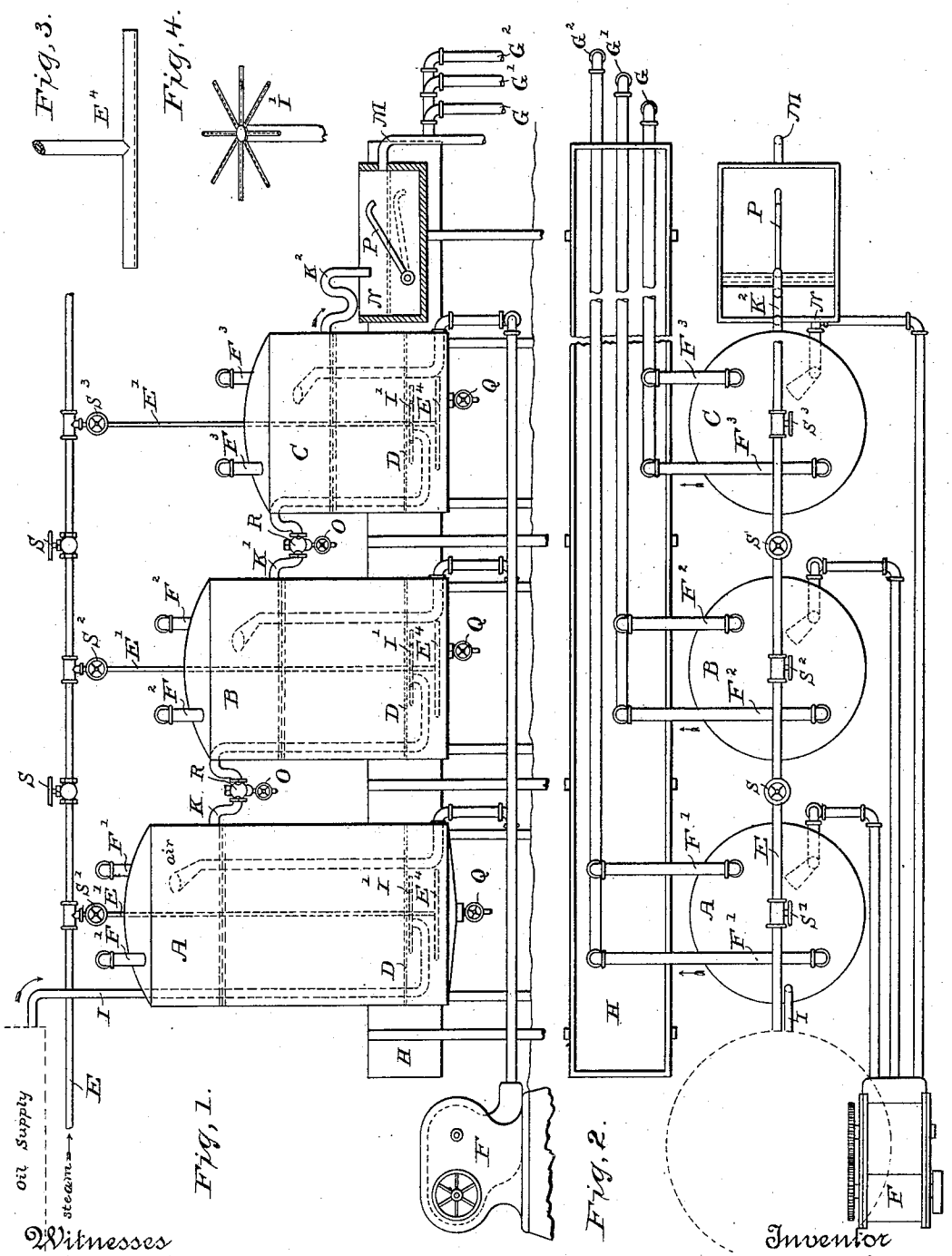
(No Model.)

H. R. ANGUS.

PROCESS OF PURIFYING AND DEVOLATILIZING PETROLEUM DISTILLATES.

No. 407,274. Patented July 16, 1889.



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PROCESS OF PURIFYING AND DEVOLATILIZING PETROLEUM DISTILLATES.

SPECIFICATION forming part of Letters Patent No. 407,274, dated July 16, 1889.

Application filed June 5, 1885. Renewed September 28, 1888. Serial No. 286,709. (No model.)

