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APPARATUS FOR REFINING MINERAL OILS.

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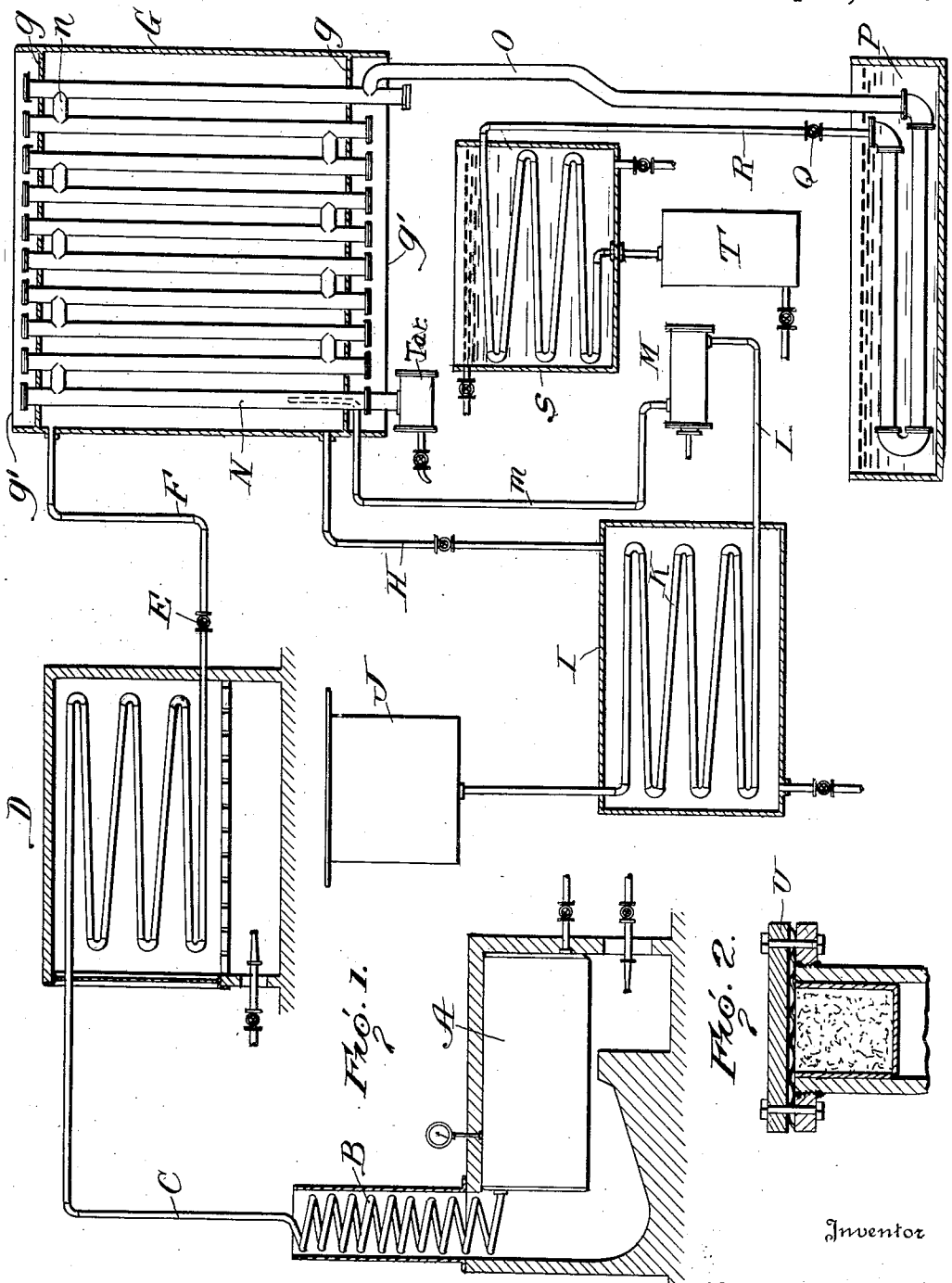

Fig. 1.

Fig. 2.

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APPARATUS FOR REFINING MINERAL OILS.

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To all whom it may concern:

Be it known that I, HARRY WAGENSELLER JONES, a citizen of the United States of America, residing at Independence, county of Montgomery, State of Kansas, have invented certain new and useful Improvements in Apparatus for Refining Mineral Oils, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to the art of refining mineral oils, and has for its object particularly the improvement of methods of and apparatus for cracking hydrocarbons.

Heretofore it has been proposed to vaporize the hydrocarbon to be treated, and then to expose the vapor while under high pressure to a high temperature, the pressures proposed ranging from 500 pounds upwardly and the temperatures from 500° C. upwardly. In one form of apparatus, the hydrocarbon vapors have been introduced from the top and passed downwardly through a vertical column retort provided with a tar pot at its lower end. In other forms, pipe stills comprising downwardly inclined but horizontally arranged sections, have been employed, the introduction of the vapor or of the oil to be cracked being usually at the uppermost point in the coil. In the latter form, openings or heads at the ends of the several pipe sections have been proposed for the purpose of cleaning out the deposit of tar and carbon which accumulates during a run, and of course the purpose of the vertical arrangement in the first instance is to facilitate cleaning, and to keep the retort free from adherent deposits.

