No. 880,466. PATENTED FEB. 25, 1908.

T. W. PRITCHARD.

PROCESS OF DESTRUCTIVE DISTILLATION OF WOOD.

APPLICATION FILED AUG. 9, 1906.

Fig. 1

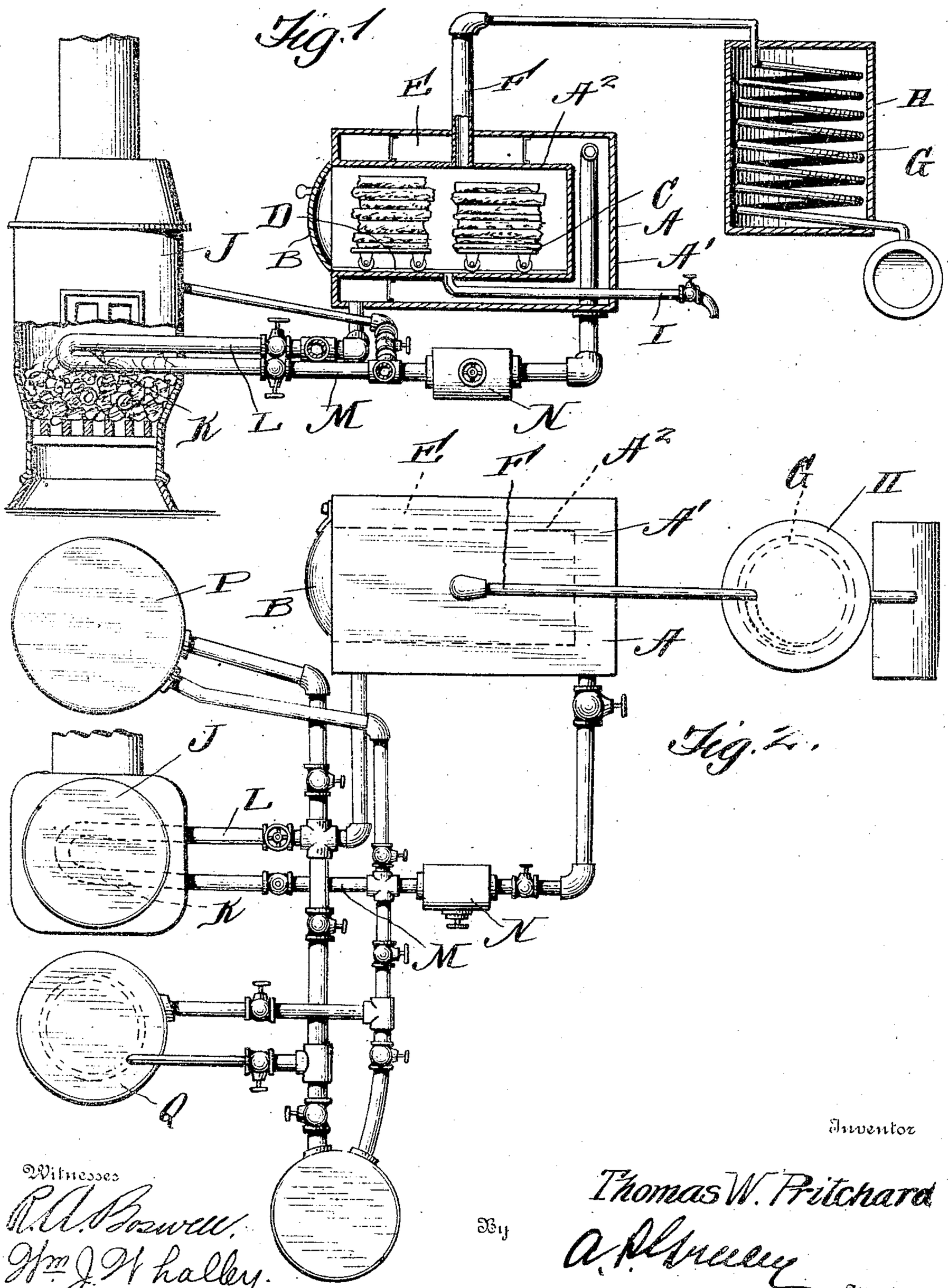

Fig. 2.

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PROCESS OF DESTRUCTIVE DISTILLATION OF WOOD.

No. 880,466. Specification of Letters Patent. Patented Feb. 25, 1908.

Application filed August 9, 1906. Serial No. 329,929.

