Dec. 29, 1925. 1,567,458

D. L. NEWTON

APPARATUS FOR DISTILLING AND BLENDING HYDROCARBONS

Filed July 19, 1924

Fig. 1.

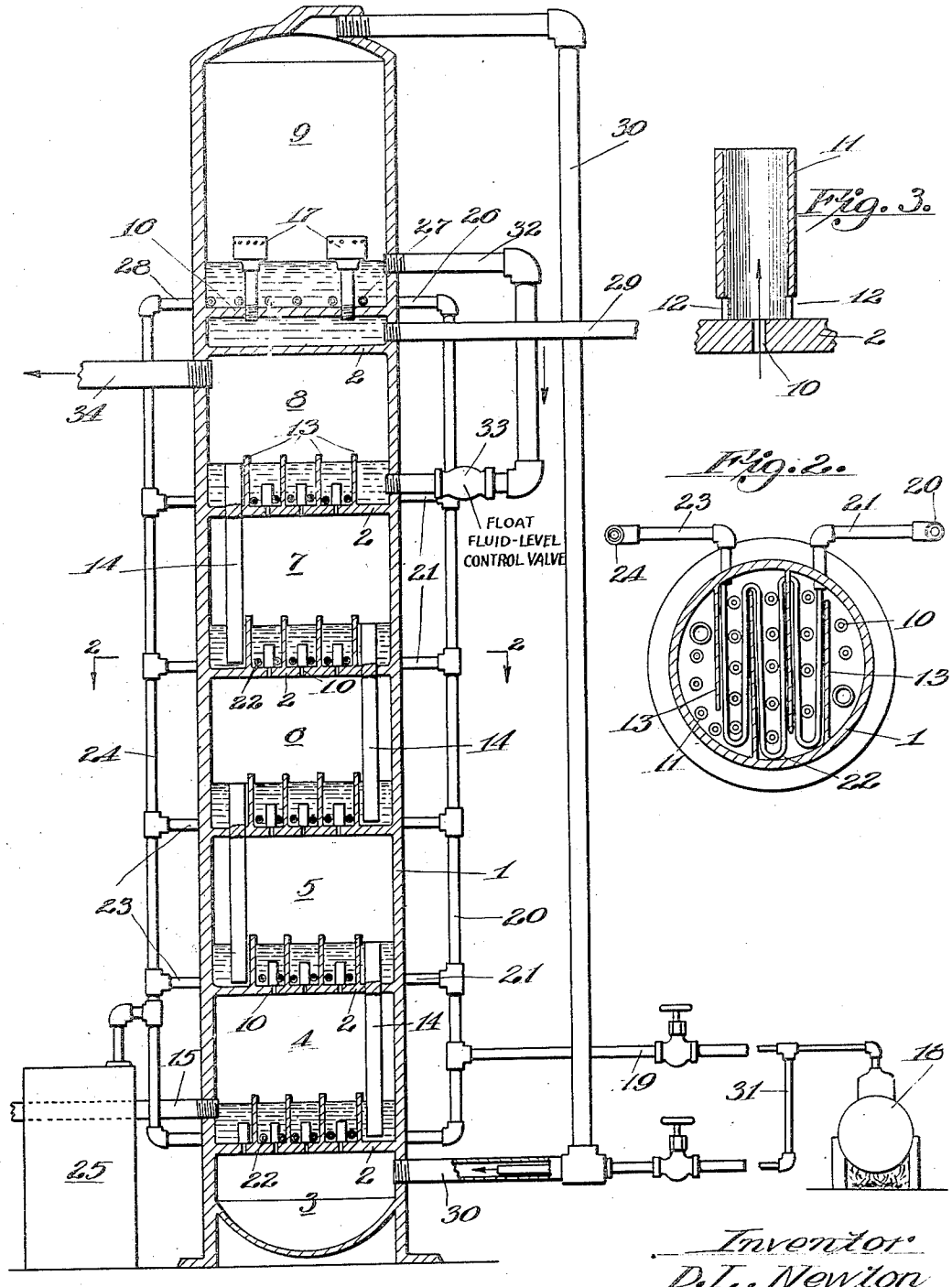

Fig. 3.

Fig. 2.

