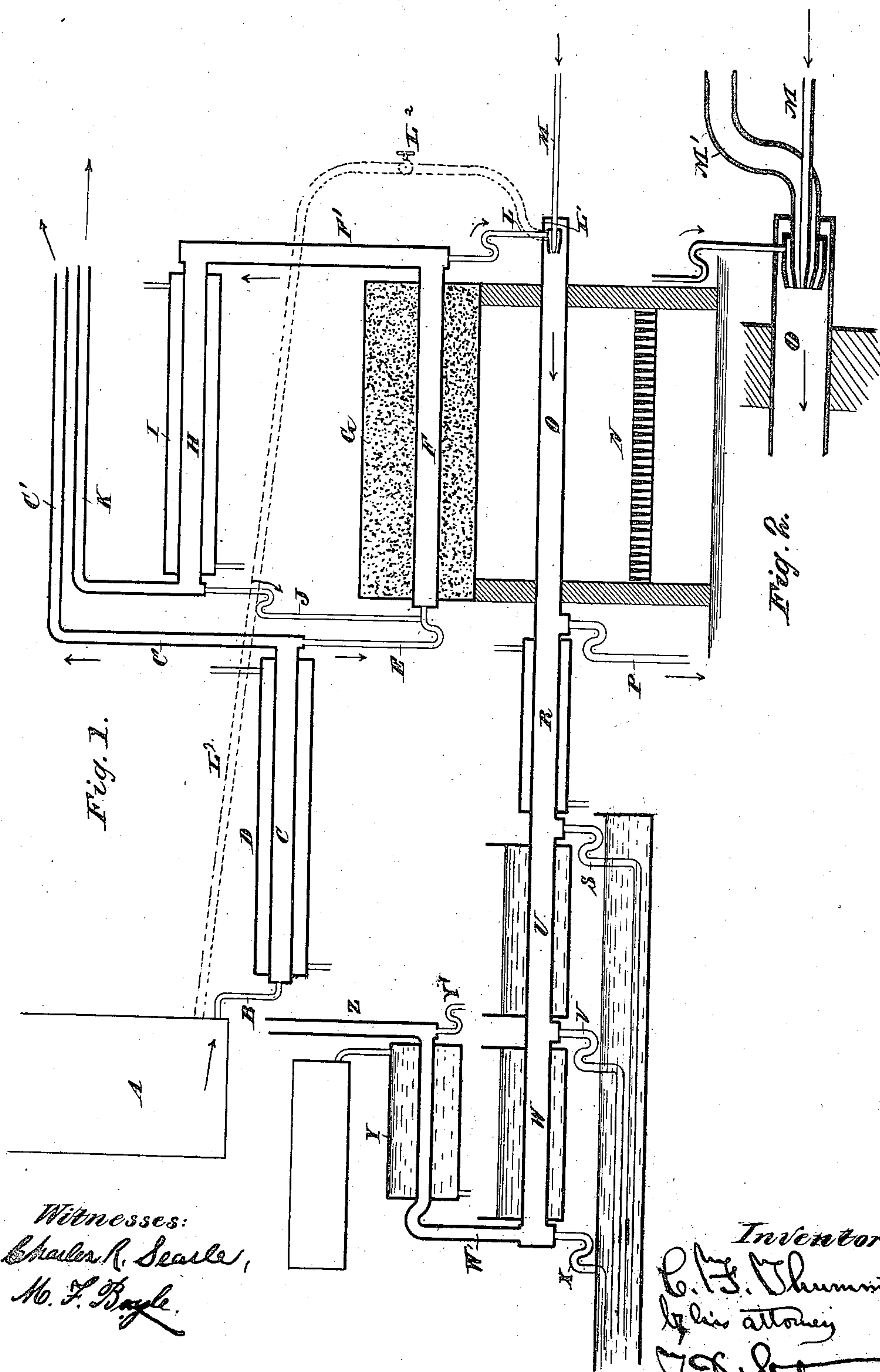


(No Model.)

C. F. THUMM.
REFINING PETROLEUM.

No. 389,988.

Patented Sept. 25, 1888.



Witnesses:
Charles R. Seale,
H. L. Boyle.

Inventor:
C. F. Thumm
by his attorney
J. D. Stetson.

UNITED STATES PATENT OFFICE.

CHARLES F. THUMM, OF NEW YORK, N. Y.

REFINING PETROLEUM.

SPECIFICATION forming part of Letters Patent No. 389,988, dated September 25, 1888.

Application filed June 22, 1886. Serial No. 205,929. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. THUMM, of the city, county, and State of New York, have invented certain new and useful Improvements in Apparatus for Refining Volatile Hydrocarbons, of which the following is a specification.

My invention relates to an improved method and apparatus for separating the extremely volatile portions of volatile hydrocarbons by atomizing such liquids in the presence of air at a high temperature and condensing the vapors carried off by the air.

The above mentioned objects I attain by the methods and means described and illustrated in the following description and accompanying drawings.

Referring to the drawings, Figure 1 represents a vertical sectional view of the apparatus which I employ in carrying out my invention, and Fig. 2 a detached section of a portion showing a modification for inducting the air by a blast of steam.

