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E. R. EDSON & B. F. SILLIMAN.

PROCESS OF DRYING MATERIAL FROM WHICH OIL HAS BEEN EXTRACTED.

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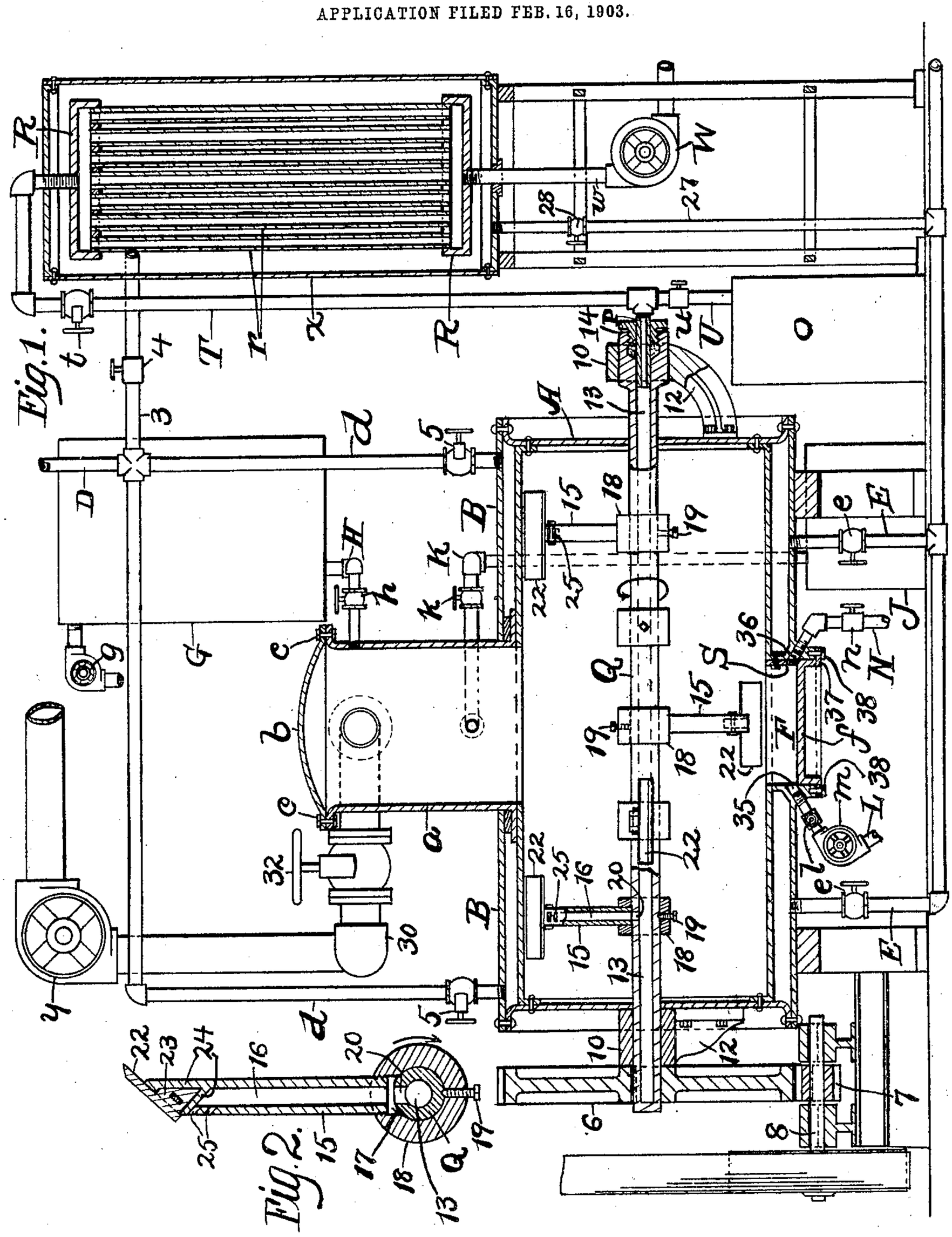

Fig. 1.

Fig. 2.

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PROCESS OF DRYING MATERIAL FROM WHICH OIL HAS BEEN EXTRACTED.

No. 803,051. Specification of Letters Patent. Patented Oct. 31, 1905.

