C. TURNER & R. F. SCHROEDER.

METHOD OF EXTRACTING OILS FROM SOLIDS.

APPLICATION FILED JAN. 31, 1910.

985,862. Patented Mar. 7, 1911.

3 SHEETS—SHEET 1.

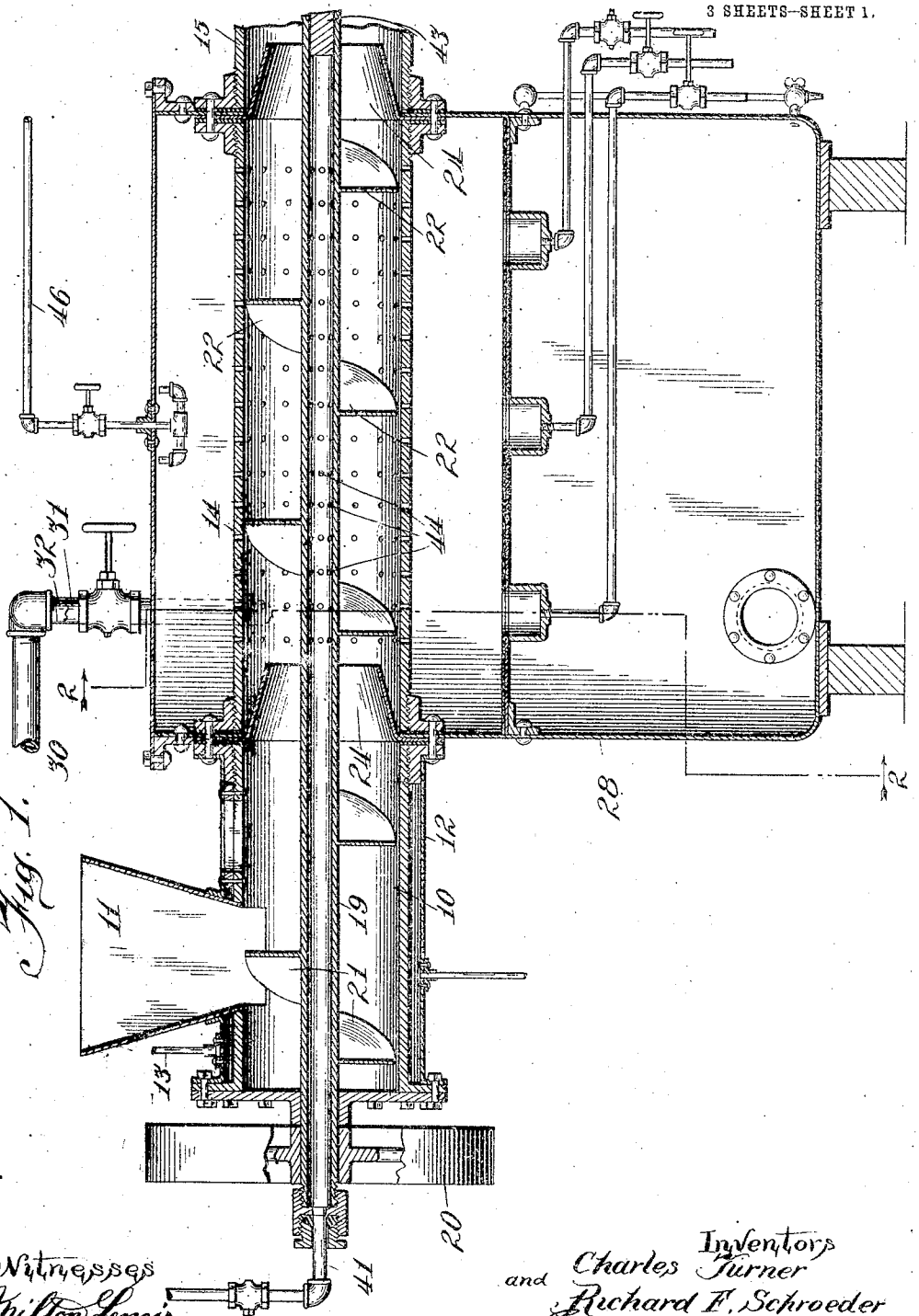

Fig. 1.