Inventor:
D. L. Newton
By Hazard and Miller
Attys

Patented Dec. 29, 1925. 1,567,458

UNITED STATES PATENT OFFICE.

DANIEL L. NEWTON, OF FULLERTON, CALIFORNIA.

APPARATUS FOR DISTILLING AND BLENDING HYDROCARBONS.

Application filed July 19, 1924. Serial No. 726,986.

To all whom it may concern:

Be it known that I, DANIEL L. NEWTON, a citizen of the United States, residing at Fullerton, in the county of Orange and State of California, have invented new and useful Improvements in Apparatus for Distilling and Blending Hydrocarbons, of which the following is a specification.

My invention relates to an apparatus for a continuous process of distilling and blending hydrocarbons and especially gasoline distilled from an absorbing medium, in particular the distilling and blending of gasoline from casing head gas absorbed in a hydrocarbon medium.

It is an object of this invention to provide a simple and efficient apparatus which not only quickly separates and distills the gasoline dissolved in an absorbing medium, but repeatedly blends the constitutents composing commercial gasoline in such a manner as to produce a more stable motor fuel which has no tendency to lose any substantial part of its more volatile constituents by evaporation in the ordinary handling of the same. Unless the gasoline is blended in this manner, and this is especially true in regard to casing head gas, a considerable part of the casing head gasoline is lost by evaporation.

With the above and other objects in view, which will appear from the following detailed description, my invention consists in the construction and arrangement of parts hereinafter described and claimed.

In the accompanying drawings which form a part of the specification, I have illustrated my approved apparatus, in which:

Figure 1 is a vertical cross section of the apparatus,

Fig. 2 is a horizontal cross section taken on the line 2—2 of Fig. 1, and

Fig. 3 is an enlarged detail view showing a vertical cross section of one of the recirculating jet tubes.

Referring to the drawings in which similar reference characters designate similar parts, the numeral 1 designates a vertical cylindrical shell divided by horizontal partitions 2 into a series of compartments or chambers. The lowest chamber 3 is a gasoline vapor supply chamber; 4, 5, 6, 7, and 8 are distilling and blending chambers; while the chamber 9 above the chamber 8 is a distilling chamber only.

The bottom partition of each of the distilling and blending chambers 4, 5, 6, 7 and 8 is provided with a series of perforations 10, which open into cylindrical recirculating jet tubes 11, open at the top and provided at the bottom adjacent the partition 2 with side openings 12, as shown in Fig. 3. The tubes 11 are arranged in parallel rows which are divided by vertical baffle plates 13. The baffle plates are slightly more than twice the height of the tubes 11. There is an overflow pipe 14 leading from each of the distilling and blending chambers 8, 7, 6 and 5 to the distilling and blending chamber immediately below. Each overflow pipe 14 is so arranged that its upper end extends to a height twice the height of the tubes 11 so that the level of the liquid in each of the chambers 4, 5, 6, 7 and 8 will be maintained at twice the height of the said tubes 11. From the lowest distilling and blending chamber 4 an outlet pipe 15 conducts the absorbing medium to a supply tank or absorption apparatus (not shown).

The distilling chamber 9 is provided with a false bottom 16 provided with a series of openings in which spraying nozzles 17 are disposed. Means for maintaining the necessary temperature in the distilling chamber 9 and the distilling and blending chambers 4 to 8 inclusive is provided by a boiler 18 from which the steam is conducted by a valved supply pipe 19 leading to a header pipe 20 from which branch pipes 21 lead to each of the distilling and blending chambers 4, 5, 6, 7 and 8. A steam coil 22 is arranged between the baffle plates 13 of each chamber 4 to 8 inclusive, and connected to a steam exhaust pipe 23 leading into an exhaust header pipe 24 communicating with a steam trap 25. A steam pipe 26 leads from the steam header pipe 20 into the distilling chamber 9, where it communicates with a steam coil 27 arranged on the top of the false bottom 16, from which a steam exhaust pipe 28 communicates with the exhaust header pipe 24.