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To all whom it may concern:

Be it known that we, EUGENE RILEY EDSON and BENJAMIN F. SILLIMAN, citizens of the United States of America, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Rendering or Reducing Grease-Yielding or Oil-Yielding Material; 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 an improved process of reducing vegetable or animal matter which has been heated in a closed receptacle under a pneumatic pressure greater than the pressure resulting from the heating of the material and relieved of extracted or liberated oily or greasy matter, said improved process consisting in the conversion of the mass remaining in the said receptacle into a valuable marketable product by first draining the drainable liquid portion of the mass from the mass in the said receptacle after interrupting the pneumatic pressure on the mass, stirring the mass during the draining period, then evaporating any moisture remaining in the mass in the said receptacle, and then admitting heated air into the mass in the said receptacle and distributing air throughout the mass.

With this object in view and to the end of realizing other advantages hereinafter appearing the said invention consists in the steps or process hereinafter described, and pointed out in the claim.

In the accompanying drawings, Figure 1 is a side elevation, largely in section, of a novel apparatus suitable for use in carrying out the process which constitutes the subject-matter of this application. Fig. 2 is a cross-sectional view of the stirring-shaft of the apparatus and shows one of the stirring-arms of the said shaft in longitudinal section. Fig. 2 is drawn on a larger scale than Fig. 1.

Referring to the drawings, A designates a receptacle which is in the form of a horizontally-arranged cylinder into which the material—animal or vegetable matter and capable of yielding oil and grease—is placed for treatment to extract grease and oil from the material. The receptacle A is a closed container provided at the top and centrally between its ends with a dome *a*, whose interior chamber forms an upward extension and communicates with the interior chamber of the body portion of the receptacle. The dome *a* consists, preferably, of a vertically-arranged cylindrical shell closed at its upper end by a head *b*, which is removably secured to the said shell by suitably-applied bolts and nuts, as at *c*. The dome *a* constitutes the charging-inlet of the receptacle A. A closed heating-jacket B surrounds and extends longitudinally of the receptacle A.

A steam-supply pipe D is provided with two branches *d* and *d*, which discharge into opposite ends, respectively, of the chamber of the jacket B. Each branch pipe *d* is provided with a normally closed valve 5. The jacket B is provided at the bottom with drain-pipes E, which have normally closed valves *e*.

The receptacle A is provided at the bottom and centrally between its ends with a downwardly-extending duct or outlet F, at which is discharged the marketable product contained in the receptacle upon the treatment of the residue remaining after the removal of the grease and oil from the material treated within the said receptacle. The outlet F is normally closed at its lower end by a suitably-applied door *f*.

A compressed-air reservoir G is arranged in any convenient place externally of the receptacle A, and a pipe H communicates at one end with the chamber of the said reservoir and discharges at its opposite end into the upper portion of the interior chamber of the dome *a*. Said pipe H is provided with a normally closed valve *h*. An air-pump *g* has its outlet communicating with the interior chamber of the reservoir G and is operated whenever required to maintain the desired pneumatic pressure within the said reservoir.

A pipe K communicates at its receiving end with the lower portion of the interior chamber of the dome *a* below the discharging end of the air-conducting pipe H and a short distance above the lower extremity of the said dome, and consequently above the interior chamber of the receptacle A. The pipe K is provided with a normally closed valve *k* and leads to any convenient place where it discharges into a tank or receptacle J.

A water-supply pipe L discharges into the duct F and is provided with a normally closed

valve *l*. A pump *m* is arranged in the line of the pipe L. The duct F is provided also with a drain-pipe N, which has a normally closed valve *n*.

A stirring-shaft Q is arranged horizontally and centrally and longitudinally of the receptacle A. The shaft Q extends longitudinally through the receptacle A and is operatively provided at one end, externally of the said receptacle, with a gear 6, which meshes with a pinion 7, operatively mounted upon a suitably-supported driving-shaft 8, to which power is applied in any approved manner. The shaft Q has bearing in boxes 10, arranged at the ends and externally of the receptacle A, which boxes are rigid with brackets 12, secured to the said receptacle. The shaft Q is provided interiorly and centrally with a passage-way 13, which extends from within the gear-bearing end of the shaft to the opposite extremity of the shaft, and a fluid-conducting pipe P discharges into the said passage-way at the last-mentioned extremity of the shaft. The shaft Q is provided with a stuffing-box 14 around the pipe P.