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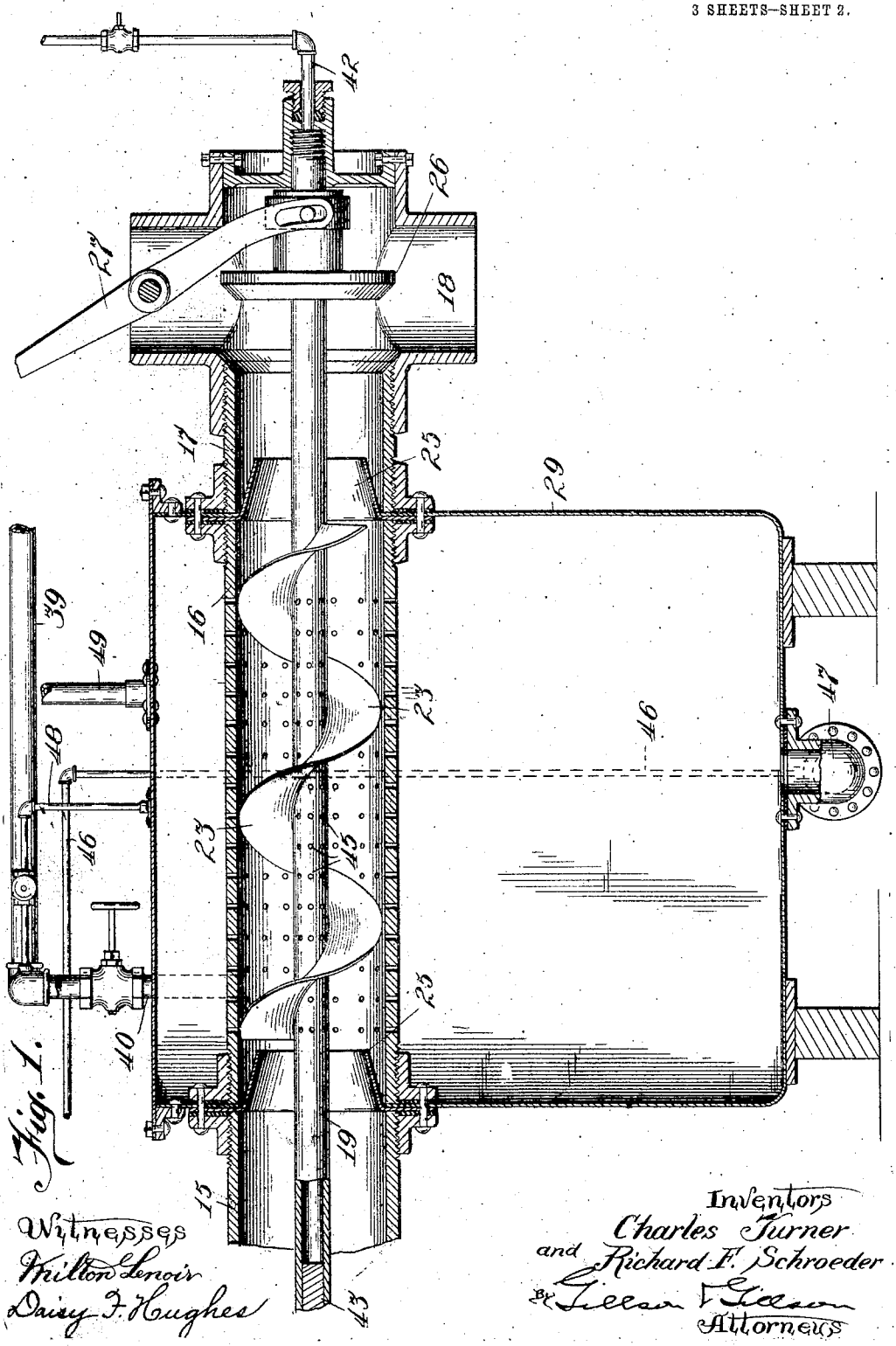

Fig. 1.

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3 SHEETS—SHEET 3.

Fig. 2.