The letter A indicates an elevated tank containing partially-refined or crude oil, and B a pipe leading therefrom to a retort, C, which is inclosed in a chamber, D, to which superheated steam is supplied. An ascending connection, C', leads the evaporated portion of the oil upward and away to a condenser, (not represented,) in which it is condensed and recovered. This pipe conveys away nearly all the more volatile portions with which my apparatus has nothing further to do. A pipe, E, formed with a trap, as shown, conducts the unevaporated material from the base of the retort C into a retort, F, which is immersed in a sand bath, G, kept at a high temperature by a fire in a furnace, N, below. An ascending connection, F', leads the evaporated material upward to a pipe, H, which is inclosed in a chamber, I, filled with steam at such temperature as serves to condense any heavy oils which may have been borne away by the current of steam or vapor. Such oils, on being condensed in the condenser H, descend through the trapped pipe J and are again introduced into the retort F. The vapor which passes through the condenser H uncondensed is conducted away through a pipe, K, to a condenser. (Not represented.) It produces a grade a little

denser than that led away through C'. The oil which passes through the pipe or retort F unevaporated descends through a trapped pipe, L, and is subjected to a further separation. This contains a small quantity of the light inflammable oil which it is the object of my invention to separate and recover.

M is a pipe bringing air at a considerable pressure, preferably as high as from fifty to one hundred pounds to the square inch, the air being supplied at this pressure by an air-compressor. (Not represented.) A blast of air is discharged from the jet M by means of a shell, L', brought in such relation to the other parts that it will atomize the oil and throw it forward in a finely-divided condition, which presents a great surface to the air. The mixture of air and oil in this condition is led through a retort, O, which is so presented to the fire in the furnace N that a large proportion is raised to a state of vapor. The remainder is discharged as a dense liquid through the trapped pipe P and is of no further interest. I have determined by repeated experiments that this treatment is peculiarly effective in removing the last traces of light oil from the mass of heavy oil. I ascribe its success to the presence of air with sufficient heat while the oil is atomized. I have discovered that the presence of air gives an increased disposition of the oil which is volatile to leave its previous union with the denser oil and assume its proper state of vapor, corresponding to the temperature. The subsequent steps are for the recovery of the volatile oil from its union with the air and its proper separation into grades.

The mixture of air with the vapor is led through a series of condensers, R U W, each successively cooler than the preceding. These may be termed "warm condensers" to distinguish them from the much cooler one beyond. In each of these some condensation takes place, the least volatile vapor being condensed in the first and warmest condenser, R, and discharged through the trapped pipe S. The material a little lighter is condensed in the cooler condenser U, and is discharged through a trapped pipe, V. A still lighter and more volatile product is condensed in the condenser W and discharged through the trapped pipe X. Any number of these con-

condensers may succeed each other, each cooler than the preceding. The last of these should have a temperature which can be readily obtained from graduated quantities of water.

5 The heavy petroleum, when introduced into the apparatus by the atomizing-jet, is broken up mechanically, so as to let the volatile portions be readily carried off and vaporized by the heated air or vapor, the heavier non-volatile portions dropping by their own density, and being trapped off. The volatile portions are successively condensed in grades corresponding to their varying specific gravity, and the gaseous or non-condensable portions are finally carried off with the air or vapor employed in atomizing the petroleum initially. Finally, the air is carried by a pipe, W', through a vessel, Y, which is kept at a very low temperature by the aid of a refrigerating apparatus or otherwise. In this the air is cooled to a temperature at or below the freezing-point. In passing through this condenser Y the small quantity of highly-volatile oil contained in the air is condensed and flows out through the trapped pipe Y'. The air retaining only a trace of the volatile oil is finally discharged through the pipe Z into the atmosphere.

Although I have described the invention as applied only to petroleum, I believe it may be used with advantage in treating other liquids containing elements of different degrees of volatility. I propose in some cases to introduce steam at high pressure through the atomizer. The provision for attaining this end is shown on a large scale in Fig. 2. When thus worked, the air may be admitted at less pressure even than ordinary atmospheric pressure; but I esteem it essential that the air be introduced at this stage and while the petroleum is in the atomized condition, in order

to be presented to a very great surface of the petroleum, and thus be enabled to promptly combine with the volatile portions. I attach importance both to the introduction of the air to the dense oil in an atomized condition at a high temperature prior to the condensation at moderate temperatures in the condensers R U W, and to the final cooling of the air to a very low temperature, in order to recover the small amount of volatile material, which would be otherwise conveyed away thereby.

My apparatus fractionally distills the petroleum by both the methods of fractional distillation. In the retorts C and F the main body of the volatile material is taken away by successively increasing the temperatures in retorts. In the subsequent treatment the temperatures are successively decreased in condensers R U W, and in the final refrigerating in passing through the vessel Y. It is at the middle stage and at the highest heat that the atomizing is effected and the air is allowed to act on the atomized oil.

I claim as my invention--

The combination, with the primary furnace and its retorts, of the injector L', and provision, as M, for admitting air, and a series of successive condensers and trap-pipes leading from the same, and the retort wherein the oil is initially heated, the same being connected with the decomposing-retort in the primary furnace by means of a trap-pipe, substantially as described.

In testimony whereof I have hereunto set my hand, at New York city, N. Y., this 17th day of June, 1886, in the presence of two subscribing witnesses.

CHARLES F. THUMM.

Witnesses:

F. A. RICHMOND,
M. F. BOYLE.