

UNITED STATES PATENT OFFICE.

HOMER T. YARYAN, OF RICHMOND, INDIANA.

IMPROVEMENT IN REFINING FAT-OILS.

Specification forming part of Letters Patent No. 205,516, dated July 2, 1878; application filed February 23, 1878.

To all whom it may concern:

Be it known that I, HOMER T. YARYAN, of Richmond, Wayne county, Indiana, have discovered a new and useful method of removing petroleum solvent from vegetable and other substances with which it has been used as a solvent for extracting their oils, of which the following is a full, clear, and exact description.

In removing the oils by solution and percolation from flax-seed and cotton-seed meal and other substances, a hydrocarbon, usually naphtha, is necessarily used as a solvent to obtain the largest product of oil. After the oil is thus extracted there remains in the meal a quantity of the solvent, which it has heretofore been impossible to separate therefrom, and which contaminates the meal to an extent rendering it valueless as food for animals or other purposes.

The heavier constituents of the solvent cannot be entirely volatilized and removed by the use of steam in the ordinary condition and manner of applying it, and when so used it leaves the meal in a saturated condition likewise, by reason of which it soon becomes soured and useless.

By the use of my new process the deleterious effects of the solvent are removed, and a large saving is realized, not only by restoring the meal to its normal inodorous condition for commercial uses, but in the recovery of the solvent, which is driven off as vapor to a condenser, from which it can be again drawn for use, and, also, in extracting a larger percentage of oil from the meal, and improving its quality as food to that extent.

At a certain stage of the operation of extracting the oil from the meal by the use of a solvent, I inject dry superheated steam centrally into and through the mass, and thus volatilize the solvent, and recover it, together with the oil which remains in the meal after percolation.

I use a suitable apparatus by which the steam, after being dried and superheated to a degree below that which would scorch the meal, is forced through the meal, vaporizing the solvent, and compelling it to pass out through an aperture in the receptacle, and at the same time drying the meal to such an ex-

tent that when discharged the remaining humidity is quickly dispelled.

To enable others to practice my new process, I will describe an apparatus which I have successfully used for the purpose, one of the prominent features of which is a furnace provided with suitable retorts or vessels interposed between a steam-boiler and the percolator or tank containing the meal and the solvent, in which the steam is superheated and dried before being injected into the meal.

In the drawing, R' denotes a boiler for generating steam; S, a furnace for superheating and drying the steam; A, a percolator or tank, in which the meal or other substance is placed for treatment. The boiler R', furnace S, and percolator A are connected by steam-pipes D D'. The percolator has a large opening at the top, closed by a closely-fitting removable cover, B. C' is a pipe connecting the percolator with the condenser O, in which the vaporized solvent is recovered for use. The pipe D has a removable nozzle, d, by which the superheated steam is conveyed to a central point in the mass of meal contained in the percolator A.

E is a pipe connecting the percolator A with a draining-tank, R. This pipe has suitable connections by which it may be used also for the admission of superheated steam during the progress of the process, as hereinafter described, into the percolator A. T is also a draining-tank, for the reception of oil and naphtha percolated from tank A; and a pump, Z, is provided, by which the contents of the draining-tanks T and R may be elevated into a tank, F.

H is a pipe extending from tank F downward through a steam-tight drum, K, being coiled therein, and dividing, after its exit below, into two branches, the branch L passing downward to the steam-coil evaporator J, and the branch M passing upward to a condensing-worm, O.

P is a tank for the final reception of the separated oil, where it may be heated and subjected to the action of a strong air-blast forced through it in divided jets, in order to remove the final traces of the solvent.

