No. 662,405. Patented Nov. 27, 1900.

E. R. EDSON.

PROCESS OF MAKING GELATIN.

(Application filed Dec. 16, 1899.)

(No Model.)

FIG. I.

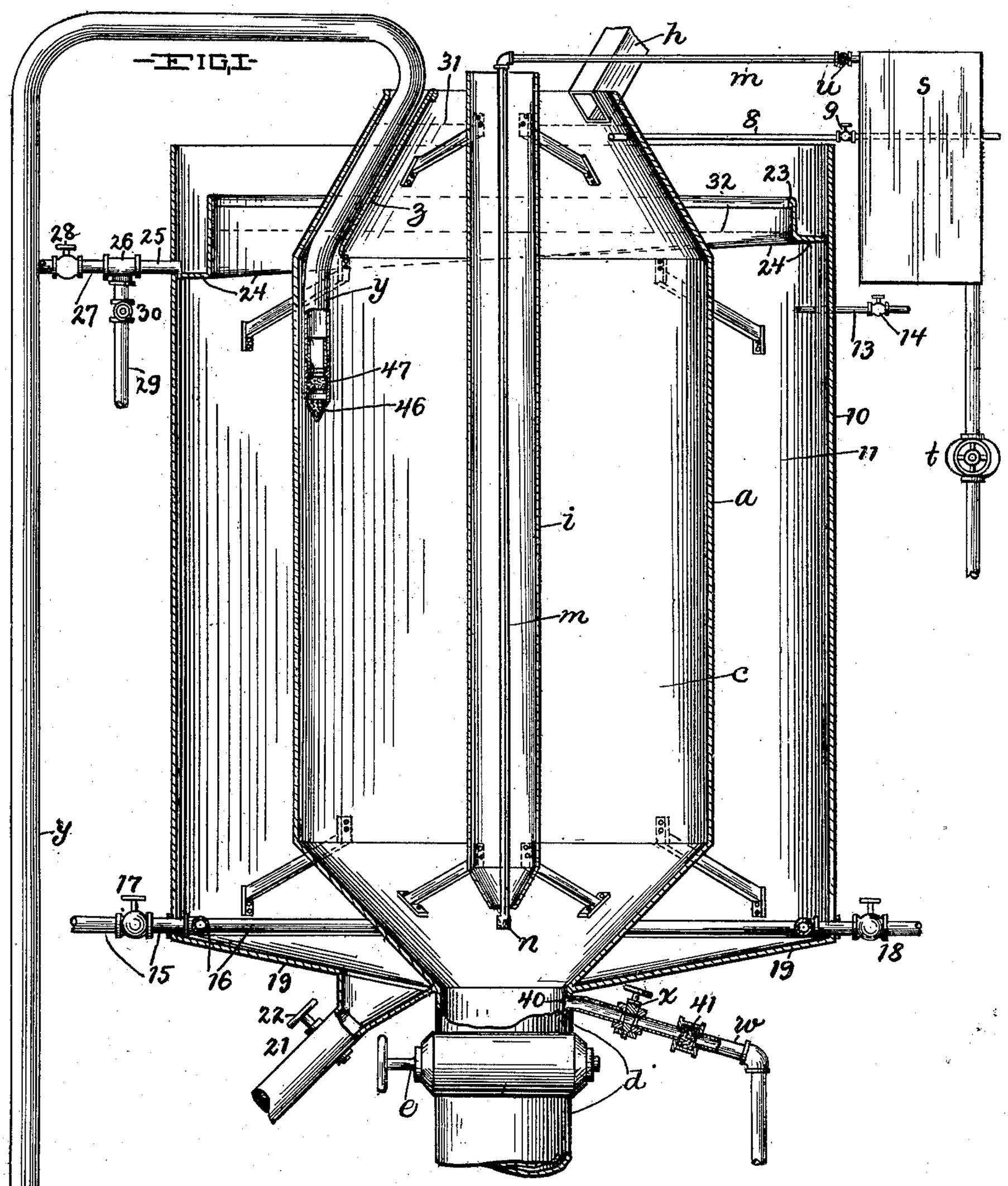
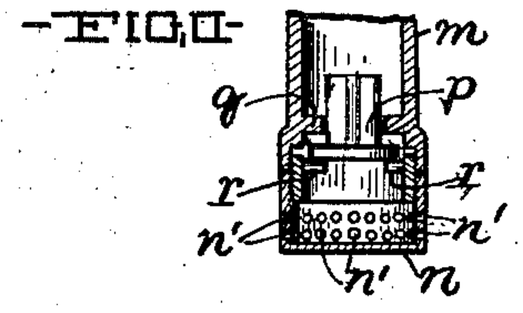


FIG. II.



