No. 647,005. Patented Apr. 10, 1900.

G. W. LUETKEMEYER & W. A. HARSHAW.

APPARATUS FOR REFINING OIL.

(Application filed Sept. 16, 1899.)

(No Model.)

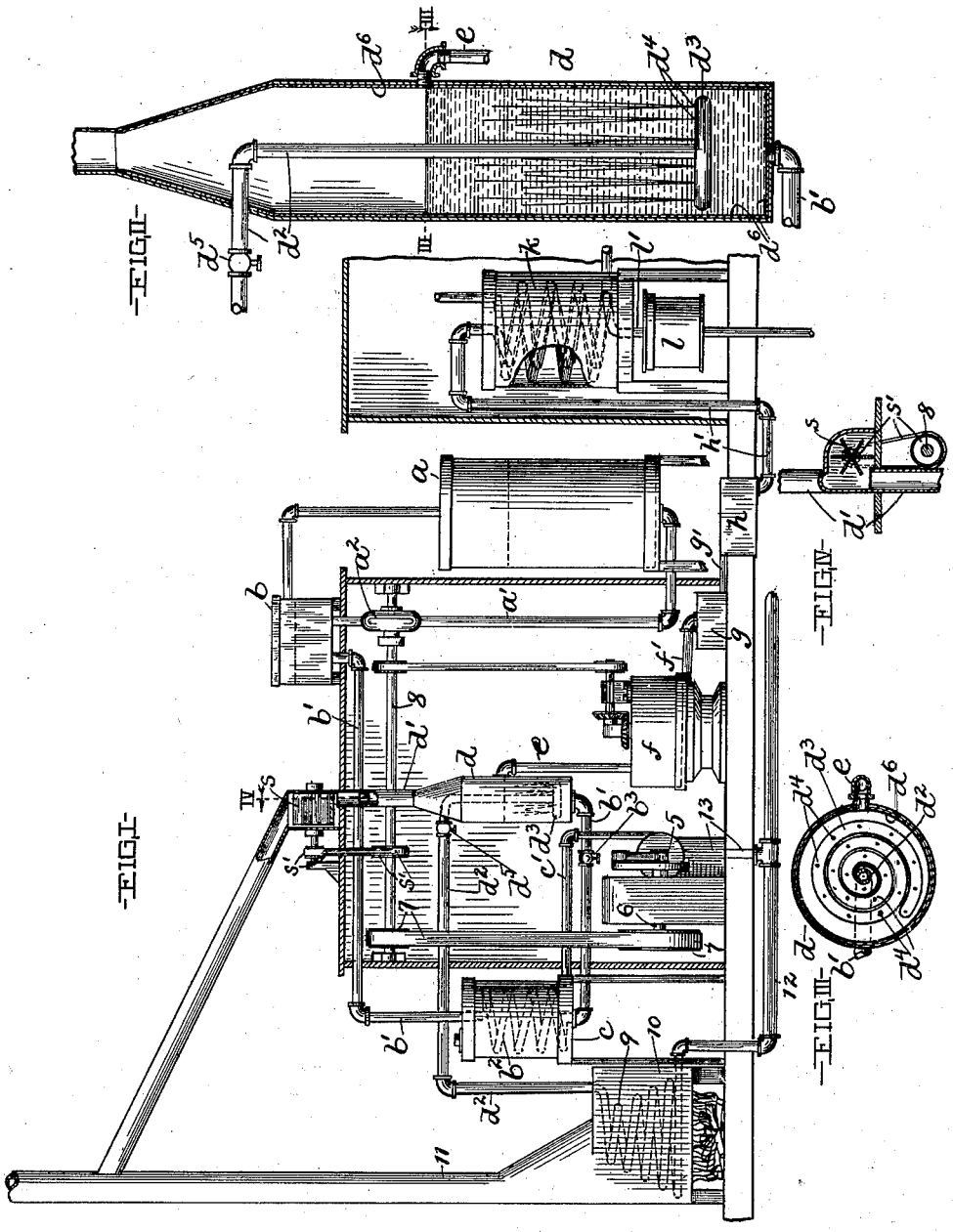

FIG. II

FIG. IV

FIG. III

WITNESSES:
Daniel E. Daly.
Victor C. Lynch.