Various other forms of retort or still have been suggested and some of them have been employed, but so far as I know none have been successful for high temperatures and pressures. For example, cylindrical retorts have been tried but when they are made large enough to satisfy commercial conditions, it has been found impossible to maintain the necessary tensile strength.

It is the purpose of my present invention to effect a combination of the advantageous features and characteristics of previous methods and apparatus, while avoiding their disadvantages. The vertical retort is of limited capacity, and if enlarged becomes weak; while the horizontal pipe still is difficult to keep clear of deposits.

Very briefly stated, I construct a pipe still or retort with vertical sections, providing the same cleaning heads or end openings heretofore referred to, and if desired I inclose my coil within a heating chamber, which of course may receive its heat from a suitable furnace, but which I prefer to fill with superheated steam, the temperature of which is maintained at the desired cracking point. Such a temperature for example is 900° F. which gives an actual temperature in the oil of 750° F. and upward.

Regarded as an improved method, my invention contemplates the continuance or multiplication of vertical motion of the body of oil or hydrocarbon vapor being treated, the linear speed of flow being preferably maintained below that at which tar and coke deposits will be carried over, the result being to trap these deposits out by permitting them to settle at the bottom of each vertical section whence they may be very readily removed either continuously through the receiving trap or at intervals by removing the lower heads of the pipe sections.

My invention is illustrated in the accompanying drawing, in which—

Figure 1 is a diagrammatic conventional form of the apparatus employed.

Fig. 2 is a sectional view of the end of the pipe section in cracking coil N.

Referring to the drawings, A is a steam boiler, containing a superheating coil B. C and F are steam pipes. D is a separately fired superheater. E is a valve. G is a shell. H is a steam pipe. I is a shell. J is an oil supply tank. K is a preheater coil for oil. L and *m* are oil pipes. P is a precooler. Q is a valve. S is a condenser. T is a receiving tank.

The method of operation is a follows:

Steam is generated in the boiler A and partially superheated by the action of the stack gases in the superheater B. The steam then passes through the pipe C to the superheater D where it is raised at constant pressure to a temperature of 950 degrees F. It then passes through the valve

E and pipe F to the shell G where it comes in contact with the cracking coil N. The steam then flows through the pipe H to the shell I where it comes in contact with the preheating coil K, and from thence it flows to a condenser or other apparatus.

The oil to be treated is drawn from the tank J, or some other similar receptacle, by means of pump M. In passing through the coil K it is heated by the steam to a temperature of approximately 650 degrees F. and at low pressure. It is discharged from the pump through the pipe *m* and enters the cracking coil N at a pressure of 50 atmospheres, more or less. Here the oil is cracked under the above pressure and a temperature of 800 degrees F. The oil then flows through the pipe O to the precooler P, and thence through the valve Q and pipe R to the condenser S and receiving tank T.

The steel shell surrounding the cracking coil is covered with a suitable insulating material to prevent the loss of heat. The coil is made up of straight vertical pipe sections each having an internal diameter of approximately four inches and connected at alternate ends by welded pipes *n*. Each pipe end extends through the head *g* in the shell or jacket G, each of these heads being welded to each pipe section which passes through it. Suitable inlet and discharge pipes with controlling valves are attached to the shell, for the inlet and exhaust of the superheated steam thereto and therefrom. The steam space in the shell G is between the two heads *g*, and the ends of the shell are closed by outer heads *g'* which should preferably be riveted to permit of their ready removal which is necessary to afford access to the detachable flanges and bolt heads U of the pipe sections. These latter are made removable for the purpose of cleaning out carbon and other agglomerated material from the pipe sections.

It is to be noted that the tar trap marked "tar" in the drawing may be duplicated or multiplied so as to have similar traps, or pipe connections to a trap, for a plurality of the pipe sections of the cracking coil N. Every section may be thus equipped if desired, but the first or inlet section at present appears to be the most important for this purpose.

Having thus described my invention what I claim and desire to secure by Letters Patent is:—

1. In apparatus for the treatment of mineral oils, a pipe still or retort having a plurality of convolutions consisting of straight sections of tubing arranged vertically and connected near alternate opposite ends by relatively short horizontal sections of tubing forming a sinuous path for the circulation of oil therethrough, each of said vertical sections extending beyond the lower horizontal section connecting therewith, and a removable cap fitted to the bottom of each vertical section for the retention of precipitates and heavy constituents below said horizontal sections and out of said sinuous path.

2. In apparatus for the treatment of mineral oils, a pipe still or retort, means for heating the same, the retort pipes being arranged in successive vertical return sections or convolutions extending in tiers from side to side and surrounded by the heating means, an outside feed pipe of reduced diameter connected near the bottom of a section of said still, each convolution consisting of a single straight section of pipe, a detachable head or cap individual to each pipe for cleaning out tar and coke deposits from the bottom end thereof and means for withdrawing the lighter hydrocarbon fractions after passage through the several vertical sections.

In testimony whereof I affix my signature.

HARRY WAGENSELLER JONES.