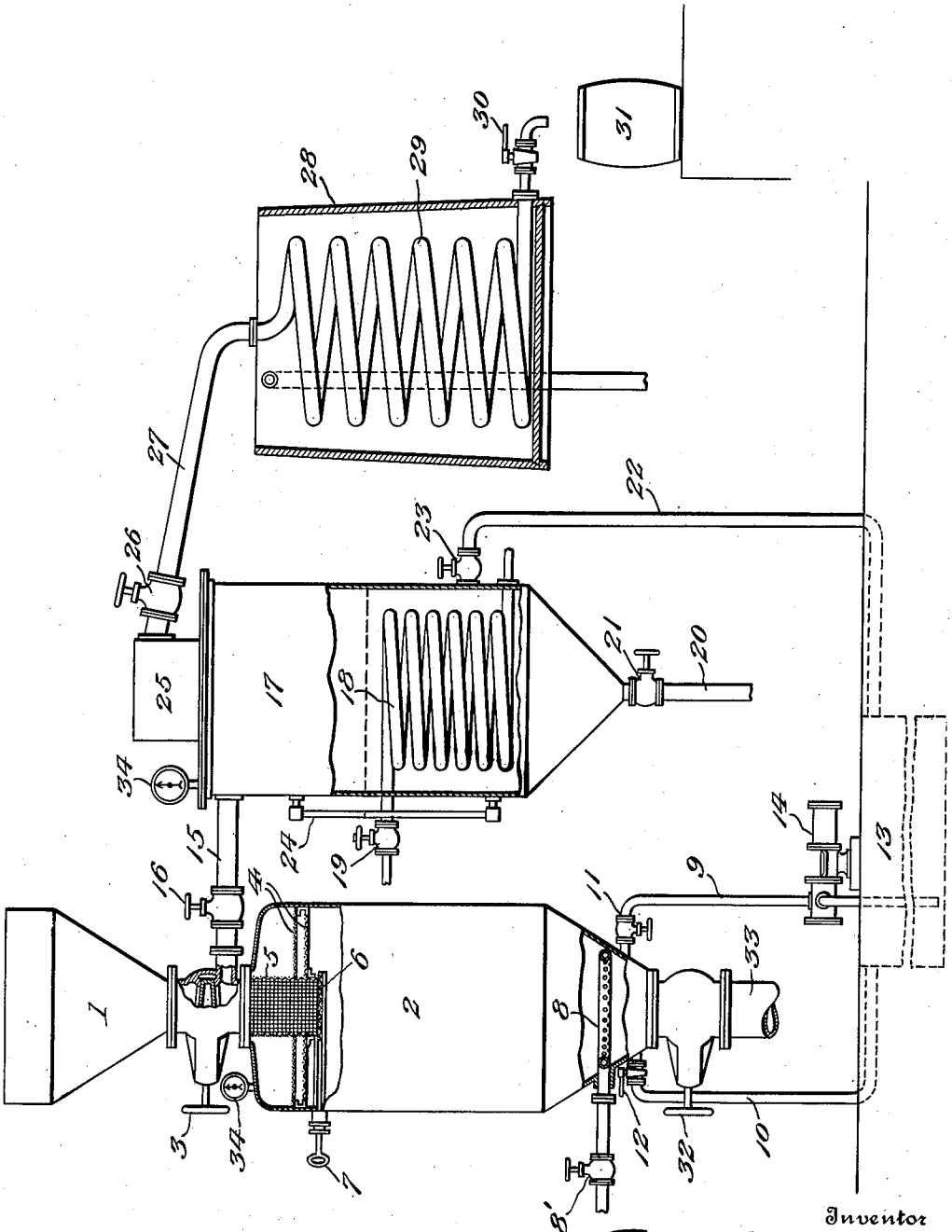
T. J. FAIRLEY.

PROCESS OF EXTRACTION.

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1,353,035. **Patented Sept. 14, 1920.**



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PROCESS OF EXTRACTION.

1,353,035. Specification of Letters Patent. Patented Sept. 14, 1920.

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To all whom it may concern:

Be it known that I, TALIAFERRO J. FAIRLEY, a citizen of the United States, residing at New Orleans, in the State of Louisiana, have invented certain new and useful Improvements in Processes of Extraction, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention comprises a process of extraction. While it is capable of general application, it has been found especially useful in the recovery of turpentine, pine-oil and rosin from woods bearing these products.

Considerable difficulty has heretofore been encountered in the extraction of these elements. In destructive distillation, there is no rosin recovered, as it decomposes and forms tar. The pine-oil and turpentine resultants in this process have a very offensive odor, and unless chemicals are added during distillation, they are generally discolored. In addition to this, their market value is low.