WITNESSES:
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UNITED STATES PATENT OFFICE.

EUGENE R. EDSON, OF CLEVELAND, OHIO, ASSIGNOR TO THE BUCKEYE FISH COMPANY, OF SAME PLACE.

PROCESS OF MAKING GELATIN.

SPECIFICATION forming part of Letters Patent No. 662,405, dated November 27, 1900.

Application filed December 16, 1899. Serial No. 740,495. (No specimens.)

To all whom it may concern:

Be it known that I, EUGENE R. EDSON, a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in the Treatment of Fish or Parts of Fish; 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 pertains to make and use the same.

This invention relates to improvements in producing isinglass or substantially pure gelatin and glues from fish-heads and fish-bodies and other material that is capable of yielding an oil and a gelatin-producible substance.

The object of this invention is to utilize every particle of the aforesaid parts of fish or material to the best advantage.

Apparatus suitable for carrying out the process that constitutes the subject-matter of this application is illustrated in the accompanying drawings, wherein—

Figure I is a side elevation, mostly in central vertical section, of the said apparatus. Fig. II is a side elevation, mostly in section, of the lower end portion of the pipe employed for supplying air under pressure to the material undergoing treatment.

Referring to the drawings, *a* designates an upright tank or receptacle into which the fish-heads and fish-bodies or material that are to be treated are introduced. The tank or receptacle *a* has its lower end provided with a discharge pipe or outlet *d*, with which the chamber *c* of the receptacle *a* communicates. The outlet *d* constitutes the receptacle's outlet for the guano-forming residue and is provided with a valve *e* for interrupting and establishing communication from the chamber *c* through the pipe or outlet *d*. A feed-spout *h* communicates with the upper portion of the chamber *c* of the receptacle *a*.

The tank or receptacle *a* is provided centrally with a vertically-arranged or upright core *i*. The core *i* is closed at its lower end and is supported from the shell of the receptacle *a* in any approved manner. The core *i* is hollow and a pipe or pipe-line *m* for conducting air under pressure into the lower portion of the chamber *c* of the receptacle *a* extends vertically and centrally through the said core and is provided within its lower end with a check-valve *p*, as shown in Fig. II, and with a seat *q* for the inner end of the valve and with two stop-forming flanges or lugs *r* for limiting the outward movement of the valve. The valve *p* is free to move, therefore, in the direction required to establish open relation between the pipe *m* and the chamber *c* of the receptacle *a* by any pressure within the said pipe *m*, but is closed and retained closed by the pressure within the chamber *c* when there is no pressure in the pipe *m* or when the pressure in the pipe *m* becomes less than the back pressure within the chamber *c*. The pipe *m* below the path of the check-valve is provided with a cap or head *n*, that has numerous lateral perforations or orifices *n'* and forms an annular screen that prevents ingress of solid material from the chamber *c* into pipe *m* and causes the air discharged from the pipe *m* to be equally distributed in all directions laterally within the said chamber *c*. The pipe *m* extends outside of the receptacle *a* a suitable distance and is in open relation at its outer end with the chamber of a tank *s*, wherein air under pressure is stored and supplied by a suitably-operated pump *t*, that has its outlet connected with the tank *s* and has its inlet communicating with the external atmosphere. The pipe *m* is provided with a valve *u* for regulating the supply of air under pressure to the chamber *c*.

