No. 647,004. Patented Apr. 10, 1900.

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

PROCESS OF REFINING OIL.

(No Model.) (Application filed June 16, 1899.)

2 Sheets—Sheet 1.

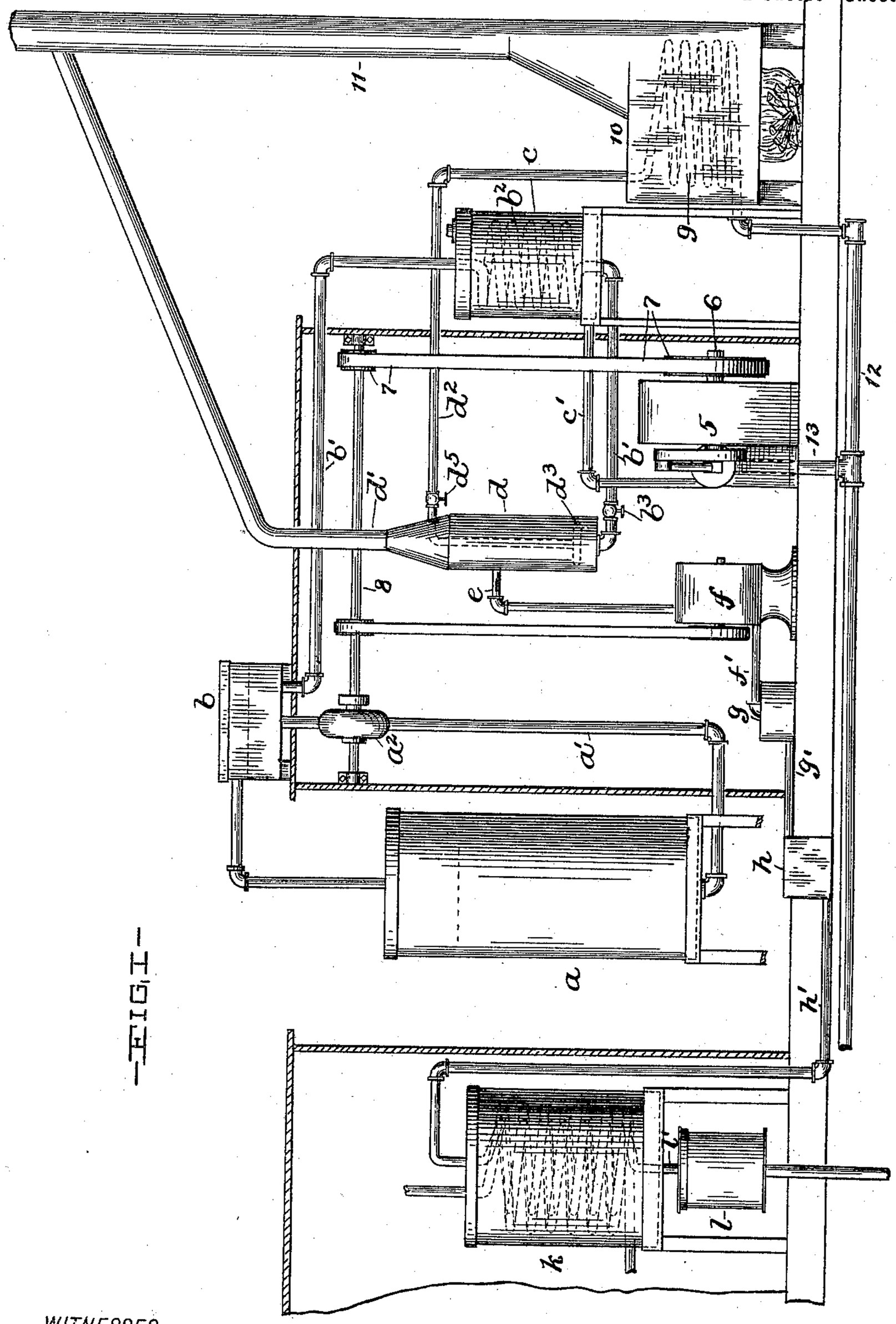

FIG. I.