In the steam distillation, while a good grade of turpentine and pine-oil may be produced, it is necessary to add a solvent after these have been driven off, in order to recover the rosin. This solvent, in addition to being expensive, must be re-distilled in order to recover it, and these steps together with the initial cost of the solvent, render the process slow and expensive. The loss of solvent incurred is such that it renders the recovery of rosin impractical under normal market conditions.

It is contemplated by the present invention to produce a process of extraction which will avoid the difficulties and disadvantages above enumerated; which will produce a resulting product of high grade commercially; and which will effect these results in a much more expedite manner, thus cutting down the labor cost which has heretofore been a large item in the production of these commodities.

Other objects and advantages will in part be apparent, and in part be brought out more fully in the description which follows.

A drawing diagrammatically setting forth an embodiment of the process is hereto appended as a part hereof, the disclosure therein having been found to produce the objects set forth, in a satisfactory manner.

In these drawings, 1 represents a hopper for wood in the form of chips, preferably, and which may be fed into an extractor 2, through valve 3. A screen 4, here shown of the double mesh variety extends across the upper portion of the extractor, an opening therein being provided in alinement with the feed opening for the chips. This opening is also provided with a screen collar 5, and a slide 6, operable by a handle 7 on a rod passing through a stuffing box in the side of the extractor, may be moved across the opening in the screen after the chips are inserted.

In the lower part of the digester there is provided a heating means 8, which may be of any suitable type, but a coil, perforated for the admission of steam under pressure has been found satisfactory.

A circulating system for a solvent is provided in connection with the extractor, and to this end pipes 9 and 10, provided with valves 11 and 12, connect the extractor with a reservoir 13. A pump 14 is also included in this system.

In the upper portion of the extractor, and preferably in such a manner that there will be no air space when it is filled with solvent, a pipe or the like 15, having a valve 16, connects the extractor with a separator 17.

The separator is provided with a heating means 18, here shown in the form of a coil provided with a control valve 19, and having at its lower portion an outlet 20 controlled by a valve 21. The lower portion of the separator is also in communication with the reservoir 13, as through pipe 22, which may be controlled by valve 23. A water glass 24 renders visible the height of liquid in the separator, and it is in communication at its upper portion through dome 25, valve 26, and pipe 27 with a condenser 28. This includes a coil 29, and vent cock 30 through which materials may be delivered to a suitable receptacle 31.

For the purpose of emptying the extractor, there is provided a valve 32 and outlet 33, secured to the lower portion of the extractor.

I have found that turpentine, and pine oil are natural solvents for rosin, but when

they are separated from the rosin in the course of extraction, the latter, being heavier than water, precipitates and attaches itself to the wood or portions of the apparatus. I have also found that if these solvents are quickly driven off the rosin remains in the wood and to regain it, a separate process using solvents, is necessary. To prevent the precipitation of the rosin and the use of additional solvents or an additional step in the extraction process, I extract the turpentine, pine-oil and rosin all at the same time, and in a manner which will now be described.

The chips are fed from hopper 1 to the extractor 2, and when they have reached about the level of the screens 4, the valve 3 is closed and slide 6 placed over the opening in the screen thus confining the chips below the screen.

With valves 11 and 16 open, and valves 12 and 32 closed, water, which has preferably been previously heated to a temperature of about 180 degrees F. is delivered by pump 14 and pipe 9 until it has completely filled the extractor and reached the level of the dotted line in the separator. 17.

Valve 16, is now closed, the pump 14 shut down, and valve 11 closed. This leaves the extractor completely filled with water and no space therein for the volatilization of the turpentine or pine-oil. Valve 8′ is now opened and live steam at boiler pressure is admitted to the extractor through perforated coil 8. The result is an increase in pressure within the retort which is allowed to rise to from about 50 to 70 pounds to the square inch, depending upon conditions. This increase in pressure is accompanied by a corresponding increase in temperature ranging from 180 degrees F. the temperature of the water before the admission of the steam, up to about 300 degrees F., the temperature between these points varying according to the variations in the pressure.

While the steam is being admitted to the extractor, a pressure is generated in the separator by means of the heating coil 18, the desideratum being to maintain about equal pressures in these two vessels during the step just described. For determining the respective pressures, both the extractor and separator may be provided with pressure gages 34, and these may be utilized to determine the temperature also of the respective vessels.

In addition to the function of raising pressure and temperature of the contents of the retort, the admission of steam through coil 8 causes a violent ebullition of the chips, which keeps them circulating upwardly toward the center of the retort and downwardly along the sides thereof, the perforations in the coil being arranged to effect this movement. This circulation prevents packing of the chips and causes an intimate association and penetration of the water, which in turn carries the heat into the innermost recesses of the wood, being aided therein by the excessive pressure within the retort.