The outlet *d* of the receptacle *a* is provided with a valved drain-pipe *w* for draining from the said receptacle any glue solution accumulating in the outlet and in the lower portion of the receptacle *a* above the valve *e* of the outlet, and the passage-way from the chamber *c* through the pipe *w* is controlled by the valve *x*, with which the said pipe is provided. The pipe *w* at its receiving end is provided with a screen 40 for preventing the ingress of solid matter from the chamber *c* into the said pipe. The pipe *w* is provided also, preferably beyond the outer end of the casing that contains the valve *x*, with a filter 41, whereby the liquid that is conducted from the chamber *c* through the said pipe is purified. The receptacle *a* is provided also with an outlet for the solution that contains the

substance required to form isinglass or a higher grade of gelatin extracted from the material treated within the receptacle, and the said outlet comprises, preferably, a siphon consisting of a somewhat stiff flexible hose or tube *y*, that extends into the outer portion of the said receptacle. The siphon-forming hose or tube *y* has its receiving end provided, preferably, with a screen or strainer 46 for preventing the ingress of solid matter from the chamber *c* into the said tube, and the latter at the inner side of the screen 46 is provided with a filter 47. The screen or strainer is preferably conical or tapering to facilitate the passage of the same into and through material being treated within the receptacle *a*.

The provision of the core *i* centrally of the receptacle *a* renders the form of the chamber *c* annular around the said core. The annular form of chamber *c* is important to prevent solidifying or caking of the mass within the receptacle. If the core were omitted, the material undergoing treatment within the receptacle *a* would have a tendency to gather and cake into a solid mass within the central portion of the receptacle. The presence of the core *i* prevents such a caking or gathering of the material.

A valved water-supply pipe 8 is arranged to discharge into the upper end of the receptacle *a*.

The tank or receptacle *a* is arranged centrally of a vertically-arranged or upright tank 10, that is larger diametrically than the receptacle *a*, so as to form an annular chamber 11, surrounding the said receptacle *a*. The tank 10 extends from the lower end of the receptacle *a* upwardly to near the upper end of the receptacle *a*. The tank 10 is supported in any approved manner, and the receptacle *a* is suitably supported from and internally of the tank 10. A water-supply pipe 13 extends and discharges into the chamber 11 of the tank 10 below a trough 23, formed internally of the upper portion of the said tank. The pipe 13 has a valve 14 for controlling the supply of water to the chamber 11. A steam-supply pipe 15 extends into the lower end of the chamber 11 and there terminates in a coil 16, employed in heating the water supplied to the said chamber. The pipe 15 is provided with a valve 17 for controlling the supply of steam to the coil 16, and the coil 16 is provided, preferably, with a valved drain-pipe 18. The bottom 19 of the chamber 11 declines toward the lower end of the receptacle *a*, and the chamber 11 at the lower portion of the bottom 19 is in open relation with the valved drain-pipe 21.

As already indicated, a trough 23 is formed internally of and upon the upper portion of the tank 10 a suitable distance above the water-supply pipe 13. The trough 23 is arranged only above the outer portion of the water-receiving chamber 11 of the tank 10, and consequently the said chamber extends upwardly between the trough and the upper conical portion of the tank or receptacle *a*. The bottom 24 of the trough declines toward the trough's outlet that is formed by a short pipe 25, that has its inner end communicating with the deepest portion of the trough. Pipe 25 has its outer end connected by an elbow 26 with two valved pipes 27 and 29.

