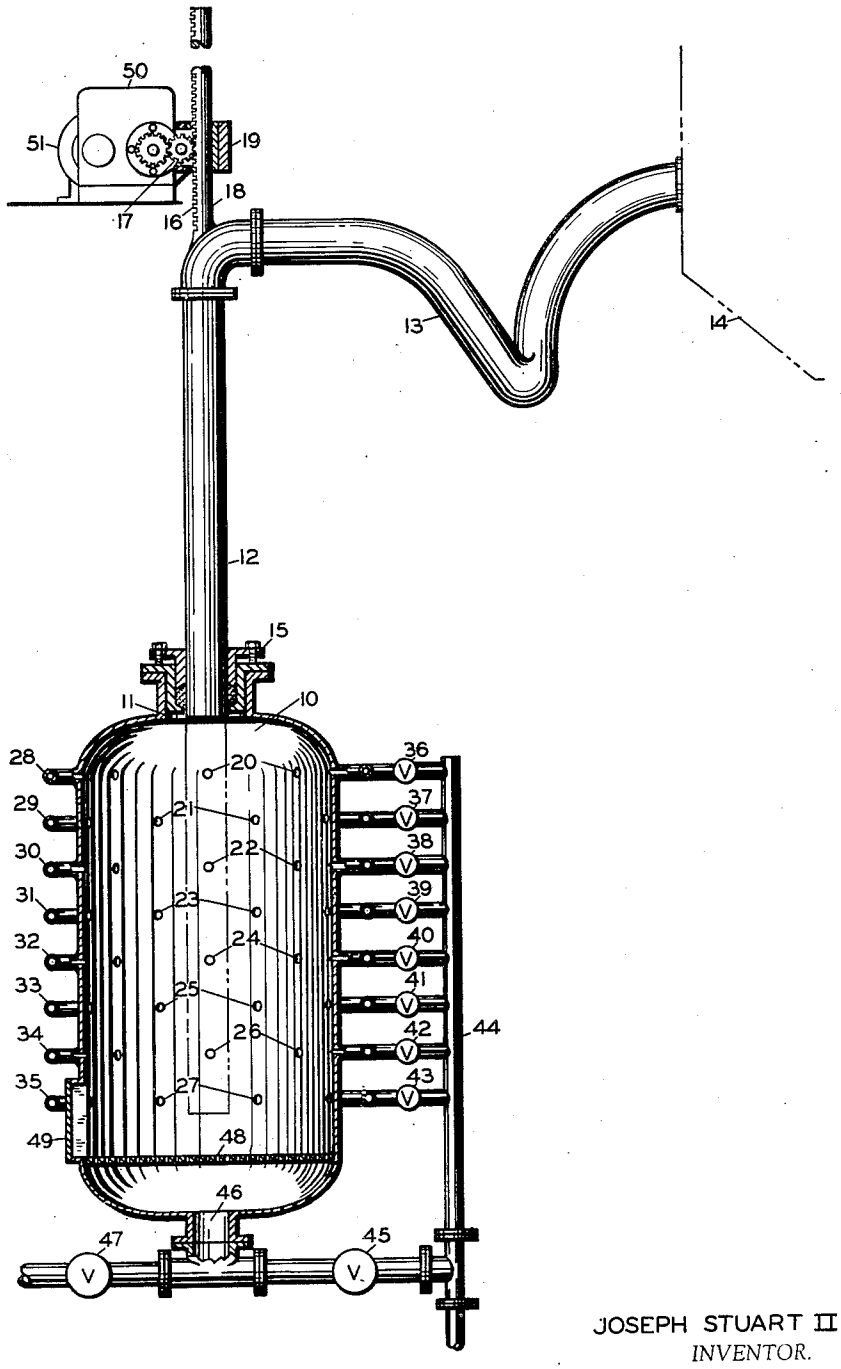
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EXTRACTOR PROVIDED WITH MEANS FOR UNLOADING IT

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EXTRACTOR PROVIDED WITH MEANS FOR UNLOADING IT

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This invention relates to improvements in extraction or leaching apparatuses and to a method of discharging leached residue therefrom. More particularly, it relates to an improved apparatus for the extraction of rosin from wood chips and to the process of discharging the spent wood chips therefrom.

It is common practice in the art of extracting rosin, pine oil, and turpentine from pine stump wood to shred or chip the wood and to load the resulting fragmentary material or chips into an elongated cylindrical tank through a porthole in the top thereof, to extract said material with a volatile solvent, and, after withdrawing the extract and steaming off the residual solvent from said material, to discharge the resulting extracted material manually by rake and pitchfork through an unloading porthole near the lower end of the tank. Since the extracted material or so-called "spent chips" are steaming hot, the removal of spend chips in this manner is unpleasant and time consuming.