INVENTORS
Gustave W. Luetkemeyer
and
William A. Harshaw
BY
Lynch & Dorer
their ATTORNEYS

UNITED STATES PATENT OFFICE.

GUSTAVE W. LUETKEMEYER AND WILLIAM A. HARSHAW, OF CLEVELAND, OHIO, ASSIGNORS, BY MESNE ASSIGNMENTS, TO THE AMERICAN LINSEED COMPANY, OF CHICAGO, ILLINOIS.

APPARATUS FOR REFINING OIL.

SPECIFICATION forming part of Letters Patent No. 647,005, dated April 10, 1900.

Application filed September 16, 1899. Serial No. 730,678. (No model.)

To all whom it may concern:

Be it known that we, GUSTAVE W. LUETKEMEYER and WILLIAM A. HARSHAW, of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Apparatus for Purifying Linseed-Oil and other Vegetable Oils; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to improvements in apparatus for purifying linseed-oil and other vegetable oils.

The object of this invention is to obtain a purer product and at less cost.

With this object in view and to the end of attaining other advantages hereinafter appearing the invention consists in certain features of construction and combinations of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure I is a diagrammatic view, partly in section, of our improved apparatus. Fig. II is a central vertical section of a heater employed for the coagulation of the impurities in the oil preparatory to the separation or removal of the impurities from the oil. Fig. III is a top plan in section on line III III, Fig. II. Fig. IV is an elevation in detail, partly in section, on line IV IV, Fig. I.

Referring to the drawings, *a* designates a tank or reservoir containing the oil that requires purification. The oil received in the tank *a* is oil in a raw or crude state or oil already partially purified. The oil-containing chamber of the tank *a* is connected by a pipe-line *a'* with the chamber of an elevated feed-tank *b*. A pump a^2 is interposed in the line of the pipe-line *a'* and is employed in pumping oil from the tank *a* into the tank *b*. A heater *c* is arranged at an elevation below the tank *b* and comprises, preferably, a tank supplied with exhaust-steam. A pipe-line *b'* extends through heater *c* and is provided within the tank of the heater with a coil b^2. The pipe-line *b'* communicates at one end with the chamber of the tank *b* and at its other end is connected and in open relation with the chamber of the tank or still *d*. A steam-engine 5 has its exhaust-steam outlet connected by a pipe-line *c'* with the chamber of the tank *c*. The shaft 6 of the engine is operatively connected by pulleys and belt 7 with the shaft 8, with which the pump a^2 is operatively connected in any approved manner. The oil is heated by heater *c* to about 200° Fahrenheit and preferably to 212° Fahrenheit.

Apparatus for coagulating the albuminous matter and other impurities in the oil and for vaporizing and carrying off volatile matter is provided, which apparatus comprises, preferably, the upright still or tank *d*, that is arranged at an elevation below the feed-tank *b* and is provided at the top with a stack or flue *d'*. The lower end of the chamber of the tank *d* is in open relation with one end of pipe-line *b'*, that is provided with a valve b^3 for regulating the flow of oil into the tank *d*. A steam-pipe line d^2 for supplying superheated steam to the body of oil within the tank *d* extends into the lower portion of the said tank and there terminates in a horizontally-arranged spiral coil d^3, provided, preferably, with numerous upwardly-discharging orifices d^4. Pipe-line d^2 is provided with a valve d^5 for regulating the supply of superheated steam to the tank *d*. Pipe-line d^2 is connected with one end of a coil 9, arranged within the heating-chamber of the superheater 10, having a stack 11, with which the stack *d'* is connected. The other end of the coil 9 is connected with a live-steam-supply-pipe line 12, that has a branch 13 leading to the live-steam inlet of the engine 5. The oil within the tank *d* is subjected, preferably, to a temperature of about 500° Fahrenheit and is maintained at the desired temperature by the regulation of the flow of oil into the tank or by the regulation of the heat, or by both heat regulation and oil-supply regulation. The oil is introduced into the tank *d*, as already indicated, at a temperature of about 200° Fahrenheit, and the temperature of the oil upon the latter's introduction into the tank *d* quickly rises to a temperature of about 400° Fahrenheit. The upper portion of the chamber of the tank *d* forms a vapor-space that communicates with the stack *d'*. A pipe *e* leads from the upper end of the oil-space of the chamber of the tank *d*, and in the opera-

