

No. 668,210.

Patented Feb. 19, 1901.

N. B. POWTER.

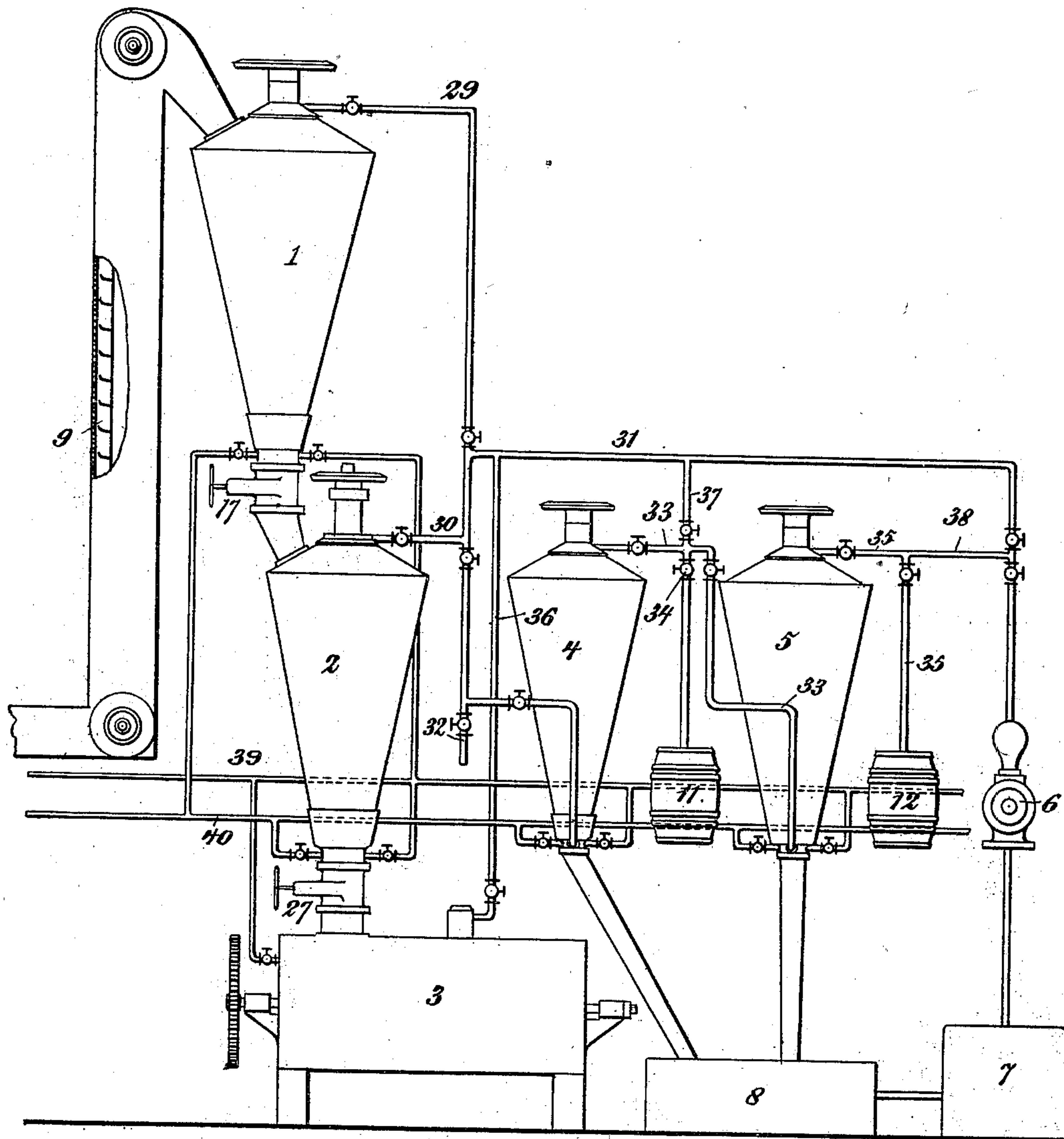
PROCESS OF EXTRACTING OIL OR GREASE.

(No Model.)

(Application filed Dec. 21, 1898.)

3 Sheets—Sheet 1.

Fig. 1.