It is the object of this invention to provide an improved apparatus for extraction of pine wood chips. It is a particular object to provide an extraction apparatus from which the spent wood chips may be readily discharged. Another object is to provide means whereby an extraction apparatus can be rapidly unloaded and put in condition for reloading with fresh wood chips. A still further object is to provide means for removal of hot spent wood chips from extractors to storage bins without intermediate handling.

Other objects and advantages of the invention will appear hereinafter.

Now in accordance with this invention, there is provided an apparatus for extraction of hogged, shredded, or chipped pine stump wood which comprises a tank with openings for loading with chips and extraction solvents, a discharge orifice such as a porthole in the top of the tank, a close fitting slidable flue through said porthole having sufficient length to extend from the porthole to the bottom of the tank, a plurality of nozzles for admitting steam at spaced intervals from top to bottom, means for opening said nozzles at each level independently, and means for lowering said flue to the lower part of said tank.

In discharging a charge of wood chips from the apparatus of this invention, steam is injected through the ports in the uppermost part of the tank to loosen the top layer of chips from the chip mass. The flue is lowered to the zone

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above the chip mass and the loosened chips are swept out by the current of steam. Steam is then injected through ports on the next lower level and the ports above are shut off. The flue is again lowered to the zone of the loosened chips and the chips are swept out through the flue. These steps are repeated until the tank is empty. Preferably the injecting of the steam at the progressively lower levels and the lowering of the flue to the preceding top of the chip mass are synchronized to provide an optimum rate of flow of wood chips with the current of steam.

Having now indicated in a general way the nature and purpose of this invention, there follows a more detailed description of the preferred embodiments thereof, with reference to the accompanying drawing in which:

The figure illustrates an apparatus in accordance with this invention from which spent chips can be discharged rapidly according to the method of this invention. The extraction tank 10 is a pressure-resistant vessel preferably cylindrical in shape and vertically disposed having a discharge orifice or porthole 11 in the top thereof adapted to be sealed with a cover (not shown) when used in the extraction process and adapted to be fitted with a flue 12 leading by means of a flexible conduit 13 to a chip collector 14 when being unloaded or discharged. The flue is adapted to fit the discharge orifice closely, preferably by means of a packing gland assembly 15 and to be slidable therethrough to the lower part of the tank and to be of sufficient length to extend from the discharge orifice to the lower part of the tank as indicated by the broken line. The flue is fitted with means for raising and lowering such as a rack 16 and motor-controlled pinion 17. The rack is attached to or forms part of a guide rod 18 slidably connected to a support 19 to aid in alignment of the flue.

The tank is fitted with a plurality of ports 20, 21, . . . 27 which may be nozzles for admission of steam at spaced levels from the top to the bottom. These ports are supplied with steam through annular mains 28, 29, . . . 35, the main at each level being independently valved with valves 36, 37, . . . 43 connecting with a steam header 44. The bottom of the tank is fitted with a valve 45 for allowing passage of steam through port 46 from steam header 44. Port 46 is also used during the extraction operation for admitting and withdrawing extraction solvent through valve 47.

Within the tank is a foraminous false bottom 48 for supporting the chip mass, and in the side of the tank in the zone above the false bottom there is a manhole fitted with a detachable cover 49 for allowing access to the inside of the tank.

The steam ports may be arranged in any of several ways other than that shown. In the drawing the ports are arranged partly in vertical planes and partly in staggered planes. They may also be arranged all in vertical planes or advantageously all in staggered planes or in various combinations. A zigzag arrangement minimizes any tendency toward channeling. The ports may be provided with nozzles or other suitable means for directing the steam jets. The steam in this way may be directed either centrically or tangentially. It is preferred that the steam be directed tangentially so as to give a longer effective steam path. In any arrangement of the ports, it is preferable that the ports be directed away from the path of the steam from an opposite port to avoid channeling due to combined action of the steam jets. While the steam jets may be directedly upwardly, downwardly, or horizontally, it is preferred that they be directed upwardly at at least a slight angle from the horizontal.

While only one valve is shown for controlling the flow of steam at each level, there are further advantages in having each port on the level provided with individual valves.

The operations involved in discharging a mass of spent chips from an extraction tank of the type set forth and described are best understood by a detailed description with reference to the drawing of the apparatus.