tion of the heater oil flows continuously to and from the tank of the heater, and the temperature within the tank d can be regulated by the manipulation of either or both of the valves b^3 and d^5 in connection with the continous flow of oil through the heater. Preferably the oil undergoing treatment is maintained at the desired temperature within the heater by the said continuous flow of oil and the regulation of the valve b^3.

This invention has been reduced to practice, and good results have been attained by maintaining the temperature of the oil within the tank d at about 480° Fahrenheit, and any foreign substances or matter, contained in the oil and capable of being vaporized by heat, are removable during the said heating of the oil and pass up the stack d' with the steam issuing upwardly through the body of oil. The jets or streams of steam facilitate the escape of the vaporized impurities. The capacity of the tank d is preferably comparatively small, and fine results have been obtained by employing a tank that has a capacity of about fifty gallons and is suitable for treating about twenty gallons of oil at a time. The stack d' is instrumental in creating suction within the vapor-space of the tank d, and thereby assists the jets or streams of superheated steam in conducting or discharging the volatile matter from the said tank. Sometimes, however, a more positive or vigorously-acting suction-creating device is desirable, and we have therefore provided a suitably-operated fan s within a case whose chamber communicates with and is contiguous to the stack, which fan is operated in the direction required to create or assist the creation of an outward draft in the stack. The fan is shown operatively connected by pulleys and belt s' with the shaft 8.

The oil would not be injured by subjecting it to a temperature higher than that hereinbefore indicated—for instance, to a temperature of 600° or 650° Fahrenheit; but the temperature must not be high enough to destroy or injure the internal lining or wall of the tank d. The tank should be lined internally with a material or substance that is non-corrosive and not injuriously affected by the action of any substance or matter contained in the oil or steam within the tank d and that will not deleteriously affect the product either by discoloration or otherwise. We would here remark that steam will not combine with any constituents of the oil. A lining of platinum, gold, porcelain, wood, or lead, and, preferably the latter on account of its comparative cheapness and durability, is suitable for the purpose. Therefore the tank d is provided, preferably, with an internal lining d^6 of lead. As already indicated, the heating of the oil to the high temperature indicated coagulates albuminous matter and other foreign matter or substances contained in the oil; but this coagulated matter is of such relative weight and character as to enable it to float within the oil and be discharged from the tank with the oil into pipe e. Pipe e connects with the inlet of a centrifugal machine f, whose function is to separate the oil from the albuminous or solid foreign matter discharged into the said machine with the oil. Whether or not the temperature of the oil before its delivery to the centrifugal machine should be reduced will depend on the nature and character of the parts composing the centrifugal machine. A centrifugal machine having its interior parts composed of material that will withstand a high temperature and that is non-corrosive is desirable, so that no reduction in the temperature of the heated oil will be necessary. The centrifugal machine is driven in any approved manner and is preferably operatively connected with the shaft 8. A pipe f' leads from the outlet of the centrifugal machine into the upper end of an oil-accumulating tank g, and a pipe g' leads from the lower end of the said tank g to and connects with one end of a suitably-constructed filter or filtering apparatus h, whence the oil is conducted by a pipe h' to a refrigerating or cooling chamber of a refrigerator k, that is constructed in any approved manner. From the oil-cooling chamber the oil is conducted through another filter l and is then ready for use.