To facilitate the exit of the water which has been driven into the wood to take the place of the products of extraction which, at this stage of the process, has considerably advanced, pressure is let down within the extractor from time to time. This may be effected by cutting off the steam by manipulating valve 8′, or by operating valve 16 to open communication with the separator when the pressure in the latter is below that in the extractor.

In opening valve 16, it is desirable to have nearly equal pressures, however, as it is desirable to float over, from the extractor, to the separator, the products of extraction, as distinguished from processes in which they are blown over, or otherwise violently handled in such a way that separation of the turpentine and pine-oil might be effected, and consequent precipitation of the rosin to become attached to the wood chips or parts of the apparatus.

In the present process floating over of the products of extraction is effected without permitting any air space in which the more volatile constituents might become separated from the rosin, and it may also be done continuously, after the process has reached a certain stage, and without letting down perceptibly the pressures in the retort or separator.

When the pressure gages show the pressures to be approximately equal, in the separator and extractor, valves 16 and 11 are opened, and the pump started. This effects a circulation through the extractor of the hot water in well 13, and the products of extraction, being lighter than the water are floated over from the extractor into the separator without causing any falling in the level of the water in the extractor or permitting any room at the top thereof for volatilization.

After the products have been floated over, valve 16 may be closed, heat applied in the separator to effect a separation of the turpentine and pine-oil from the rosin, the latter collecting in the bottom of the separator where it may be drawn off by means of outlet 20 and valve 21. The pine-oil and turpentine pass over as volatile products through dome 25 to condenser 28 whence they are conducted to receptacle 31.

While this separation is being effected, the wood chips which have been subject to extraction may be withdrawn from the extractor through valve 32 and outlet 33, and a new charge placed in the extractor, while whatever water remains therein may be transferred through pipe 10 to well 13.

By cracking valve 26, leaving valve 16 slightly open and maintaining a circulation of water through the extractor by pump 14 and pipe 9, the process may be continuously effected, after heat and pressure sufficient for the process has been established in the extractor. It will be seen that these valves may be regulated to permit floating over of the products from the extractor to the separator regardless of the pressure in the former, provided an approximately equal pressure is maintained in the separator; and this is one of the principal features of the present invention. The maintaining of pressure in the extractor drives the water into the chips, forces the products of extraction out of the chips, and the letting down of pressure from time to time greatly facilitates the leaching out of the rosin and increases the amount of this product without the use of any additional solvent. The maintaining of approximately equal pressures in the extractor and separator permits the floating over of the rosin in combination with its solvents, as there is no room in the extractor for volatilization, and consequently the rosin is not precipitated.

Another advantage of this process is the elimination of discoloration due to the formation of carbon. When trees have been charred, and the chips are acted on by a solvent such as gasolene, the carbon is dissolved, and permeates the rosin. It is then a difficult matter to reclaim it, and requires considerable time and extra steps in the process. By the present method this carbon is not dissolved, but is merely screened out in the circulation system, and in no way does it associate itself with the products of extraction.

In the continual operation of the apparatus, valve 23 may be regulated so that the water in the separator will be maintained at approximately the level indicated by the dotted lines, the operation of this valve permitting any excess of water to flow back into well 13. The water in this well is maintained heated approximately at a temperature not below 180 degrees F., and the well itself is, in practice of sufficient size to hold enough hot water for the entire system.

It will be understood that I do not wish to be limited to the precise steps of this disclosure, as many changes in the general operation are contemplated as within the scope of the invention without sacrificing its chief advantages.

What I claim is:—

1. A process of extraction which consists in placing the material to be extracted in a closed vessel filled with water at approximately 180 degrees F. so as to leave no space in the vessel unfilled, and forcing live steam into the vessel to cause an increase of pressure therein from approximately 50 to 70 pounds to the square inch.

2. A process of extraction which consists in acting upon materials to be extracted in an extractor completely filled with a liquid, maintaining a pressure above atmospheric pressure in the extractor, floating over the products of extraction from the extractor to a separator by adding liquid so as to leave no space in the extractor unfilled, and maintaining a pressure in the separator approximately equal to that in the extractor.

3. A process of extraction which consists in treating materials in a closed extractor completely filled with a liquid, floating over products of extraction from the extractor to a separator without reducing the quantity of liquid in the extractor, and maintaining an approximately equal pressure, above atmospheric, in the extractor and separator during extraction.

In testimony whereof I affix my signature in the presence of two subscribing witnesses.

TALIAFERRO J. FAIRLEY.

Witnesses:

JAMES ATKINS,

MARY E. SMOOT.