In using this apparatus, the process is as follows: The tank A being filled with the meal

or other substance to be treated, the naphtha or other hydrocarbon solvent is poured in until the meal is thoroughly saturated, and is so allowed to remain until the operation of solution is complete. For linseed-meal I allow it so to remain in the closed tank for about thirty-six hours. The vent *x* is then opened, and the liquid contents of the tank A, consisting of naphtha and oil, pass over into the tank T through pipe E. When the outflowing stream shows by the hydrometer only about five per cent. of oil, the vent *x* is closed and the tank A refilled with fresh solvent. The resulting liquid is allowed to drain downward through the vent *x* into the tank R. When the liquid ceases to flow, a nozzle, *d*, is inserted in the side of the tank A through a screw-threaded aperture at *y*, and into the center of the mass of meal therein, and connected at its outer extremity with the superheated-steam pipe D. The vent C is then also opened, and a jet of dry superheated steam allowed to pass in from the furnace S.

The action of the steam is both upward and downward through the mass of meal, vaporizing and driving the solvent upward until the mass of meal becomes sufficiently heated, when the vaporized solvent is driven off through the vent C and pipe C' to the condenser O and recovered. That portion of the solvent below the level of the nozzle *d* is driven downward, being vaporized and recondensed, and so percolating downward through the meal until the steam has driven the solvent and remaining traces of oil downward through the vent *x* into the receiving-tank R. As soon as the vapor of water shows at the upper vent C, said vent is closed, and when afterward it shows at *x* below, that vent is also closed. The pipe D is then disconnected, the nozzle *d* removed, and its aperture closed by a suitable stopper. The pipe D is then connected with the vent *x*, and, the upper vent C being again opened, the superheated steam is allowed to pass upward through the entire mass of meal, vaporizing and driving off the last remaining traces of the solvent, and purifying the meal of all taint therefrom. The pipes are then disconnected, and the contents of the tank or percolator A removed to the drying-room, and are ready for the ordinary uses.

The extracted oil, combined with the solvent, is contained in the tanks R and T. From these it is pumped, for convenience of treatment, into a tank, F, whence it is permitted to flow downward in a graduated stream through a pipe, H, coiled within a steam-tight drum, K, where, in its passage through the coil N, it is heated by steam in the ordinary or "raw" state, admitted directly into the tank sur-

rounding the coil from the generating-boiler R' at the usual pressure—say, of sixty pounds per square inch, or about 300°. In the passage through the coil the solvent is vaporized to such a degree that when the oil and solvent reach the dividing-point of the exit-pipe below, the liquid oil passes downward by the branch L, and the solvent passes upward in a vaporized state through the branch M to the condenser O.

The oil from the branch L flows into a trough arranged above a steam-coil, J, also supplied with raw steam from the generating-boiler R', whence it drips downward over the exterior surfaces of the steam-pipes J into a final receiving-tank, P, below. In this portion of the process all but a faint trace of the solvent is removed from the oil, which may be entirely removed by heating the oil in the tank P by means of a steam-jacket, and forcing a current of air in divided jets into and through the body of the oil, or by forcing into and through the oil a similarly-divided jet or blast of heated air.

The process and apparatus herein described may be used with great advantage in connection with the spent meal resulting from the common mode of extracting oils by presses. I obtain a large and profitable percentage of oil from the ordinary oil-cake of commerce by first treating it with a hydrocarbon solvent, and then driving off and recovering the remaining solvent and oil by this means; and in addition to the advantage accruing from my process by reason of the increased amount of oil obtained from a given quantity of material, the resulting oil is of better quality, because free from the crushed woody fiber which forms a sediment in linseed or cotton-seed oils obtained in the ordinary manner by expression.

I do not confine myself to the particular form of apparatus herein described, as it is apparent that many other forms of apparatus may be used in practicing my process, and that herein described may be simplified.

I claim as new and desire to secure by Letters Patent—

The herein-described process, which consists in treating the residuum of vegetable substances from which the oil has been extracted by the use of a hydrocarbon solvent with superheated steam, for the purpose of removing and recovering the solvent, substantially as specified.

Witness my hand this 16th day of February, 1878.

HOMER T. YARYAN.

Attest:

L. M. HOSEA,
H. P. K. PECK.