The shaft Q is provided with laterally-projecting and radially-arranged stirring-arms 15, which are spaced equidistantly longitudinally of the shaft. Each arm 15 has an interior passage-way 16, which extends longitudinally of the arm, as shown more clearly in Fig. 2. Each arm 15 is round and externally screw-threaded at its inner end and screwed into a correspondingly screw-threaded aperture 17, formed in a collar 18, which is mounted upon and adjustable endwise of the shaft Q, being secured to the said shaft in the desired adjustment by a suitably-applied set-screw 19, and the aforesaid passage-way 16 communicates at its inner end with the passage-way 13, formed in the said shaft through a lateral aperture 20, with which the said shaft is provided at the inner end of the said arm. Each arm 15 is provided at its outer end with a shovel or blade 22, which projects from the arm in the direction in which the said arm revolves during the rotation of the shaft, which, therefore, rotates when operated in the direction indicated by the arrow. Each shovel or blade 22 has an arm or shank 23 engaging and secured to a socket 24, formed by the outer end of the arm 15, which bears the said blade or shovel. Each arm 15 is provided at the inner end of its socket 24 with orifices 25, arranged to discharge in a direction opposite to the direction in which the said arm revolves during the rotation of the shaft Q.

A compressed-air holder is provided and consists, preferably, of two horizontally-arranged interiorly-chambered plates or heads R, located a suitable distance apart vertically, and pipe-sections *r*, connecting the said heads together and establishing communication between the interior chambers of the said heads. A reservoir *o*, in which ozone under pressure is stored, is also provided. The pipe P is provided with two branches T and U. The pipe T communicates with the interior chamber of the upper head R and is provided with a normally closed valve *t*. The pipe U communicates with the chamber of the reservoir *o* and is provided with a normally closed valve *u*. An air-conducting pipe *w* discharges into the interior chamber of the lower head R and communicates with the outlet of an air-pump W, operated whenever required to maintain the desired pneumatic pressure within the compressed-air holder, which consists, as already indicated, of the heads R and the pipe-sections *r* and is surrounded by a heating-jacket *x*. The pipe D has another branch 3, which communicates with the chamber of the jacket *x* and is provided with a normally closed valve 4. The jacket *x* is provided at the bottom with a drain-pipe 27, which has a normally closd valve 28.

A vapor-conducting pipe 30 communicates at its receiving end with the upper portion of the interior chamber of the dome *a* a suitable distance above the receiving end of the pipe K. A pump or suction-creating device *y* is arranged in the line of the pipe 30, which is provided between the said suction-creating device and the dome with a normally closed valve 32.

A screen S, suitably applied interiorly of the duct F, is arranged as required to prevent solid particles from passing with liquid into the pipe N.

In carrying out the process which constitutes the subject-matter of this application the head or cover *b* of the dome *a* is removed and the material requiring treatment is introduced through the said dome into the receptacle A, which is filled with material up to the lower end of the dome. When the receptacle A has been supplied with material, the head or cover *b* is closed and the valve *h* of the pipe H is opened to supply air under pressure to the interior chamber of the dome and results in placing the mass of material with which the receptacle A has been charged under a pneumatic pressure. The valves 5 of the branch steam-pipes *d* are then opened to supply steam to the chamber of the heating-jacket B, and a pressure of steam which will heat quickly and thoroughly—say a pressure of about twenty-five pounds per square inch—is employed; but so high a pressure of steam would unless the mass of material within the receptacle A were kept quiet by some other agency result in boiling the mass, and consequently in an emulsification of the oil and grease and other liquid matter of the mass. Hence air under sufficient pressure is admitted into the dome of the receptacle A through the pipe H upon opening the valve *h* preparatory to the heating of the mass. A pneumatic pressure greater than the pressure which results from any heating of the material