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FIG. III.

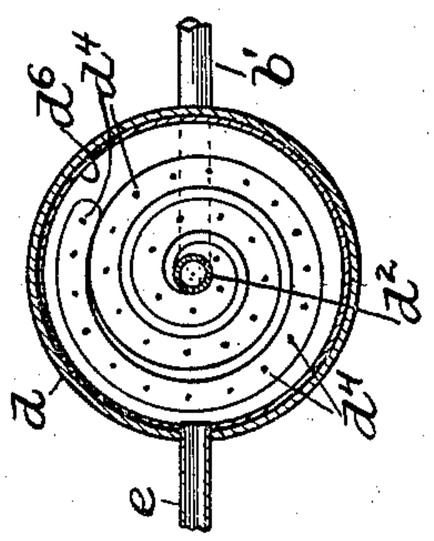
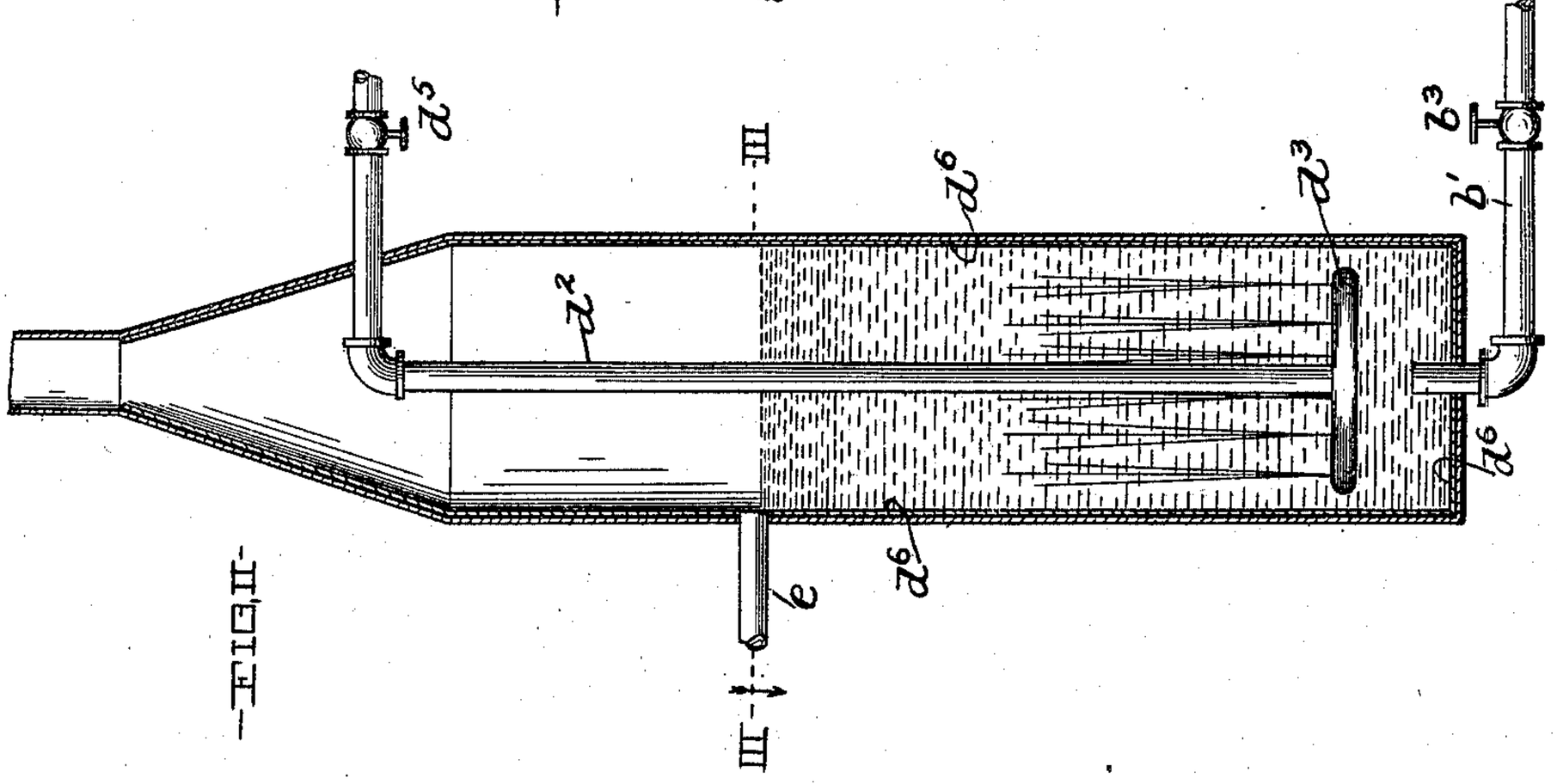