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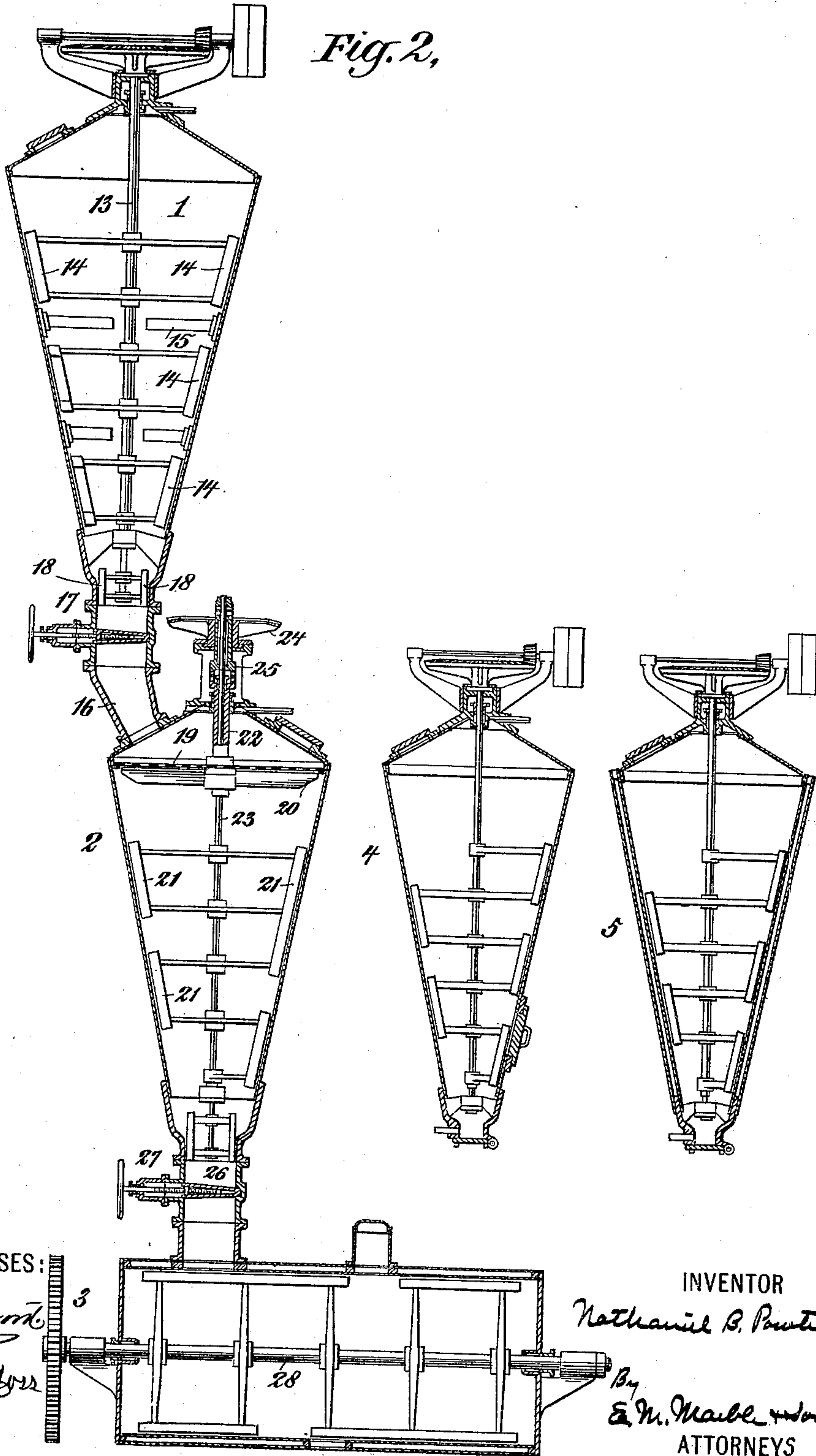
PROCESS OF EXTRACTING OIL OR GREASE.

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(Application filed Dec. 21, 1898.)