The absorbing medium, such as kerosene,

stove distillate or other suitable medium, charged with gasoline which is to be subjected to the distilling and blending treatment, enters the distilling chamber 9 under the false bottom 16 by means of a supply pipe 29 under a pressure of 10 lbs. or more. The medium, preferably preheated at a temperature from 150 to 400° F., is forced through the nozzles 17 where it is atomized in the chamber 9 and the combined action of heat and atomization will liberate about 50% of the gasoline dissolved in the medium. The portion of the gasoline distilled in the chamber 9 contains substantially all the more volatile portions of the gasoline. The gasoline vapors pass from the distilling chamber 9 through a pipe 30 to the supply chamber 3 at the bottom of the apparatus. Before entering the chamber 3 live steam at a temperature of 230 to 250° F. is introduced by means of a steam supply pipe 31. The mixture of live steam and gasoline vapors passes from the chamber 3 into the first distilling and blending chamber 4 through the perforations 10 to the recirculating jet tubes 11, where it comes in intimate contact with the absorbing medium whence the vapor mixture is successively conducted from the distilling chamber to each of the distilling and blending chambers 5, 6, 7 and 8. The absorbing medium in the distilling chamber 9 passes through an outlet pipe 32 to the distilling and blending chamber 8 immediately below.

To prevent any gasoline vapors from passing through the pipe 32, I provide a fluid level control float valve 33, which permits the medium only but not any gas or vapors to pass from chamber 9 to chamber 8. The medium passes successively from the distilling and blending chambers 8 to 4 inclusive through the overflow pipes 14.

The mixture of live steam and gasoline vapor in passing through the recirculating jet tubes 11 will throw the medium upwardly and there will be a constant reentering of the medium through openings 12 of tubes 11 and a violent agitation resembling boiling will take place in each of the distilling and blending chambers 4 to 8 inclusive. From the topmost distilling and blending chamber 8 an outlet pipe 34 conducts the vapors to a condenser (not shown).

In the process just described, the absorbing medium is first preheated, then introduced under pressure in the distilling chamber 9 where it is thoroughly atomized, which in conjunction with the heat supplied by the steam pipe 27 will distill out about 50% of the gasoline contained in the medium and substantially all the more volatile portion of the gasoline. The gasoline vapors mixed with live steam will now pass successively through a series of distilling and blending chambers 4 to 8 inclusive, which form an important part of my invention and in which the distillation of the gasoline is completed and the blending of the gasoline is effected. In each of these distilling and blending chambers the gasoline vapors are repeatedly and intimately mixed with one another and kept at a temperature by means of the heat supply steam coil 22, so as to effect a stabilizing action on the gasoline produced, preventing much of the loss due to volatilization of casing head gas which takes place where no such blending action during the distilling process is effected.

The gasoline obtained in this process compares well with the gasoline produced by the cracking process in the stability of the product; and furthermore by the use of the counter-current principle in which the absorbing medium is successively conducted from one chamber to another against a current of steam and gasoline vapors passing in the opposite direction, a thorough and rapid extraction of all the gasoline contained in the absorbing medium is effected so that when the absorbing medium leaves the lowest distilling and blending chamber 4, it is substantially denuded of all gasoline vapors absorbed.

In cases where the absorbing medium is kerosene, stove distillate, or similar cheap by-products, a portion which may reach as high as 20% of the absorbing medium is blended with and incorporated in the gasoline distilled therefrom and remains a stable constituent of the final product of the motor fuel produced. In this manner commercial gasoline is made directly in one distilling operation from natural gas dissolved in a medium and the yield of the final product is increased beyond the volume of gasoline vapors absorbed by the medium for the reason that the part of the medium itself becomes a constituent part of the commercial gasoline.

In my co-pending application filed July 19, 1924 Serial No. 726,985, I have claimed the process disclosed in the present application, which is limited to the apparatus employed.

It will be understood that various changes in the arrangement and construction may be made by those skilled in the art without departing from the spirit of my invention as claimed.