FIG. II.



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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.

PROCESS OF REFINING OIL.

SPECIFICATION forming part of Letters Patent No. 647,004, dated April 10, 1900.

Application filed June 16, 1899. Serial No. 720,875. (No specimens.)

To all whom it may concern:

Be it known that we, GUSTAVE W. LUETKEMEYER and WILLIAM A. HARSHAW, residing at Cleveland, Cuyahoga county, and State of Ohio, have invented certain new and useful Improvements in Processes of Refining Oil; 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.

Our invention relates to an improved process of refining oil.

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 steps hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure I is a diagrammatic view of apparatus suitable for carrying out our improved process. 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.

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 with numerous upwardly-discharging orifices or apertures 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, 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. A pipe *e* leads from the upper end of the oil-

space of the chamber of the tank d, and in the operation 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 continuous 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 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. No inconsiderable importance attaches to the lining of this tank 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 refrigerator k, that is constructed in any approved manner. From the refrigerator 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. The importance of removing any impurities that can be removed before conveying the oil to the refrigerator is obvious. The subjection of the oil to a temperature as low as 32° Fahrenheit or lower is important in order to remove such foreign substances or matter as are contained in the oil and not removable by heating the oil and to remove an undesirable excess of certain fatty matter contained in or participating in the composition of the oil. For instance, olein and homologues form a large percentage of the objectionable matter remaining in the oil preparatory to the subjection of the oil to the aforesaid low temperature, and the said olein and homologues and an undesirable excess of stearin and homologues and free stearic and oleic acids 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 the congealable foreign substances or matter still contained in the oil, and the congealed matter is then removed from the oil by filtration effected in a filter m, to which the oil is conducted from the refrigerator by a pipe l'. The resulting product is an oil that has greater purity than any linseed-oil heretofore attainable.

Our improved process comprises, therefore, the following: The coagulation of albuminous substances and impurities in the oil by heating the latter in a chamber whose walls are composed of material that is non-corro-

sive and the elimination from the oil of those impurities that can be vaporized by heat, then mechanically separating the oil and coagulated matter, then subjecting the oil to a low temperature and thereby congeal greasy and fatty matter remaining in the oil, and then mechanically separating the said fatty impurities from the oil.

Our invention comprises not only the continuous process hereinbefore described and other features hereinafter claimed, but embraces, broadly, a process involving the following steps: The treatment of the oil to effect the coagulation of the albuminous impurities contained in the oil and an elimination of volatile matter, the separation of the coagulated impurities from the oil, the congealing of greasy or fatty impurities in the oil, and the separation of the last-mentioned impurities from the oil. It is obvious also that in our improved process the oil is caused to flow upwardly through the oil-space of the tank in the same direction in which the heated aeriform or gaseous body is discharged into the said space, that the oil laden with the coagulated impurities is caused to overflow into the pipe *e* at the upper end of the said space, and the regulation of the valve b^3 and the size of the oil-outlet are relatively such that the level of the oil undergoing treatment is maintained at the elevation required to effect a continuous flow of oil from the upper end of the oil-space and at the same time to maintain the required space above the oil-space.