The operation of the apparatus is as follows: The material that is to be treated within the apparatus is washed or cleaned and chopped or cut into small pieces or particles and then introduced at the spout *h* into the tank or receptacle *a* after the operator has closed the valve *e* of the receptacle's outlet *d* and the valve *x* of the drain-pipe *w*. The valve *u* of the air-supply pipe *m* is normally closed. The valve 9 of the water-supply pipe 8 is normally closed. When the receptacle *a* has been supplied with a suitable amount of material to be treated, the valve 9 is opened, whereupon water will run from the pipe 8 upon the material within the receptacle *a*, and such relative quantities of water and fish are introduced into the receptacle as will prevent caking of the solid material in a vertical direction and will cause the said receptacle to be filled too near the latter's upper extremity. Preferably hot water is supplied through the pipe 8. The level of the contents within the receptacle is indicated by the dotted line 31 within the upper portion of the said receptacle. The water discharged into the receptacle *a* from the pipe 8 constitutes a solvent suitable for the treatment of the material within the receptacle. Having supplied the receptacle *a* with the material to be treated and the solvent-constituting water, the outer tank 10 has its annular chamber 11 supplied with water from the pipe 13 upon opening the valve 14 of the said pipe. The water introduced into the chamber 11 by the pipe 13 is preferably heated in any approved manner before it enters the said pipe. The desired level of water maintained within the chamber 11 is indicated by the dotted line 32 within the upper end of the said chamber. The chamber 11 having been supplied with water from the pipe 13, the valve 17 of the steam-supply pipe 15 is opened, so as to supply steam to the heating-coil 16, and the hot water supplied to the chamber 11 by the pipe 13 is quickly heated to a boiling temperature by the action of the heating-coil 16. The diameter of the receptacle *a* is preferably about two-thirds of the diameter of the tank 10. In any event the diameter or transverse area of the receptacle *a* is such relative to the diameter or transverse area of the chamber 11, and the boiling water within the chamber 11 is maintained at such a temperature that the mass of material within the chamber *c* of the receptacle *a* shall be heated to and maintained at a comparatively high temperature, but below the boiling-point. A temperature of from 150° to about 200° is desirable. A temperature as high as or greater than 212° Fahrenheit should be avoided in the

treatment of the mass of material within the receptacle *a*, because the treatment of the said material with a temperature as high as or above the boiling-point would result in the conversion of the oil that is to be extracted from the material into an emulsion and would discolor or otherwise injure the oil and destroy the congealableness of the substance to be dissolved in the water to produce gelatin upon the subjection of the solution to a suitably low temperature after its removal from the receptacle *a*. During the treatment of the material within the receptacle *a* with the solvent water at a suitable temperature below 212° Fahrenheit the scum-forming impurities that constitute the lightest portion of the mass rise first and appear and accumulate on top of the mass within the upper end of the receptacle and overflow from the receptacle's upper extremity onto the boiling water in the tank 10. Any matter escaping with the said scum from the receptacle *a* and heavier than the water within the chamber 11 of the tank 10 descends to the bottom of the said chamber, and that portion of the scum that is lighter than the boiling water is either vaporized or caused to overflow from the top of the boiling water into the trough 23, whence it passes into pipe 25, and thence is conducted off by pipe 27, and of course preparatory to the reception of the scum by the trough the valve 28 of the pipe 27 is opened, if not already opened, and the valve 30 of the pipe 29 is closed, if not already closed. The water-level maintained within the chamber 11 of the tank 10 should be such relative to the trough 23 that such portions of the scum as have not been precipitated within the boiling water nor evaporated upon the boiling water shall be at once conducted to or caused to overflow into the trough 23. The oil extracted from the material within the receptacle *a* is the next lightest portion of the mass of material undergoing treatment, and consequently rises into the upper end of the receptacle and causes any scum that has not yet overflowed from the receptacle to overflow therefrom. As soon as the scum is removed from the receptacle *a* and conducted off by pipe 27 the valve 28 of the said pipe is closed and the valve 30 of the pipe 29 opened. Oil extracted from the material within the receptacle *a* continues to rise and ultimately overflow from the upper open end of the said receptacle onto the boiling water within the chamber 11 of the tank 10. The steam rising from the boiling water through the oil floating upon the water vaporizes the impurities in the oil. Any foreign matter passing with the oil to the boiling water and heavier than the oil and water descends to the bottom of the chamber 11. The lighter impurities contained in the oil are vaporized, as already indicated, and purified oil overflows from the boiling water into the trough 23. The desired level of boiling water within the chamber 11 can be readily maintained by such a regulation of the valve 14 of the pipe 13 as will first establish a suitable level and thereupon maintain the said level during the boiling of the water by establishing a continuous flow of water from the pipe 13 into the chamber 11 equal to the quantity of water continually passing off in the form of steam during the operation of the water. The oil is floated on top of the boiling water a suitable length of time and then caused to overflow by causing more water to flow into the chamber 11 from the pipe 13. As soon as the extracted oil that has already risen has overflowed from the receptacle *a* without requiring any assistance from an external agency, or as soon as the flow of oil from the material undergoing treatment within the receptacle *a* becomes slow and rises with difficulty on account of the gradual decrease in the quantity of the oil remaining with the material, air under pressure is introduced through the pipe *m* into the lower portion of the chamber of the receptacle *a* upon opening the valve *u* of the said pipe, and obviously the provision of the said pipe with the head *n* and the latter's annular screen causes the air to be discharged laterally into every portion of the lower end of the chamber, and the air discharged from the said head rises into and disintegrates the material and forces the remaining oil or facilitates the flow of oil to the top of the mass within the receptacle *a*.

