe H is opened. The gas now issues from the apertures of the pipe H in finely-divided jets, and rises upward through the body of oil contained in the cistern, and escapes through the pipe F, to be returned to the gasometer, the gas in its passage through the oil impregnating the same, and the supply being continued until the oil becomes thoroughly impregnated.

The flow of gas to the cistern is now cut off, and the oil drawn off through the outlet C, to be subsequently showered with water to remove the impurities which have been taken up by the gas.

Most crude petroleums contain a very small percentage of natural impurities, and but about one per cent. of paraffine; hence the escape-pipe B would seldom be resorted to.

From the above description it will be seen that it is not necessary to confine the execution of my process to any particular form of apparatus. All oils are composed of carbon and hydrogen, and the classification is based upon the atomicity of carbon. This element is tetrad, being capable of uniting with at most four atoms of hydrogen or other monatomic elements, and when thus combined becoming a saturated hydrocarbon, not capable of uniting directly with other monad elements, but only of exchanging a part or the whole of its hydrogen for an equivalent quantity of another monad element. In most cases the value or atomicity of an element is most safely determined by the number of monad elements with which it can combine. Of dyad atoms any compound may take up an indefinite number without alteration of its combining power, for each dyad atom, possessing two units of equivalency, neutralizes one unit in the compound which it enters, and introduces another, leaving, therefore, the combining power of the compound just what it was before.

The molecules of all gases, simple or compound, occupy equal volumes, or equal volumes of all gases contain equal numbers of molecules. All the petroleums are saturated hydrocarbons, incapable of uniting directly with monatomic elements or radicals; but they easily yield substitution derivations. In the many petroleum-oils that are impregnated with sulphur, arsenic, and phosphorus, or any other foreign substance, the introduction through the body of the oil of chlorine gas passed through water (as the gas in the state of perfect dryness will produce no effect) not only combines with the impurities and precipitates them, but substitutes to the extent of four atoms or molecules of the gas for an equivalent quantity of hydrogen.

After this treatment of such oils they should be thoroughly showered with water at a temperature of 40° Fahrenheit above the temperature of the oil, in order to dissolve out the impurities which have been taken up by the gas.

In the lighter gravities of crude petroleum, containing none of the impurities named, the gas is simply passed through the oil until it has substituted four atoms of the gas for four atoms of hydrogen. This will not reduce the quantity of oil or change its specific gravity, as there is no change of temperature, thus forming a new compound having the same density as before, but a proportionately higher flash-test, and therefore less explosive in its character.

When distilled by direct heat, the specific gravities of the distillates are in a measure reduced; but when the distillation is continued until the paraffine begins to come over, and the stream then cut off, it will be found that the gravity is higher by several degrees, the flash-test of the distillate has been raised, and when treated with sulphuric acid, and afterward with caustic soda, the flash-test will be still further increased, although the entire distillate has been converted into illuminating-oil with an increased flash-test and of a specific gravity, having deprived the crude oil of four atoms of hydrogen by the substitution of four atoms of chlorine gas. There is no production of gasoline or benzine, the character of the compound having been entirely changed by the action of the gas; and the product from the crude oil is not only increased in illuminating-oil, but the flash-test is increased in the same proportion, making the oil perfectly safe to use in all climates, and by my treatment of the crude oil the danger from explosions in the treating-houses of oil-refineries is entirely removed, owing to the increased flash-test of the distillate. It also deodorizes perfectly all crude petroleums, and renders them pure by removing the cause of the disagreeable odor, particularly of that class containing sulphur and arsenic.

I claim—

The process of converting crude petroleum and analogous oils into a substantially uniform fluid of the same homologous series, practically without changing its volume, which consists in subjecting the crude oil to the action of chlorine gas, whereby a certain proportion of the hydrogen element is replaced by an equivalent of the gas, substantially as set forth.

H. F. HOWELL.

Witnesses:
LOUIS A. CURTIS,
H. E. LODGE.