What we claim is—

1. An improvement in treating linseed-oil and other vegetable oils hereinbefore disclosed, consisting in causing the oil to pass into an oil-space of a tank or container; heating the oil within the said space to a temperature high enough to effect the coagulation of the albuminous matter contained in the oil, causing the oil laden with the coagulated matter to overflow from the said space and effecting such a regulation of the flow of oil into the said space, relative to the oil overflow, that the level of the oil undergoing treatment shall be maintained at the elevation required to effect a continuous flow of oil from the top of the oil-space, substantially as and for the purpose set forth.

2. An improvement in the treatment of linseed-oil and other vegetable oils hereinbefore disclosed, consisting in feeding the oil into the lower end of the oil-space of an upright tank or container; heating the oil within the said space to a temperature high enough to effect the coagulation of albuminous matter contained in the oil; causing the oil laden with the coagulated matter to overflow from the upper end of the said space, and effecting such a regulation of the flow of oil into the said space relative to the size of the oil overflow that the level of the oil undergoing treatment shall be maintained at the elevation required to effect a continuous flow of oil from the upper end of the oil-space and to maintain the required space above the oil-space, substantially as and for the purpose set forth.

3. An improved process of purifying vegetable oils, involving, first, the heating of the oil to a temperature high enough to effect a coagulation of albuminous impurities contained in the oil; then effecting a separation of the coagulated matter from the oil; then lowering the temperature of the oil sufficiently to effect congelation of an undesirable excess of fatty matter contained in the oil, and then separating the congealed matter from the oil.

4. An improved process for purifying linseed and other vegetable oils involving the heating of the oil to a temperature high enough to effect the coagulation of albuminous impurities contained in the oil; the mechanical separation of the coagulated impurities from the oil; the subjection of the oil to a temperature low enough to congeal an undesirable excess of fatty matter contained in the oil, and a mechanical separation of the congealed matter from the oil.

5. The process of purifying vegetable oils, herein described, consisting in suitably treating the oil to effect a coagulation of the albuminous impurities contained in the oil and an elimination of volatile matter; then mechanically separating the said impurities from the oil; then suitably treating the oil to congeal the greasy or fatty impurities remaining in the oil, and then mechanically separating the last-mentioned impurities from the oil, substantially as and for the purpose set forth.

6. The process of purifying vegetable oils herein described, consisting in suitably treating the oil with jets or streams of an intensely-heated gaseous or aeriform body to effect a coagulation of albuminous impurities contained in the oil and an elimination of volatile matter; then effecting a separation of the coagulated matter from the oil; then exposing the oil to a temperature low enough to congeal an undesirable excess of fatty matter contained in the oil, and then filtering the oil.

7. The process of purifying vegetable oils, herein described, consisting in suitably treating the oil to effect a coagulation of the albuminous impurities contained in the oil and an elimination of volatile matter; then treating the oil containing the coagulated matter in a centrifugal machine; then filtering the oil; then exposing the oil to a temperature low enough to congeal an undesirable excess of fatty matter contained in the oil, and then again filtering the oil, substantially as and for the purpose set forth.

8. The process of purifying vegetable oils, herein described, consisting in suitably treating the oil with jets or streams of a highly-

heated gaseous or aeriform body under pressure in a chamber whose walls are composed of a non-corrosive substance or material; then removing the contents of the container and treating the same in a centrifugal machine; then filtering the oil; then exposing the oil to a temperature low enough to congeal an undesirable excess of fatty matter contained with the oil, and then again filtering the oil, substantially as and for the purpose set forth.

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

GUSTAVE W. LUETKEMEYER.
WILLIAM A. HARSHAW.

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