To all whom it may concern:

Be it known that I, THOMAS WILLIAM PRITCHARD, a citizen of the United States, residing at Wilmington, in the county of New Hanover, State of North Carolina, have invented certain new and useful Improvements in Processes of Destructive Distillation of Wood, of which the following is a description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to the distillation of wood and relates particularly to a process and apparatus particularly adapted for the destructive distillation of pine wood by which the turpentine and other volatile oils may be driven off independently without the turpentine and lighter oils being contaminated with the less volatile empyreumatic and essential oils or other matter which would tend to impart an objectionable odor or otherwise injuriously affect the market value of the turpentine or other lighter oils.

In the destructive distillation of pine wood in a retort exposed to the direct heat of a fire no spirits of turpentine salable as such is produced. The turpentine produced is mixed with empyreumatic and essential oils and probably with extract matter, giving it a woody odor distinctly different from that of pure spirits of turpentine. This odor cannot be eliminated except by refining with caustic soda by which the siccative qualities of the turpentine are also eliminated, leaving a product known on the market as wood turpentine, which commands a price considerably less than that of pure turpentine.

So far as I am aware, no turpentine salable as such on the market is produced by any process of destructive distillation of wood known or practiced before my present invention.

In the drawings, Figure 1 is a vertical sectional view of an apparatus embodying my invention and adapted to carry out my process, and Fig. 2 is a plan view partly in horizontal section of the apparatus shown in Fig. 1.

Referring to the drawings which are intended to be understood as illustrative merely and not as limiting the invention to the construction or arrangement shown, A indicates the retort which may be of any desired shape, but is here shown as having at one end an opening, closed by a door B, through which cars C, carrying the wood to be treated, may be introduced on tracks D. The retort instead of being formed as usually the case of a shell of sheet iron or steel, to which direct heat of a fire is applied, consists of an outer shell A′ of any convenient metal and an inner shell A^2 of non-corrodible material, preferably copper, separated from the outer shell by a space E, the inner shell being suitably braced from the outer shell.

From the top of the inner shell A′ leads the outlet pipe F, for the lighter products of distillation, this pipe leading to a condensing worm G suitably cooled as by placing it in a tank H supplied with cool water. From the inner shell at some point near its lowest point leads an outlet I for rosin, tar or other relatively non-volatile liquid products.

The retort is suitably supported in any convenient way, but instead of being heated directly by fire is heated by a liquid circulating in the space E between the inner and outer shells A′ and A^2. The liquid preferably used for this purpose is a heavy petroleum oil, which is non-volatile at a temperature higher than that necessary for the carbonization of wood. For bringing the heating menstruum to the temperature required, I provide a furnace J located at a suitable distance from the retort and having therein a coil K connected at one end by a pipe L with the space E, between the shells A′ and A^2, at or near the lowest point of the shell A′ and connected at its other end through a pipe M with the space E near the top of the retort. In the pipe M is interposed a circulating pump N. The pipes L and M are provided with suitable valves for controlling the flow of liquid and a valve controlled by-pass O between the two pipes is provided.

While the apparatus as above described is sufficient to carry out my process, so far as the heating of the retort is concerned, I prefer to provide means as shown in Fig. 2 for quickly cooling the retort by pumping off the hot oil or other heating liquid and pumping cool oil or other liquid into the space E. This is readily provided for by having a tank P to receive the hot oil suitably connected with the pipes L and M and a tank Q for cold oil and also suitably connected with the pipes L and M, so that after pumping out the hot

liquid the cool liquid may be circulated through the space E to rapidly cool the retort and its contents, making it possible to open the door B and to remove the charcoal remaining in the retort much sooner than would otherwise be the case.

The use of a liquid heating medium not only secures an even heating of the retort throughout, but enables the heat to be regulated at any degree desired and to be increased as the distillation proceeds, so that the first run may be made at a comparative low temperature and the heat gradually increased until all of the volatile matters have been driven off. By thus regulating the temperature all of the turpentine may be driven off as turpentine without any disassociation of its elements, such as would be caused by too great a heat and without driving off with it any of the substances which volatilize only at a temperature above that at which the turpentine volatilizes.

By the use of a non-corrodible material for the inner shell A^2 of the retort, I am able to obtain products materially lighter in color than can be secured in an iron or steel retort. In an iron or steel retort the acetic or tannic acids present to a slight extent appear to attack the iron with the result of forming ink which stains or darkens the products, particularly those which are more slowly driven off.

I am, of course, aware that water jacketed kettles and steam jacketed kettles have been used for various purposes and I am also aware that copper kettles or retorts have been used for many purposes, but so far as I am aware, no retort heated by a liquid capable of being raised to a heat above that necessary for the carbonization of wood has been used in the destructive distillation of wood.