The substance extracted from fish material and dissolving in the solvent-constituting water is suitable for the production of various grades of gelatin and may properly be denominated a "gelatin solution." Fish-heads and fish-bodies contain a gelatin-producible substance of various grades—such, for instance, as matter suitable for the production of isinglass or substantially pure gelatin, and other matter convertible into the lower grades of gelatin—such, for instance, as glues. Fish material of this character may be subjected to two or more treatments within the receptacle *a* and several runs of gelatin solution from the receptacle taken. Suppose the first run of liquid were suitable for producing a high grade of gelatin—such, for instance, as isinglass. This run would be effected through the hose or tube *y*. If the second run of liquid from the receptacle were suitable for producing a high grade of glue, the same may be drained from the receptacle *a* through the hose or tube *y*, but kept separate from any purer liquid previously drawn from the receptacle or drained through the pipe *w*. A third or fourth run of liquid from the receptacle *a* will generally yield a lower grade of glue-producing product and is effected through the pipe *w*. In other words, the tube *y* is the receptacle's outlet for the liquid from which high grades of gelatin are obtained, while the pipe *w* constitutes the receptacle's outlet for the liquid from which lower grades of gelatin are producible. The siphon-forming tube *y* is introduced first into the upper

portion of the mass within the receptacle *a* and is gradually fed downwardly in the receptacle *a* as the level of the gelatin solution descends within the mass during a run of solution from the receptacle *a*. The gelatin solution largely forms or appears within the outer portion of the chamber *c*, and hence the tube *y* by means of a guide *z* is introduced and guided into the said portion of the chamber. As already indicated, the liquid that is conducted from the receptacle through the tube *y* is strained by the strainer or screen at the receiving end of the said tube and cleaned by the filter within the said tube, and the liquid that is drained from the receptacle *a* through the pipe *w* is strained by the screen or strainer at the receiving end of the said pipe and filtered by the filter within the pipe.

The operation of the apparatus may be continued by so regulating the valve 9 of the water-supply pipe 8 or opening the said valve at suitable intervals of time as to maintain such a level of the mass of material within the receptacle *a* or to establish the desired level as will accommodate a continuation of the flow of oil from the upper end of the receptacle *a* until all or substantially all of the oil has been extracted from the fish material and until all or substantially all of the substance useful in the production of gelatin has been separated from the solid material. The residue remaining in the chamber *c* of the receptacle *a* after the separation of the desired oil and the gelatin-forming substance from the mass within the said chamber is drawn off through the outlet *d* upon opening the valve *e* and forms guano or fertilizer.

Any solid matter that has accumulated upon the bottom 19 of the chamber 11 of the tank 10 is removable from the said chamber through the pipe 21 upon opening the valve 22 of the said pipe.