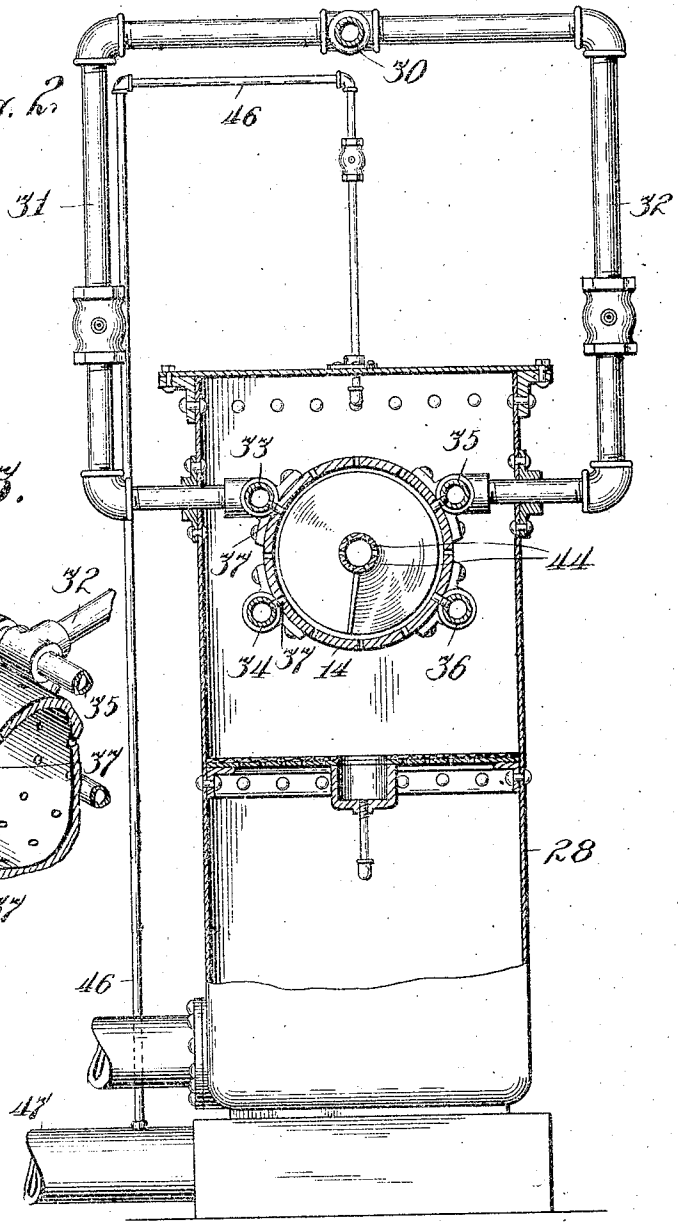
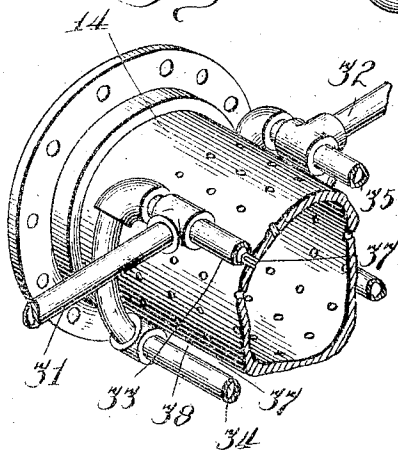


Fig. 3.



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UNITED STATES PATENT OFFICE.

CHARLES TURNER AND RICHARD F. SCHROEDER, OF CHICAGO, ILLINOIS, ASSIGNORS OF THREE-FOURTHS TO SAID CHARLES TURNER AND ONE-FOURTH TO SAID RICHARD F. SCHROEDER, BOTH OF CHICAGO, ILLINOIS.

METHOD OF EXTRACTING OILS FROM SOLIDS.

985,862. Specification of Letters Patent. Patented Mar. 7, 1911.

Application filed January 31, 1910. Serial No. 541,202.

To all whom it may concern:

Be it known that we, CHARLES TURNER and RICHARD F. SCHROEDER, citizens of the United States, and residents of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in the Method of Extracting Oils from Solids, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to that method of extracting oils from solids, such as vegetable or animal matter, in which an oil solvent is employed, and which may include treatment of the material by hot vapors for the purpose of eliminating the volatile parts, and particularly for recovering by volatilization and subsequent condensation the oil solvent which may be held in the material by absorption.