The use of filtering apparatus has not been practical in removing the slimy albuminous impurities from the oil because the said impurities would quickly clog and obstruct the operation of the filter; but a suitable centrifugal machine is admirably adapted for the mechanical separation of the said impurities from the oil. The centrifugal machine, while removing the larger portion and non-filterable impurities, does not remove every trace of the said impurities, and consequently the oil is filtered after leaving the centrifugal machine in the filter h. Certain foreign substance or matter contained in the oil and an undesirable excess of fats or other ingredients of the oil cannot be removed by heating the oil. For instance, an undesirable excess of fats—such, for instance, as olein and homologues and stearin and homologues—can only be removed after congealing the same by subjecting the oil to a sufficiently-low temperature for the purpose, and consequently the oil that is filtered after leaving the centrifugal machine should be subjected to a temperature sufficiently low to congeal any undesirable excess of fats and other congealable, objectionable, or foreign substance or matter still contained in the oil, and the congealed matter is then removed from the oil by filtration effected in the filter l, to which the oil is conducted from the cooling-chamber by a pipe l'.

What we claim is—

1. Apparatus for treating vegetable oils, comprising an oil-receiving tank having an oil-outlet; means for effecting the coagulation of albuminous matter contained in the oil

within the said tank; a passage-way leading from the oil-outlet of the aforesaid tank; means interposed in the line of the said passage-way for partially purifying the oil by separating the coagulated albuminous matter from the oil; a cooling-chamber, a passage-way arranged to receive the partially-purified oil and conduct the latter through the cooling-chamber so as to congeal greasy or fatty impurities contained in the partially-purified oil, and a filter arranged to receive the oil conducted through the cooling-chamber, substantially as and for the purpose set forth.

2. Apparatus for treating vegetable oils, comprising a heater for effecting the coagulation of the albuminous matter contained in the oil, and the elimination of volatile matter; a centrifugal machine having its inlet connected with the outlet of the oil-space of the heater; a filter having its inlet connected with the outlet of the centrifugal machine; a cooler having its inlet connected with the outlet of the aforesaid filter, and another filter connected with the outlet of the cooler, substantially as and for the purpose set forth.

3. Apparatus of the character indicated, comprising an oil-supply tank or reservoir *a;* an elevated feed-tank *b;* a pump; a pipe or passage-way connecting the inlet of the pump with the said reservoir; a pipe or passage-way connecting the outlet of the pump with the feed-tank; a heater comprising a tank arranged below the feed-tank, a pipe-line connecting the outlet of the feed-tank with the oil-chamber of the heater's tank; means for heating the oil within the heater's tank to a temperature high enough to effect the coagulation of albuminous impurities contained in the oil within the said heater's tank; a passage-way for conducting the heated oil and coagulated matter from the heater's tank, and means in the line of the last-mentioned passage-way for mechanically separating the coagulated impurities from the oil, substantially as and for the purpose set forth.

4. Apparatus of the character indicated, comprising a tank having a vapor-outlet at the top, a passage-way for conducting oil requiring treatment to the oil-space of the said tank; means for heating the oil preparatory to its discharge into the tank; means for supplying superheated steam to the oil-space of the tank to effect a further heating of the oil to a temperature high enough to effect a coagulation of albuminous impurities contained in the oil; a passage-way for conducting the oil from the oil-space of the tank, and means for separating the coagulated matter from the oil conducted off by the last-mentioned passage-way, substantially as and for the purpose set forth.

5. Apparatus of the character indicated, comprising a tank for receiving the oil requiring treatment and suitably equipped to effect a coagulation of albuminous matter contained in the oil, which tank has an oil-outlet; a centrifugal machine having its inlet connected with the oil-outlet of the tank; an oil-accumulating chamber having its inlet in open relation with the outlet of the centrifugal machine; a filter having its inlet connected with the outlet of the oil-accumulating tank; an oil-cooling chamber; a passage-way connected with the outlet of the aforesaid filter and leading through the cooling-chamber, and another filter arranged to receive the oil conducted through the cooling-chamber, substantially as and for the purpose set forth.

Signed by us at Cleveland, Ohio, this 2d day of September, 1899.

GUSTAVE W. LUETKEMEYER.
WILLIAM A. HARSHAW.

Witnesses:
C. H. DORER,
A. H. PARRATT.