To all whom it may concern:

Be it known that I, HENRY R. ANGUS, of Brooklyn, in the county of Kings and State of New York, have invented a new and Improved Process of Purifying and Devolatilizing Petroleum Distillates and Obtaining Purified and Graded Oils and Naphthas Therefrom, of which the following is a specification.

This invention relates to the treatment of petroleum distillates for the purpose of obtaining therefrom a high fire-test oil and different grades of naphthas, the oil and naphthas being purified in the process, so that they are obtained ready for commercial use without being subjected to further manipulation.

The petroleum distillate or "stock" which is employed in practicing the invention includes, preferably, all the higher products of the crude oil still of higher specific gravity than lubricating-oils and which have been bleached and deodorized by the usual methods. In the preparation from the crude oil of the distillate which is to be treated by the present process it is preferable that all of the products of the crude still except the lubricating-oils should be run into one tank or reservoir and be bleached and deodorized together.

The present invention consists in obtaining purified and graded oils and naphthas, including gasoline, benzine, naphtha, and a high fire-test kerosene, at one continuous operation by repeatedly subjecting the refined petroleum distillate to the action of heated water at successively higher temperatures by passing the distillate upwardly through the water in a series of closed communicating tanks, separately removing the product of each tank as the process advances, and condensing and discharging said products separately from each other and from the residuum distillate.

This invention is unlike crude-oil distillations of every sort and differs from all operations of oil-refining or raising the fire-test in which fire-heat is applied to vessels containing the oil or in which steam is introduced into the oil within the vessels. In such operations the oil or distillate is constantly liable to deterioration and discoloration by overheating—a contingency which is impossible in the present improved process.

The invention also differs from those processes wherein the distillate is spread in a film over the surface of heated water, since such methods necessarily prohibit the subjection of the distillate to successively increasing temperatures, and such processes are slow and tedious.

The present improved process is expeditious, and by passing the distillate upwardly in a finely-divided condition through heated water it is purified and cleansed of all remaining impurities contained in it, either originally or as the result of the previous processes by which the distillate had been obtained.

Prior to this invention the volatile fluids derived from the distillate in raising the fire-test thereof have been driven off and condensed as in ordinary naphthas without reference to its commercial state or value, it being necessary to subject such naphthas to other processes or manipulations before they are ready for final use. In the present process, however, the lighter volatile properties of the distillate are driven off in a purified condition, and are separately condensed, graded, and discharged in different divisions, according to their respective specific gravities, ready for use, leaving the residuum of the distillate a high fire-test purified burning-oil ready for immediate use.

The improved process is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of an apparatus suitable for carrying out the improved process, portions of the apparatus being shown in section and interior parts being shown in dotted lines. Fig. 2 is a plan view of the same. Fig. 3 is a detail view of the steam-discharge within the tanks, and Fig. 4 is a detail view of the rose or nozzle for the discharge of the distillate within the tanks.

A B C are a series of closed tanks, three being the number shown, which may be of any suitable dimensions and proportions. Preferably the tanks are of different heights and capacities, the initial tank A being the largest—say twelve feet high—and the last tank C being the smallest—say eight feet high—the in-

termediate tank B being of a medium height—say ten feet. Each tank is constructed to be filled with water to within a short distance—say two feet—of its top, the upper unfilled portion of each tank constituting a vapor-chamber. The tanks may be made of suitable material—such as galvanized iron or wood—and if made of wood they should be lined with metal, preferably lead. Each tank has a perforated horizontal partition or false bottom D a short distance above its bottom. The water within the tank is heated by steam from a convenient generator, which is conducted therefrom by a main pipe E, having branch pipes $E' E^2 E^3$ leading into each of the tanks. Each branch pipe terminates at its lower end in a perforated horizontal cross discharge pipe or nozzle E^4, which is located at the bottom of the tank beneath the perforated false bottom D. The main steam-pipe is provided with suitable stop-cocks S, and the branch pipes are also provided with separate stop-cocks $S' S^2 S^3$, so that each tank can be independently supplied with steam in proper quantities. In this manner the temperature of the water in each tank can be properly regulated, so that the temperature of the water in tank A shall be the lowest and in tank C the highest.