The object of the invention is to simplify and expedite the work and to provide for continuous operation upon material as it moves through the zones of action.

The invention consists broadly in passing the material through a chamber, or chambers, in a practically loose and open state and introducing into the mass the oil solvent or the heating agent, the material being impacted at the receiving and delivery ports of such chamber, or chambers, and thereby preventing the escape through these ports of any part of the dissolving or heating agent except so much thereof as may be held by absorption.

The invention may be practiced by means of any apparatus which will advance the material through the chamber, or chambers, within which it is to be treated, retarding its movement as it enters and leaves such chamber for the purpose of impacting it into a substantially impervious mass and which includes means for introducing the solvent or heating agent into the material at suitable stages.

One form of apparatus suitable for practicing the improved method is illustrated in the accompanying drawings, in which—

Figure 1, appearing in part on each of two sheets, shows a longitudinal, vertical section of the apparatus; Fig. 2, a vertical section on the line 2—2 of Fig. 1; and Fig. 3, a detail in perspective of the section of the apparatus within which the material is to be treated by the solvent or heating agent.

The apparatus shown comprises a continuous tubular cylinder through which the material to be treated may be caused to travel at variable rates of speed through different sections of the cylinder. The cylinder, as shown, comprises a receiving section 10, into which the material may be introduced through a hopper 11, and which is shown as inclosed by a jacket 12 into which steam may be introduced through a pipe 13, for the purpose of freeing the material from moisture, the vapor being permitted to escape through suitable openings; a section 14 having foraminous walls and receiving the material from the section 10; a section 15 receiving the material from the section 14 and passing it on to a section 16 having foraminous walls; and a section 17 receiving the material from the section 16 and being provided with a lateral discharge aperture 18.

A shaft 19 is journaled in the heads of the cylinder and is located upon the axis thereof and is provided at the end with a pulley 20 by means of which it may be rotated. Conveyer blades 21, 22 and 23, here shown as each formed of a continuous spiral, are mounted upon the shaft 19 and located respectively within the cylinder sections 10, 14 and 16. Choking nipples 24, 25 are preferably placed within the cylinder intermediate of the sections 10 and 14, and 15 and 16. The delivery end of the cylinder may be cramped by means of a valve 26 shown as slidably mounted upon the shaft 19 and controlled by a hand lever 27. The cylinder sections 14 and 16 are inclosed, respectively, within tanks 28, 29, adapted to receive liquids discharged from the material.

The oil solvent may be introduced into the apparatus by means of a pipe 30, branching, as shown, at 31, 32, and entering the tank 28, each of the branch pipes 31, 32 delivering to a plurality of pipes, as 33, 34 extending along the outer surface of the cylinder section 14 and opening into the interior of this section through a plurality of nipples, as 37, 38. A heating vapor, such as steam, may be introduced into the cylinder

section 16 by means of a similar arrangement of pipes, the main steam pipe being shown at 39 and one of its branches at 40. If desired, the shaft 19 may be tubular and thus used as means for introducing an additional supply of both the oil solvent and the heating fluid, pipes 41 and 42 leading to the ends of the shaft for this purpose, and a plug 43 being inserted within the bore of the shaft between the cylinder sections 14 and 16. Those portions of the shaft which are included within the cylinder sections 14 and 16 are freely perforated, as shown at 44, 45. A vent pipe 46 is shown as leading from the chamber of the tank 28 to the discharge pipe 47 leading from the tank 29, this vent carrying off any vapors which may accumulate and which it may be desirable to condense. A steam pipe 48 is shown as entering the tank 29, and serves as means for driving out any vapors which may accumulate therein. A pipe 49 leads from the upper portion of the tank 29 for the purpose of conveying therefrom vapors which may be delivered to a suitable condenser.