is necessary to prevent emulsification during the treatment of the material, and consequently a pressure of about thirty pounds per square inch in the dome of the receptacle is adequate against twenty-five pounds of steam-pressure employed in heating the mass. The pneumatic pressure on top of the mass and supplied to the interior chamber of the dome *a* is applied before agitation or ebullition of the material from fermentation or heat is possible, and the mass is continuously kept under the requisite pneumatic pressure during the treatment of the material within the receptacle A. Oil and grease contained within the material undergoing treatment and liberated during the treatment of the material rise to the top of the mass and into the dome *a*, whence the risen grease and oil as soon as the level of the same reaches a point above the bottom of the inlet of the pipe K pass into the said pipe and through the latter upon opening the valve *k* into the tank or receptacle J, and the pneumatic pressure established and maintained within the dome *a* facilitates the passage of the risen grease and oil from the said dome through the said pipe. The material is digested under pneumatic pressure greater than the pressure of the heat applied without adding moisture to the moisture contained by the material. The layer of grease and oil having formed at the top of the mass during the treatment of the material within the receptacle A is caused to rise upwardly in the dome *a* by pumping water into the lower portion of the interior chamber of the said receptacle, and the water thus supplied to the said receptacle is conducted into said receptacle by and through the pipe L upon opening the valve *l* and operating the pump *m*. The water thus introduced into the receptacle A permeates the mass, and as the level of the water rises in the said receptacle opens any pockets confining oil and grease in the mass and having formed by a gathering together of solid pieces of the mass, and consequently liberates any oil and grease still remaining within the mass and enables and facilitates the rise of such grease and oil to the top of the mass. The water thus supplied to the chamber of the receptacle A is at the ordinary temperature or at a temperature at least less than 212° Fahrenheit, so as to positively avoid ebullition and emulsification upon contact of the said water with the mass. When the grease and oil have practically all been extracted from the material treated within the receptacle A and conducted from the mass through the interior chamber of the dome *a* and the connected pipe K, the supply of water to the receptacle A through the pipe L is cut off by interrupting the operation of the pump *m* and closing the valve *l*, and the pneumatic pressure upon the mass is interrupted by closing the valve *h* and opening the valve 32 of the pipe 30, and the water and any solution—such, for instance, as a solution of gelatin—is drained from the said receptacle through the pipe N upon opening the valve *n*, and the flow of liquid to the said pipe N is facilitated by operating the shaft Q to disintegrate or stir the material, because any water or liquid which may be confined in pockets formed in the mass is liberated upon breaking or opening such pockets by stirring the mass.

The arrangement of the head *f* next below the bottom of the aperture 36 of the casing of the duct F prevents liquid remaining within the said duct and upon the said head after the draining of liquid through the pipe N.

When the free and drainable water or liquid remaining with the mass after the interruption of the pneumatic pressure upon the mass has been drained, as aforesaid, the suction-creating device *y* is operated to create suction within the interior chamber of the dome *a* and pull off any vapors and gases entering and rising within the said dome and facilitate the passage of gases and vapors from the residue remaining in the receptacle A. The said residue is heated and dried within the receptacle A, and any free moisture contained and held by the said residue and not drained through the pipe N is evaporated and escapes in the form of vapor through the pipe 30. When all of the free moisture contained or held by said residue has been eliminated, the operation of the suction-creating device *y* is interrupted, and heated air is admitted and distributed throughout the mass in quantities sufficient to materially participate in oxidizing and granulating the mass. Heated air is thus admitted to the mass upon opening the valve *t*, so as to cause hot air under pressure to pass from within the upper head R of the hot-air holder through the branch pipe T and through the pipe P into the passage-way 13 interiorly of the shaft Q and thence through the interior passage-ways 16 of the shaft-arms 15 and through the orifices 25 into the mass, and said shaft is rotated during the passage of hot air into the mass, so as to distribute the hot air throughout the mass. The temperature of the hot air thus introduced into the mass may range from 212° to 300° Fahrenheit or exceed 300° Fahrenheit, depending upon the nature of the material treated and the resulting product desired. Said mass is also preferably ozonized. This ozonizing of the material is readily effected by closing the valve *t*, if not already closed, and opening the valve *u*, whereupon ozone under pressure will pass from the reservoir *o* through the branch pipe U, and through the pipe P into the interior passage-way of the shaft Q, and thence through the interior passage-ways 16 of the shaft-arms 15 and through the orifices 25 into the mass, and said shaft is rotated to distribute the ozone throughout the mass. The introduction and distribution of ozone within

the mass are found to be valuable in deodorizing and oxidizing the resulting product, which, being dry and granular, constitutes a marketable product suitable for use as feed or for other purposes, according to the nature of the original material. The resulting product is removable from the receptacle A through the duct F upon removing the head *f*.

The apparatus illustrated and described in this application constitutes the subject-matter of a contemporaneous application filed simultaneously with this application and bearing Serial No. 143,570.

What we claim is—

An improvement in the art of reducing vegetable or animal matter which has been heated in a closed receptacle under a pneumatic pressure greater than the pressure resulting from the heating of the material and relieved of extracted or liberated oily or greasy matter, said improvement consisting in draining the drainable liquid portion of the mass from the mass in the said receptacle after interrupting the pneumatic pressure on the mass; stirring the mass during the draining period; then evaporating any free moisture remaining in the mass in the said receptacle, and then admitting heated air into the mass in the said receptacle and distributing the said air throughout the mass.

Signed by us at Cleveland, Ohio, this 28th day of January, 1903.

EUGENE RILEY EDSON.
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Witnesses:
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TELSA SCHWARTZ.