The subject-matter of this application consists more especially in the process adapted to be carried out by means of hereinbefore-described apparatus and comprising the treatment of the fish-heads and fish-bodies within the receptacle *a* with the solvent-constituting water at a comparatively high temperature, lower, however, than 212° Fahrenheit, for several hours, preferably about three hours. During the said treatment of the mass the oil, being lighter than the gelatin solution, overflows from the receptacle *a* in the manner hereinbefore described. The solvent-constituting water becomes saturated during the aforesaid period of three hours with gelatin-forming substance extracted from the solid matter of the mass of material, and the first run of the resulting saturated solution is effected by the operation of the siphon *y*. The first run of gelatin solution is suitable for the production of pure or substantially pure gelatin—such, for instance, as isinglass—and is congealed or solidified by subjecting it to a temperature lower than 50° Fahrenheit—for instance, a temperature of from 33° to 44° Fahrenheit—a temperature that will not disintegrate the gelatin solution or convert the solution into an emulsion and that will not reconvert the same into a liquid state, and the solidified or congealed product is maintained at the said comparatively low temperature until the product is sufficiently dry, and the drying of the product may, if desired, be assisted by artificial means—such, for instance, as a blast or current of air. The siphoned solution is preferably run into vessels that are placed in the cooling-chamber of a refrigerator wherein the solution is congealed. The material remaining in the heated receptacle a^2, from which one run of oil and one run of gelatin solution has taken place, is again treated with water that is added to the said material, and this second mass is heated to a comparatively high temperature below the boiling-point, preferably a temperature of from about 150° to about 200° Fahrenheit, and maintained at this temperature for two or three hours or longer, during which time oil will flow from the solid material and ascend and accumulate on top of the mass, when the oil overflows. During this period of time the water of the mass will have become saturated with a substance that is convertible into gelatin, and the solution is drained from the mass in any approved manner. The withdrawn solution that constitutes the second run from the receptacle *a* is then exposed to a low enough temperature, preferably from 33° to 44° Fahrenheit, to congeal or solidify the product and is maintained at this temperature until the product has become sufficiently dry. I would remark also that during the second treatment of the solid matter of the mass to extract the gelatin-forming substance therefrom an air-blast or currents of air are preferably introduced into the lower portion of the mass by the pipe *m* upon opening the valve *u* of the said pipe, and this air under pressure assists in the liberation of oil from the solid material and facilitates or assists the rising of the oil to the top of the mass, and the mass is preferably allowed to settle after the use of air, as aforesaid. Having had a second run of oil and a second run of gelatin-forming solution from the mass, the material remaining in the heated receptacle is again treated with added water at a comparatively high temperature below the boiling-point, preferably a temperature of from about 150° to 200° Fahrenheit, and maintained at this temperature for several hours, preferably from three to six hours, during which time oil has again accumulated on top of the mass and overflows. During the said period of from three to six hours air under pressure is freely introduced into the lower portion of the mass for the purpose of disintegrating the solid matter of the mass and facilitating or assisting the ascension or flow of oil to the top of the mass, and the solid matter after the disintegration is allowed to settle a suitable length of time. Preferably from one to

two hours settling are allowed, especially if the parts of fish originally introduced into the receptacle consisted entirely or largely of fish-bodies. The solution formed during the third treatment of the material within the receptacle *a* is a glue solution and is drained or withdrawn from the lower end of the receptacle by opening the valve *x* of the pipe *w*, and after its withdrawal or removal from the receptacle is exposed to a low or congealing temperature, preferably a temperature of from 33° to 44° Fahrenheit, that is capable of congealing or solidifying the product without disintegrating or injuring the same, and the congealed product is exposed to the said low temperature until it has sufficiently dried. The residue remaining in the receptacle is thereupon removed or withdrawn from the receptacle and is suitable for use as guano or fertilizer.

The carrying out of my improvements in the production of gelatin and oil from fish or the parts of fish involves the use of a body of boiling water surrounding the receptacle containing the material undergoing treatment, which body of water performs the function of desirably heating the material within the receptacle and receives and floats the oil overflowing from the receptacle.

The apparatus illustrated in the drawings and employed in carrying out the improvements that constitute the subject-matter of this application is disclosed and claimed in application, Serial No. 736,401, filed by me in the United States Patent Office November 9, 1899.

What I claim is—

1. An improvement in the treatment of material of the character indicated, to produce gelatin and oil, comprising the treatment of the material with a suitable liquid at a suitable temperature, overflowing the oil issuing from the material and draining the gelatin solution from the mass, then suitably treating the remaining material with additional liquid and disintegrating the mass during the last-mentioned treatment, then permitting the mass to settle, and then again separately withdrawing oil and gelatin solution from the mass.