In the operation of my invention, the filled retort is first brought to and maintained at a heat of from 250° to 380° F. until the turpentine and water is driven off, this first run consisting of pure turpentine and water, the turpentine being practically not to be distinguished from the spirits of turpentine distilled from the crude turpentine collected from the pine trees, and the water being clear and without acid. The second run at a temperature of from 380° F. to 480° F. consists of a light amber colored oil, which by re-distillation may be separated into a certain percentage of turpentine containing empyreumatic and essential oils not unlike the best product produced by the processes of destructive distillation in use prior to my present invention, and a heavier oil of clear reddish brown color and mild odor heretofore unknown to the art. The third run at a temperature of from 480° F. to 520° F. consists of a heavy brown viscid oil apparently a very high grade oil of tar or tar oil.

It will be understood that the heat is gradually raised as the successive fractional distillates are driven off. After the third run passes off, the liquid residuum remaining in the retort is drawn off through the outlet I. This consists of rosin and tar. When this is drawn off, there is left in the retort after completion of the process of distillation more or less pure carbon or charcoal.

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

1. The within process for the distillation of wood to extract turpentine and resin consisting in subjecting the wood in a closed retort or still to a degree of heat sufficient to extract the turpentine and resin and less than will cause the creosote and pyroligneous acid of the wood to combine with the turpentine to an appreciable degree, said heat being derived from a non-congealable heated fluid having a boiling point in excess of the temperature necessary to extract the turpentine and positively circulating said fluid out of contact with the wood, substantially as described.

2. The within process for the distillation of wood to extract turpentine and resin consisting in subjecting the wood in a closed retort or still to a degree of heat sufficient to extract the turpentine and resin and less than will cause the creosote and pyroligneous acid of the wood to combine with the turpentine to an appreciable degree, said heat being derived from a non-congealable heated fluid having a boiling point in excess of the temperature necessary to extract the turpentine, circulating said fluid out of contact with the wood, and regulating the temperature of the retort by regulating the speed of circulation of the fluid substantially as described.

3. The within process for the distillation of wood to extract turpentine and resin consisting in subjecting the wood in a closed retort to a degree of heat sufficient to extract the turpentine and resin and less than will cause the creosote and pyroligneous acid to combine with the turpentine to an appreciable degree, said heat being derived from a non-congealable heated fluid having a boiling point in excess of 400 degrees F. and positively circulating said fluid out of contact with the wood, substantially as described.

4. A process for the recovery of turpentine and other volatile oils from wood, consisting in placing the wood in a retort, heating the contents of the retort equably throughout by a positively moved heated stream of liquid which is non-volatile at the temperatures necessary to effect the distillation, first raising the contents of the retort to a regulated temperature sufficient to drive off the turpentine without vaporizing the less volatile oils, and maintaining such temperature until the turpentine is driven off, and increasing the heat to a temperature sufficient

to drive off the lighter oils without vaporizing the tar oils and maintaining such temperature until such lighter oils are driven off.

5. A process for the recovery of turpentine and other volatile oils from wood consisting in placing the wood in a retort, heating the contents of the retort equably throughout by a positively moved heated stream of liquid which is non-volatile at the temperature necessary for the destructive distillation of wood, first raising the contents of the retort to a regulated temperature sufficient to drive off the turpentine without vaporizing the less volatile oils and maintaining such temperature until the turpentine is substantially driven off, increasing the heat to a temperature sufficient to drive off the lighter oils without vaporizing the tar oils and maintaining such temperature until such lighter oils are driven off, and finally increasing the heat to a temperature sufficient to drive off the tar oils.

6. A process for the recovery of turpentine and other volatile oils from wood which consists in placing the wood in a retort, heating the retort by forcibly circulating about it a heated liquid, whereby the contents of the retort are equably heated throughout, maintaining the contents of the retort at a temperature not exceeding 380° F. until the turpentine is driven off, raising the contents of the retort to not exceeding 480° F. and maintaining such temperature until the lighter oils are driven off.

7. A process for the recovery of turpentine and other volatile oils from wood, consisting in placing the wood in a retort, heating the contents of the retort by forcibly circulating about it a heated liquid, whereby the contents of the retort are equably heated throughout, maintaining the heat at a temperature not exceeding 380° F. until the turpentine is driven off, raising the heat to a temperature not exceeding 480° F. and maintaining it at such temperature until the lighter oils are driven off, and subsequently raising the heat to a temperature above 480° F. and maintaining it at such temperature until the heavier oils are driven off.

This specification signed and witnessed this 7th day of August A. D. 1906.

THOMAS WILLIAM PRITCHARD.

In the presence of—
E. W. CADY,
A. P. GREELEY.