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Fig. 2,



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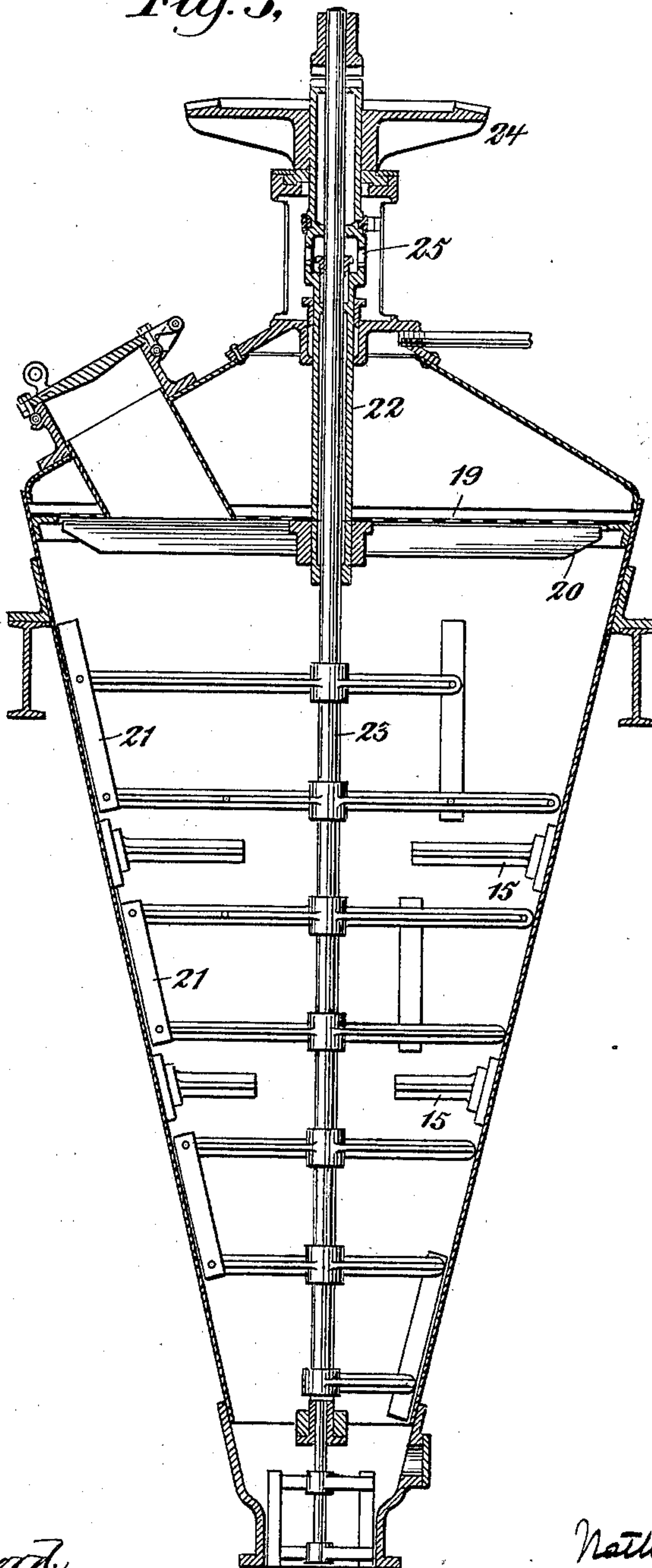
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3 Sheets—Sheet 3

Fig. 3.



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PROCESS OF EXTRACTING OIL OR GREASE.

SPECIFICATION forming part of Letters Patent No. 668,210, dated February 19, 1901.

Application filed December 21, 1898. Serial No. 699,905. (No specimens.)

To all whom it may concern:

Be it known that I, NATHANIEL B. POWTER, a subject of the Queen of England, residing in the city of New York, borough of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Process of Extracting Oil or Grease from Oil-Bearing Substances; and I 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 appertains to make and use the same.

My invention relates to a process of extracting grease and oil from oil-bearing substances, and particularly from waste products—such as refuse meat, tallow, lard, tankage, garbage, town refuse, and fish waste—and from vegetable matter, such as linseed, hemp-seed, cotton-seed, cocoanuts, or any other vegetable material holding oil; and my invention consists in the novel steps of the process herein described.