The proper temperature for the first tank A is between 100° and 130° Fahrenheit, for tank B between 150° and 170°, and for tank C between 190° and 210°. The temperature in the several tanks being thus below the boiling-point of water, the incoming steam constantly condenses, thus tending to increase the amount of water and raise the water-level in each tank. In order, therefore, to maintain the proper level in each tank and to provide communication between the same for the distillate the tanks are connected by pipes K K', each pipe extending from the water-level of one tank to near the bottom of the next tank. The last tank C has a similar discharge-pipe K^2 leading from its water-level to a discharge-well or vat N. The several pipes K K' K^2 are trapped at R to prevent the passage of the volatile products between the tanks, and the intermediate pipes K K' have draw-off spigots O.

Each tank has at the bottom a discharge-cock Q, for draining the same of the water and impurities when desired. To facilitate this, the tanks may have conical bottoms, as shown to tank A.

The distillate is introduced from any suitable source of supply to the first tank A by a pipe I, which terminates at the bottom of the tank below the false bottom D, but above the steam-nozzle E^4, in a rose or perforated nozzle I'. The distillate thus enters the tank in a finely-subdivided condition, and it is still further subdivided by passing through the perforated false bottom D. The distillate rises through the water, owing to its lesser weight, being cleansed thereby, its more volatile properties being driven off by the heat into the vapor-chamber. The unvolatilized portion of the oil floats on the surface of the water, and as it accumulates there, and the level of the water also rises, the oil and surplus water pass through the pipe K to the second tank B. The pipe K passes downward in the tank B and terminates in a rose or nozzle I', located in the same position as the distillate nozzle in the first tank. The oil thus introduced in the tank B rises up through the water therein, being further purified, and the water in this tank, being more highly heated than in the first tank, lesser volatile vapors accumulate in the vapor-chamber of the tank B. The unvolatilized distillate in the tank B floats on the surface of the water and escapes into the tank C through the pipe K' and a nozzle I', similar to the nozzle in the tanks A and B. In passing upwardly through the water in this tank, which is at a still higher temperature, the least volatile properties are driven off and accumulate in the vapor-chamber. The residuum of the distillate floating on the surface of the water in this tank is finally discharged as a high fire-test kerosene perfectly pure into the vat N, mingled with the surplus water. The perfected distillate or kerosene floats on the surface of the water in the vat N, and passes off through pipe M into proper receptacles, which may conveniently be the barrels in which it is to be shipped for use, since it requires no further settlement or manipulation. The vat N is provided with an ordinary movable regulator-pipe P, which conducts off the water and maintains its level below the ingress to the oil-discharge M. The volatile products accumulating in the several vapor-chambers A B C are conducted away by separate and independent pipes $F' F^2 F^3$, which pass through a condenser, which may be a simple cold-water tank H. The several pipes $F' F^2 F^3$ have separate and independent discharges $G G' G^2$, respectively, which discharge the graded products into suitable receiving-receptacles, which may be the barrels in which they are shipped.

To facilitate the discharge of the volatile constituents, an air-blast is employed, which is effected by a blower F, separate pipes leading from the blower entering the bottoms of the several tanks and passing upwardly through the heated water, whereby the air is heated. The air is discharged in the vapor-chambers through expanded mouths, as shown. The pressure and direction of the air-blast forces the vapor out through the vapor-discharge pipes. The product or distillation from the first tank is of light specific gravity—from 82° to 90° Baumé—and is known as "gasoline." This is discharged purified and ready for use at outlet G. The product or distillation from the tank B is of a heavier specific gravity—say 70° to 76° Baumé—and is the benzine of commerce. This is discharged purified and ready for use at outlet G'. The product or distillation from

the third tank C is still heavier—from 62° to 65° Baumé—and is the ordinary naphtha of commerce. This is discharged purified and ready for use at outlet G^2. It will therefore be understood that the process gives four different purified products by one continuous operation, and that each product is complete and ready to barrel for the market just as it is discharged from the several outlets.

The invention is also applicable for reducing, purifying, dividing, and grading naphthas derived from other processes of raising the fire-test of distillates and for other purposes. In place of the air-blast other means may be used, and to move the distillate more rapidly through the apparatus one or more force-pumps may be employed. Free steam has been described as the means of heating the water by condensation and for adding thereto to flow off the distillate by the surplus of water; but the water may be otherwise heated and other means may be adopted for adding to its volume.

I claim as my invention—

The process of obtaining purified and graded oils and naphthas from petroleum distillate, consisting in repeatedly subjecting the distillate to the action of heated water in closed tanks at increasing temperatures by passing the distillate upwardly through the heated water in said tanks, separately removing the volatilized product of each tank as the process advances, and condensing and discharging said products separated from each other and from the distillate, substantially as set forth.

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