In an apparatus such as has been described, the material to be treated being delivered into the cylinder section 10 is advanced therethrough, at such speed as may be desired, but before leaving this section is well heated and practically freed from all water with which it may have been charged. As it leaves the cylinder section 10 it becomes impacted and moves slowly into the cylinder section 14 where it is disintegrated and advanced more rapidly by the conveyer mechanism 22 therein. While within this cylinder section and in a practically loose state, it becomes charged with the oil solvent introduced through the pipe 30 and its branches, and this solvent with the oils are drained through the apertures of the cylinder wall into the tank 28 and conveyed therefrom to any suitable receptacle. As the material issues from the cylinder section 14, it is again retarded within the cylinder section 15 by the friction of the walls, the latter supplemented, when such device is present, by the choking nipple 25, and becomes so impacted or solidified that any vapors which may be present within the confines of the tank 28 cannot escape therethrough, and they are prevented from escaping into the cylinder section 10 by the impacted mass of material between that section and the section 14.

As the impacted material slowly enters the cylinder section 16, it is disintegrated and more rapidly advanced through that section by the conveyer mechanism 23. It is treated by the vaporizing agent, preferably steam, which is delivered through the pipe 39 and its branches. Any of the oil solvent which may have been held within the material by absorption is here vaporized and passes off through the pipe 49 to any suitable condenser. Any oil which may remain in the material is liquefied by the action of the heat and drains off into the tank 29. As the material passes beyond the cylinder section 16 and the conveyer mechanism 23, it is again retarded within the cylinder section 17 by friction of the walls thereof, and may be still further retarded by proper adjustment of the valve 26. This impacting and solidifying of the material prevents the escape of any vapors therethrough.

The oil solvent ordinarily used in such operations is gasolene and may, of course, be recovered by suitable well known means and repeatedly used.

The process is not dependent upon the particular apparatus herein shown and described, but may be practiced by any apparatus which provides for the continuous, or substantially continuous, movement of the material, its retardation and impacting at each side of the zones within which it is to be treated by the solvent or vaporizing agent may be accomplished by any suitable means other than the spiral conveyer, as, for example, a reciprocating plunger, or the process may be practiced by the use of an apparatus so arranged that the material will become impacted by gravity. The advantages of the process are that the operation may be continuous, and requires very little labor. Furthermore, the various actions may be easily regulated by varying the rate of travel of the material through the apparatus and the quantity of dissolving and vaporizing agents used. The residue of the solid material is discharged as a part of the process and without suspending the operation.

While the described method, so far as we are at present advised, may be most economically and advantageously practiced by giving the material a continuous movement, the invention is, however, of sufficient scope to include an operation in which the material may be allowed to come to rest.

The apparatus herein described is not claimed in this application, as it is made the subject of our co-pending application Serial No. 541,203.

We claim as our invention:

1. The method of treating solid material for the recovery of oils therefrom, consisting in passing the material through a chamber inclosed within a sealed casing, the material being impacted at the inlet and outlet of the chamber, and introducing an oil solvent in the material and draining liquids from within such chamber.

2. The method of treating solid material for the recovery of oils therefrom, consisting in passing a continuously moving stream of the material through a chamber having perforated walls such chamber being inclosed

within a sealed casing, impacting the material at the inlet and outlet of the chamber, and introducing an oil solvent into the material intermediate of the impacted masses.

3. The method of treating solid material for the recovery of oils therefrom, consisting in passing the material through a chamber inclosed within a sealed casing, the material being impacted at the inlet and outlet of the chamber, introducing an oil solvent in the material, and draining liquids from within such chamber, and then subjecting the material to the action of heat within an inclosed chamber for recovering such of the oil solvent as may remain therein.

4. The method of treating solid material for the recovery therefrom of oils, consisting in passing a stream of the material continuously through a series of chambers, impacting the material as it passes from each chamber, subjecting the material to heat for driving off moisture in one chamber, then introducing an oil solvent into the material in another chamber, and then heating the material in a third chamber for vaporizing all of the oil solvent which may remain therein.

5. The method of treating solid materials, consisting in passing the material through a chamber inclosed within a sealed casing, impacting the material at the inlet and outlet of the chamber, and subjecting the material while within the chamber to the action of an agent capable of increasing the fluidity of portions thereof capable of assuming the fluid form.

6. The method of treating solid materials, consisting in passing a continuous stream of the material through a chamber inclosed within a sealed casing, impacting the material at the inlet and outlet of the chamber and subjecting the material while within the chamber to the action of an agent capable of increasing the fluidity of portions thereof capable of assuming the fluid form.

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