To all whom it may concern:

Be it known that I, LEON E. HIRT, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Method of Distilling Oil, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which:

Figure 1 is a sectional elevation of a preferred form of oil still adapted for carrying out my invention.

Figure 2 is a top plan view of the same, and

Figure 3 is a detail view on a larger scale, partly in side elevation and partly in vertical section, of one of the still tubes or pipes.

In carrying out my improved method I employ a still having means whereby the oil to be distilled is caused to flow in thin films in contact with the vapors of steam as well as the heavier vapors of distillation in a manner to give very intimate contact between the oil films and the heat-carrying agencies, so that a complete distillation of the fractions, as may be desired, will take place, and wherein the temperature conditions can be readily and accurately controlled.

In the drawings the numeral 2 designates the body of the still which is shown as being of cylindrical form with a removable cover portion 3 having an offset pipe 4 for the vapors of distillation and also provided with a plurality (in the present instance four) of oil distributing and inlet pipes 5. The upper portion of the still comprises an oil receiving and distributing chamber into which the feed pipes 5 discharge and also through which the vapors of distillation flow to the offset pipe 4. 6 designates a plurality of vertical pipes or tubes which occupy the central portion of the still, their ends being secured in the upper and lower headers 7. These pipes are suitably spaced from each other in a manner to provide for a circulation around them of a suitable heating medium which may either be steam or exhaust gases from an internal combustion engine. The steam, which may be either live steam or exhaust steam, may be introduced through the pipe 8. If exhaust gases are used, they may be introduced through the connection 9. 10 designates an outlet connection for the exhaust gases and 11 a suitable outlet for the steam where that is used as the heating medium. 12 designates a manhole opening into the upper chamber of the still, 13 is a gauge-glass which indicates the level of the oil in the lower chamber 14 below the bottom header, and 15 designate oil outlets. 16 is an inlet for introducing steam into this lower chamber.

I preferably place in the upper chamber of the still broken tile, pieces of scrap iron, or other material, such as indicated at 17, which will act to further distribute the oil introduced by the distributing pipes 5. Through these several pipes and the provision of this loose block material, the oil may be very thoroughly distributed to the different tubes 6 at a temperature at or near the vaporization point of the desired product. I have, however, obtained very satisfactory results by introducing the oil cold into the pipes 6. In such cases, the capacity is much reduced since these pipes have to heat the oil as well as distill it.

In each of the tubes 6 I place a suitable arrangement of baffles calculated to form means for causing the oil to flow therethrough in a thin film. Such baffles may be of various forms such as loose broken material, wire screening, etc. In Figure 3 I have shown a tube in which these baffles are formed by suitably bent strips or ribbons 18. The operation will be readily understood.

The oil discharged into the upper chamber of the still is distributed among the various tubes 6 and flows down the interior of these tubes over the baffles which also act to slow up this passage and cause it to be distilled while flowing therethrough. The oil films are, during their passage through these tubes, brought into intimate contact with the vapors of steam arising from the lower chamber as well as the heavier vapors of distillation coming from the lower portion of the still. In this manner a very complete distillation of fractions takes place. The temperature surrounding the pipes or tubes 6 can be maintained at the desired degree, thereby controlling the flashing point of the oil as well as furnishing additional heat to the descending oil passing through the tubes. If steam is used, any desired degree of pressure may be maintained around the tubes.

The length of the tubes will depend upon the nature of the oil to be treated, the amount of fractions to be taken from the
oil, and various other characteristics that may be desired in the resulting product which passes off as a vapor from the top of the still. Live or exhaust steam is injected into the lower chamber of the still, the space within this chamber providing for expansion of the steam, so that approximately equal amounts will pass upwardly through the tubes. It will be apparent that the steam or steam mixed with vapors of distillation rising through the tubes constitutes a gaseous medium serving to mechanically remove vaporized constituents of the oil and prevent such vaporized constituents from recondensing in the tubes.

As above indicated, instead of using steam around the tubes, I may utilize exhaust gases from a gas engine or from a furnace, or any other exhaust gases which may be available provided their temperature is approximately constant.

I preferably maintain an approximately constant level of liquid in the bottom of the still so that the expansive ratio of the steam introduced into this lower chamber is always substantially the same. If the volume of this space is varied to any great extent, the steam naturally varies accordingly in its expansive temperature and pressure.

By reason of the fact that the oil is treated in the form of very thin films which pass over surfaces heated to about the fractionation point of the products desired, very effective fractionation results. I have used the still very effectively in the gasoline absorption method.

I claim:

1. The method of distilling oil, comprising producing a flow of the oil in thin films through a series of tubes in which the distillation takes place and passing a gaseous medium other than the hydrocarbon being distilled through the tubes to mechanically remove vaporized constituents of the oil, substantially as described.

2. The method of distilling oil, comprising producing a flow of the oil in thin films through a series of tubes in which the distillation takes place, and passing a gaseous medium other than the hydrocarbon being distilled through the tubes in a direction counter to the direction of flow of the oil to mechanically remove vaporized constituents of the oil, substantially as described.

3. The method of distilling oil, comprising producing a flow of the oil in thin films through a series of tubes in which the distillation takes place and passing a heated gaseous medium other than the hydrocarbon being distilled through the tubes to mechanically remove vaporized constituents of the oil, substantially as described.

4. The method of distilling oil, comprising producing a flow of the oil in thin films through a series of tubes and passing steam through the tubes in a direction counter to the direction of flow of the oil to mechanically remove vaporized constituents of the oil, substantially as described.

5. The method of distilling oil, comprising producing a flow of the oil through a series of heated tubes in which the distillation takes place, and passing a gaseous medium other than the hydrocarbon being distilled through the tubes to mechanically remove vaporized constituents of the oil, substantially as described.

In testimony whereof, I have hereunto set my hand.

LEON E. HIRT.