2. An improvement in the treatment of material of the character indicated, to produce gelatin and oil, comprising the treatment of the material with a suitable liquid at a comparatively high temperature lower than 212° Fahrenheit, then separately removing oil and gelatin solution from the mass, then treating the remaining material with additional liquid at a suitably high temperature lower than 212° Fahrenheit, and disintegrating the mass during the last-mentioned treatment, then permitting the mass to settle and then again withdrawing oil and gelatin solution therefrom.

3. An improvement in the treatment of material of the character indicated, to produce gelatin and oil, comprising the treatment of the material with a suitable liquid at a suitable temperature, and overflowing the oil and draining the gelatin solution from the mass, then suitably treating the remaining material with additional liquid and introducing air into the mass, then permitting the mass to settle and then again withdrawing oil and gelatin solution therefrom.

4. An improvement in the treatment of material of the character indicated, comprising the treatment of the material with water in a receptacle arranged within and centrally of a body of boiling water incapable of heating the mass to a temperature as high as 212° Fahrenheit, and thereby uninjurably extracting the oil and the gelatin-producible substance from the material, permitting the oil to rise within the mass, and then separately removing the oil and the gelatin solution from the mass, substantially as and for the purpose set forth.

5. An improvement in the treatment of material of the character indicated, consisting in treating the material within a receptacle surrounded by a body of boiling water and introducing air under pressure into the lower portion of the mass within the said receptacle during the treatment of the material, substantially as and for the purpose set forth.

6. An improvement in producing gelatin and oil from material of the character indicated, consisting in treating the material with water within a receptacle for several hours at a comparatively high temperature lower than 212° Fahrenheit, and overflowing oil and draining gelatin solution from the receptacle; then adding more water to the remaining material and treating the latter at a comparatively high temperature below the boiling-point and introducing air into the lower portion of the receptacle during the last-mentioned treatment, substantially as and for the purpose set forth.

7. An improvement in producing gelatin and oil from the material of the character indicated, consisting in placing the material with water within a receptacle and suitably heating the mass and thereby extracting oil and gelatin-producible substance from the material and permitting the extracted oil to rise within the receptacle and siphoning the gelatin solution from the receptacle below the risen oil, then adding water to the material remaining in the receptacle and again suitably heating the material and the added water and again draining gelatin solution from the receptacle, and then again adding water to the material still remaining in the receptacle and treating the said remainder at a suitable temperature and disintegrating the mass during the last-mentioned treatment, substantially as and for the purpose set forth.

8. An improvement in producing gelatin and oil from material of the character indicated, consisting in treating the material with water within a receptacle at a suitable tem-

perature below 212° Fahrenheit for a few hours, and overflowing the oil and siphoning the gelatin solution from the receptacle; then adding water to the material remaining in the receptacle and treating the said remaining material at a suitable temperature below 212° Fahrenheit and again draining gelatin solution from the receptacle, and then again adding water to the material still remaining in the receptacle and treating the said remainder at a suitable temperature for several hours and introducing air under pressure into the lower portion of the mass of material, substantially as and for the purpose specified.

9. An improvement in producing gelatin from fish parts or other material containing oil and a substance that is convertible into gelatin, consisting in treating the material with water within a receptacle at a comparatively high temperature lower, however, than 212° Fahrenheit, and permitting the oil to rise within the receptacle and removing the risen oil, and draining the water and the substance, that has dissolved in the water and that is convertible into gelatin, from the receptacle, and then exposing the gelatin solution to a temperature low enough to congeal the same without disintegrating the congealing liquid, and permitting the resulting product to dry at the said lower temperature.

10. An improvement in producing gelatin from fish parts or other material containing oil and a substance that is convertible into gelatin, consisting in treating the material with water within a receptacle at a comparatively high temperature below 212° Fahrenheit until the water has saturated with the substance convertible into gelatin, and permitting the oil to rise within the receptacle and then removing the oil from the receptacle, and draining the aforesaid saturated solution from the receptacle, and then exposing the said solution to a temperature below 50° Fahrenheit until the liquid has congealed or solidified and dried, substantially as and for the purpose specified.

Signed by me at Cleveland, Ohio, this 31st day of October, 1899.

EUGENE R. EDSON.

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