The object of my invention is to extract oil and grease from oil-bearing substances, and particularly from substances such as those mentioned above, in a thorough, efficient, and economical manner and to avoid the liberation of offensive fumes. This object is attained in the process herein described.

In the drawings which accompany and form a part of this specification I illustrate an apparatus which may be employed in the carrying out of the process and which forms the subject-matter of an application for Letters Patent, filed by me on December 21, 1898, Serial No. 699,906.

Figure 1 is a general elevation of the apparatus. Fig. 2 is a central vertical section of the digester, separator, drier, and purifiers; and Fig. 3 is a larger sectional view of an alternative form of digester.

In the drawings, 1 is a digester; 2, a separator; 3, a drier; 4 and 5, purifiers; 6, a vacuum or suction pump; 7, a fume-trap, and 8 a tank for receiving the waste matter discharged from the purifiers.

9 is an elevator by which the grease-bearing substances may be delivered to the digester.

11 and 12 are barrels into which the grease and oil extracted may be passed.

The digester, separator, and purifiers are

of the same shape, their form being that of two cones placed base to base. The digester has running through it a vertical shaft 13, provided with arms carrying stirring-blades 14, and between these stirring-arms are stationary projecting arms 15, secured to the sides of the digester. The digester is connected at its lower end with the separator 2 by a passage 16, provided with a gate-valve 17. The lower end of the shaft 13 is provided with stirring-arms 18, projecting downward into this passage 16, the function of which arms is to prevent solid matter from collecting at the bottom of the digester to such an extent as to block the outlet.

The separator 2 is provided with a transverse screen 19 near its upper end, the passage 16 being continued within the separator to an opening in the screen, through which the matter discharged from the digester may pass into the lower portion of the separator. Directly beneath the screen 19 is a revolubly-mounted screen-scraper 20, designed to prevent clogging of the screen, and below the scraper are revolubly-mounted stirring-arms 21, similar to the corresponding stirring-arms of the digester. No stationary arms located between the revolving stirring-arms are required, however. As shown in the drawings, the scraper 20 and the stirring-arms 21 are mounted upon separate but concentric shafts 22 and 23, respectively, which may be driven at will from a gear-wheel 24, itself driven from any suitable source of power in any convenient manner by means of a jaw-clutch 25; but both scraper and stirrers may be mounted upon the shaft 23 and so caused to rotate together, if preferred, the outer shaft 22 being omitted.

The separator 2 is slightly smaller than the digester 1, for a reason which will be given hereinafter.

The separator is connected at the bottom with the drier 3 by means of a passage 26, having in it a gate-valve 27. The drier is steam-jacketed and is provided with a series of stirring-arms mounted upon a shaft 28, by which said arms may be rotated.

To the digester 1 is connected at the top a pipe 29, leading downwardly to the bottom of the purifier 4. The separator 2 is also connected to this pipe 29 by a branch 30 enter-

ing the separator at the top, and a pipe 31, also connected to pipe 29, leads to the vacuum-pump 6. The pipe 29 is provided with a valve 32, through which grease may be drawn off without passing it into the separator 4, if desired.

A pipe 33 is connected to the purifier 4 at the top and leads to the bottom of the purifier 5. To this pipe is connected a valve 34, through which oil may be drawn off into the barrel 11. The purifier 5 is provided with a pipe 35, through which grease or oil within it may be drawn off into the barrel 12. Purifiers 4 and 5 are connected by pipes 37 and 38 with the vacuum-pump 6. The purifiers are provided with shafts and stirring-arms, by which their contents may be stirred, if desired. The purifier 5 is provided with a steam-jacket, by which its contents may be heated to any desired temperature. The purifiers are arranged to discharge their fluid contents when desired into a tank 8.

36 is a pipe connecting the drier 3 with the vacuum-pipe 31.

37 and 38 are pipes connecting the pipes 33 and 35 with the vacuum-pipe 31.

39 and 40 are steam and water supply mains, respectively, connected to the digester, separator, and purifiers at the bottom.