I claim:

1. A distilling and blending apparatus for a continuous process to recover a stabilized gasoline from an absorbing medium containing condensible hydrocarbons suitable for motor fuel, comprising a cylindrical shell having a distilling chamber at the top and a vapor supply chamber at the bottom, a plurality of distilling and blending chambers arranged in series between said distilling

chamber and said vapor supply chamber, each of said distilling and blending chambers having a bottom provided with perforations, recirculation tubes open at the top and disposed over said perforations, said tubes being provided with side openings near their lower ends, baffle plates extending above the liquid level in said distilling and blending chambers, means for supplying the absorbing medium to said distilling chamber, medium spraying means in said distilling chamber, vapor conducting means leading from said distilling chamber to said vapor supply chamber, means for introducing live steam into said vapor, means for conducting the medium from the distilling chamber successively through said distilling and blending chambers, said medium conducting means being arranged to maintain the level of the medium at a height approximately twice the height of said tubes, outlet means for the medium denuded of its condensible hydrocarbons, outlet means for the mixture of hydrocarbons and steam, and means for heating the contents of said distilling chamber and said distilling and blending chambers.

2. A distilling and blending apparatus for a continuous process to recover a stabilized gasoline from an absorbing medium containing condensible hydrocarbons suitable for motor fuel, comprising a cylindrical shell having a distilling chamber at the top and a vapor supply chamber at the bottom, a plurality of distilling and blending chambers arranged in series between said distilling chamber and said vapor supply chamber, each of said distilling and blending chambers having a bottom provided with perforations, recirculation tubes open at the top and disposed over said perforations, said tubes being provided with side openings near their ends, means for supplying the absorbing medium to said distilling chamber, medium spraying means in said distilling chamber, vapor conducting means leading from said distilling chamber to said vapor supply chamber, means for successively conducting the medium from the distilling chamber through said distilling and blending chambers and maintaining the level of said medium at a height approximately twice the height of said tubes, and means of heating the absorbing medium in the separate chambers.

3. A distilling and blending apparatus for a continuous process to recover a stabilized gasoline from an absorbing medium containing condensible hydrocarbons suitable for motor fuel, comprising a plurality of distilling and blending chambers arranged in series, each of said chambers having a bottom provided with perforations, recirculation tubes open at the top and provided with side openings near the bottom disposed over said perforations, means for conducting the absorbing medium successively through said chambers and maintaining the same at a substantial level above said tubes, and means for heating the medium in said chambers.

4. A distilling and blending apparatus for a continuous process to recover a stabilized gasoline from an absorbing medium containing condensible hydrocarbons suitable for motor fuel, comprising a distilling chamber provided with spraying means, means for heating said distilling chamber, a plurality of distilling and blending chambers arranged in series, each of said distilling and blending chambers provided with a bottom having perforations, recirculation tubes disposed over said perforations and provided with a plurality of spaced openings, means for conducting the absorbing medium from the distilling chamber to said distilling and blending chambers and maintaining the level of said medium above said recirculation tubes, means for heating said distilling and blending chambers, and means for conducting the hydrocarbon vapors from the distilling chamber through the distilling and blending chambers.

5. A distilling and blending apparatus for a continuous process to recover a stabilized gasoline from an absorbing medium containing condensible hydrocarbons suitable for motor fuel, comprising a heated, distilling chamber provided with means for spraying the absorbing medium, a heated distilling and blending chamber having a perforated bottom, recirculation tubes over said perforations, said tubes being provided with spaced openings, means for conducting the absorbing medium from the distilling chamber to said distilling and blending chamber, means for conducting the hydrocarbon vapors from the distilling chamber to the bottom of said distilling and blending chamber, and means for introducing live steam to said vapor conducting means.

6. A distilling and blending apparatus for a continuous process to recover a stabilized gasoline from an absorbing medium containing condensible hydrocarbons suitable for motor fuel, comprising a distilling and blending chamber, means for heating said chamber, said chamber having a bottom provided with perforations, recirculation tubes over said perforations, said tubes having spaced openings allowing recirculation of the liquid under treatment, means for supplying the absorbing medium to said chamber above the bottom, and means for supplying heated hydrocarbon vapors to said chamber through said perforations.

7. A distilling and blending apparatus for a continuous process to recover a stabilized gasoline from an absorbing medium containing condensible hydrocarbons suitable for

motor fuel, comprising a distilling and blending chamber, means for heating the same, said chamber having perforations at the bottom, recirculation tubes provided with spaced openings over said perforations, means for conducting the absorbing medium to said chamber and maintaining the level of said medium above said recirculation tubes, and means for supplying heated hydrocarbon vapors under pressure to said chamber through said perforations.

In testimony whereof I have signed my name to this specification.

D. L. NEWTON.