Initially the extractor is at atmospheric pressure and loaded with spent pine wood chips (60% of which initially passed through a ⅛-inch mesh screen) from which the extractable material has been removed. The spent wood chips which do not entirely fill the space within the tank 10 due to settling are hot from a previous steaming operation whereby the residual extraction solvent was removed. The top of the chip mass is in the region of the uppermost level of port 20. Porthole 11 has been fitted with packing gland assembly 15 through which flue 12 is slidably positioned. Valves 36, through 43 inclusive, 45, and 47 are all closed.

Under the above set forth initial conditions, valve 36 is opened and steam is admitted preferably under high velocity into the upper part of the tank. The chips on the top of the chip mass are loosened by the force of the steam and are carried out the flue to the chip collector 14. When the flow of the chips through the flue begins to diminish, valve 37 is opened and valve 36 is closed and the flue 12 is simultaneously lowered to the new level of the chip mass. These operations are continued stepwise by operating the valves at the successively lower levels and lowering the flue to the successively lower regions until the lowest valve 43 has been opened. The remaining chips are then loosened by opening valve 45 to admit steam by way of port 46 through the foraminous false bottom 48. The loosened chips are completely swept out the flue with the current of steam. When all of the chips have been thus removed valves 43 and 45 are closed, the flue 12 is withdrawn, and the packing gland assembly 15 is removed. The extraction tank is then ready for loading with fresh chips to be extracted.

Under actual operating conditions it sometimes happens that channeling of the steam through the chip mass occurs at the site of one or more of the ports. Under such circumstances it is desirable that the various ports at that level be fitted with individual valves to prevent loss of steam due to channeling. However, without individual valves it is possible to overcome the disadvantageous effects of channeling by opening the valve at the next lower level to aid in loosening the chip mass. Channeling may also be prevented to a large degree by operating the valves in such a manner as to provide blasts of steam of short duration. Channeling is less likely to occur when the steam ports are placed in diagonal or staggered arrangement and when the steam jets are directed tangentially so as to provide a swirling flow. The swirling flow may be either clockwise or counterclockwise but is preferably alternated by the successive levels. Thus it is seen that with various arrangements of the steam ports some flexibility in the operation, especially as to the order of opening and closing of valves, is desired. For similar reasons, flexibility as to the rate of lowering the flue is also desired. The optimum position for the flue in respect to the chip mass is only determined by experiment with the particular charge being unloaded. However, this position has been found to be usually only a few inches above the top of the chip mass.

The flue may be raised and lowered by any suitable means. While it may have sufficient weight to be lowered by gravity, and while the pressure within the tank may not be so great as to force the flue out of the tank, it has been found desirable to have under control both the raising and the lowering of the flue at all times. A rack and pinion arrangement connected through a speed reducing gear box 50 with a reversible motor 51 for driving means has been found to be particularly suitable. This driving mechanism as well as the support 19 for the guide rod 18 which aids in alignment of the flue is suitably built on an elevated platform or on an upper floor of the extraction house.

While the description of this invention has been applied to extracted wood chips, it is equally well adapted to unextracted chips. Moreover, where the term "chips" is used throughout this specification and claims it is understood to include wood fragments obtained in various sizes such as chipping, hogging, shredding, sawing, etc., and having a size not substantially greater than that used in wood pulping operations.

While steam has been used throughout this specification, it is understood that other inert gases such as air, nitrogen, waste flue gases, etc., may be used for providing the necessary gas flow to carry the chips out the flue.

From the foregoing description of the apparatus of this invention and the manner in which it is operated, it is seen that there is provided a rapid, economical, and less laborious method of removing spent chips from extraction tanks and is thus a distinct advance in the art.

What I claim and desire to protect by Letters Patent is:

1. An extractor comprising a tank, a porthole in the top of the tank, a close fitting flue slidably disposed in said porthole, said flue having sufficient length to extend from the porthole to the bottom of the tank, a plurality of steam ports at spaced levels from top to bottom of said tank, means for opening and closing said ports at each

level independently, and means for lowering said flue to the lower part of the tank.

2. An extractor comprising an elongated cylindrical tank, a porthole in the top of the tank, a packing gland in said porthole and a close fitting flue slidably positioned in said packing gland, said flue having sufficient length to extend from the porthole to the bottom of the tank, a plurality of steam ports at spaced levels from top to bottom of said tank, means for opening and closing said ports at each level independently and progressively from top to bottom, and means for lowering said flue progressively to the lower part of said tank.

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