The process is carried on as follows: The digester is charged with the material to be treated through a manhole in its top by means of the elevator 9 or in any other convenient manner. The manhole is then closed and steam is admitted to cook the contents of the digester, the stirring-arms being rotated so as to grind and disintegrate the matter being treated. The cooking is continued from three to five hours, according to the nature of the substance treated, no escape of steam or fumes being allowed. The action of the steam and of the condensed vapor and the mechanical disintegration produced by the action of the stirring-arms breaks up the fibrous structure of the matter under treatment, liberating the oils and grease, while the solid matter settles to the bottom of the digester. For the treatment of some substances dilute sulfuric acid or other suitable reducing agent may be added to the mass within the digester. When the substance being treated contains glue and similar substances, salt or other glue-restrainer may be added to the mass to restrain the glue from going over with the grease. In an application for Letters Patent filed December 6, 1899, Serial No. 739,407, I have described and claimed a process for extracting both oil and glue from fish material, in which process salt is used for restraining the glue until the oil has been removed. When the mass in the digester has been sufficiently treated therein, connection with the vacuum-pump is opened, and the steam and vapors are drawn out and caused to pass through the water in the tank 7. This I do for two reasons—first, to avoid the escape of odoriferous gases, and, second, to separate

from the mass of grease and oil and other substances within the digester certain light oils and greases which I have found will pass off with the steam and vapors when suction is applied in a practically pure condition. By this means these lighter oils may be separated from the heavier oils and grease. The oil and grease thus carried off are caught by the water in the tank 7 and float upon the top of the water and may be collected in any convenient manner. The vapors which pass through the water in the tank 7 are passed into a convenient furnace, such as the furnace of the boiler by which steam is supplied to the apparatus, and are burned, no odoriferous gases being allowed to escape. The fumes having been drawn off completely, the valve 17 in the passage connecting the digester and separator may be opened and the contents of the digester discharged into the separator. The size of the separator is so proportioned to that of the digester that a full charge of the digester after treatment, as above described, when transferred to the separator fills the latter almost up to its screen. Hence after the mass has settled down a comparatively small quantity of water admitted into the separator at the bottom will raise all of the oil and grease through the screen and cause it to pass off through the pipe 30 into the purifier 4 or otherwise. The separator having been charged, as above described, water is admitted, as above mentioned, the stirring-arms being rotated and the screen-scraper also when necessary, and the grease and oil within the mass are caused to rise through the mass and are concentrated in the narrow conical top of the separator, passing off into the pipe 30 and so into the purifier 4. Before sufficient water has been added to raise the grease within the separator to the level of the discharge-opening, suction may be applied to the separator to draw off any of the light oils capable of passing off in this manner and which have been raised to the surface of the mass by the action of the water. After the grease has been drawn off from the separator the admission of water is stopped, the gate-valve 27 opened, and the contents of the separator permitted to pass into the drier 3. The valve 27 is then closed, steam is admitted to the steam-jacket surrounding the drier, and the connection of the drier to the vacuum-pump being opened the drying of the contents of the drier is commenced, the stirring-arms being rotated, as required. Drying is continued until the mass within the drier is reduced to a dry pulverulent condition. The fumes liberated within the drier are drawn off by the suction-pump 6 and caused to pass through the water in the tank 7. The grease, which is passed over into the purifier 4, is allowed to remain quiet therein for a time in order that any solid matter which may have been carried over with it may be allowed to settle. If any decomposed matter has passed over into the purifier 4, steam may be blown through

the mass therein for a time and then dry air passed through it by means of a vacuum-pump, thus purifying the grease and drawing off all odoriferous vapors. While the oil and grease are within the purifier 4, they may also be treated with any purifying liquid with which it may be desirable to treat them, the grease and oil being caused to pass up through said liquid in the purifier 4 by reason of their lighter specific gravity. The lighter oils may then be drawn off into the barrel 11 by admitting water into the purifier 4 at the bottom. The heavier greases, such as lard, may be passed over into the purifier 5 and heated by passing steam through the steam-jacket of said purifier until all water has been driven off. When this has been done, water may be admitted at the bottom of the purifier 5, so as to cause the grease within such purifier to pass out at the top thereof, the water being admitted so slowly that it is not mixed to any appreciable extent with the grease.

The operation of separating the grease from the solid matter conducted in the separator 2 might be conducted in the digester itself, a digester being employed which has a screen and a screen-scraper, such as the digester illustrated in Fig. 3; but during the process of digestion the mass in the digester settles down so as to occupy much less volume than when first charged into the digester. To float the oil, therefore, would require the admission of a very considerable quantity of water to the digester, and all water admitted to the digester must be evaporated in the drier 3. The admission of such an excessive quantity of water for the mere purpose of floating off the grease is obviated by passing the contents of the digester, after digestion is completed, into the separator 2, the size of which bears a proper proportion to the volume occupied by a full charge of the digester after the digestion is completed, and the use of such a separator, independent of and separate from the digester, results in an important economy both in time and in cost of treatment. The drying of the solid residue might be conducted in the separator itself or in the digester itself if the separation of the grease from the solid matter also takes place in the digester; but this is not desirable, because such drying can be conducted more efficiently and economically in a vessel especially adapted for this purpose. Moreover, by using a separate digester, separator, and drier the process of digestion may be carried on in the digester while the separation of the grease from the solid matter of a previous charge is taking place in the separator and while the solid matter of a still earlier charge is being dried in the drier, the process being practically continuous. The shape of the separator is important. The conical upward-tapering upper part of the separator causes the grease after rising above the screen to be concentrated at the mouth of the pipe through which it is removed, so that practically all of the grease may be re-

moved from the separator without the passing over therewith of an appreciable quantity of water. By making the lower portion of the digester conical, with inwardly-tapering sides, it has been found that clogging of the mouth of the digester may be prevented and that when the valve 27 is opened the entire solid contents of the separator will fall into the drier.

It will be noted that throughout the operation of extracting and purifying the oil and grease and drying the residue there is no escape of vapors or gases into the outside air, the entire process being conducted in closed receptacles.

The treatment in the purifiers and drier may be omitted without departing from the essential features of my process. In some cases—as, for instance, in the fishing industry, when the process may be carried out on shipboard—the purifiers and drier may be omitted, the oils and grease being discharged directly from the separator or from a combined digester and separator, such as that shown in Fig. 2, (with or without the separate shaft 22 for carrying the screen-scraper,) into barrels or tanks, the residue being thrown overboard or utilized in any suitable manner.

When the oil-bearing substance treated contains no floating matter which it is necessary to restrain from going over with the grease, the screen and scraper in the separator or combined digester and separator may be omitted.

Having thus completely described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described process of extracting grease and oil from oil-bearing substances, which consists in subjecting such substances to the action of a heated vapor or liquid within a closed receptacle, and to mechanical disintegration, drawing off the vapors produced, by suction, after the digestion, and separating the grease and oils from the solid residue, substantially as described.

2. The herein-described process of separating oil and grease from oil-bearing substances, which consists in first liberating the oil and grease, and then applying suction to the mass, thereby separating and drawing off the lighter oil and grease, and collecting the oil and grease so drawn off.

3. The herein-described process of separating oil and grease from oil-bearing substances, which consists in first heating a mass of such substance, and then applying suction to the mass, within a closed vessel, at a point above the level of the mass, thereby separating and drawing off the lighter oil and grease, and collecting the oil and grease so drawn off.

4. The herein-described process of separating oil and grease from oil-bearing substances, and recovering the same, which consists in first liberating the oil and grease and then applying suction to the mass, within a closed vessel, at a point above the level of

the mass, thereby separating and drawing off the lighter oil and grease with vapors within the vessel, and passing the vapors so drawn off through water or other liquid, so as to
5 separate the oil and grease so drawn off from the gases and vapors.

5. The herein-described process of extracting grease and oil from oil-bearing substances, which consists in adding to the mass
10 to be treated a glue-restrainer, subjecting the mass to the action of a heated vapor or liquid, and to mechanical disintegration, and then separating the grease and oil so liberated from the solid residue, by adding water to
15 the mass so as to float such grease and oil upward, substantially as described.

6. The herein-described process of extracting grease and oil from oil-bearing substances, which consists in adding salt to the mass to be treated, subjecting the mass to
20 the action of a heated vapor or liquid, and to mechanical disintegration, and then separating the grease and oil so liberated from the solid residue, by adding water to the mass so
25 as to float such grease and oil upward, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

NATHANIEL B. POWTER.

Witnesses:

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DANIEL W. ALLAMAN.