W. CONWAY.

GARBAGE PRESS.

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1,130,149. Patented Mar. 2, 1915.

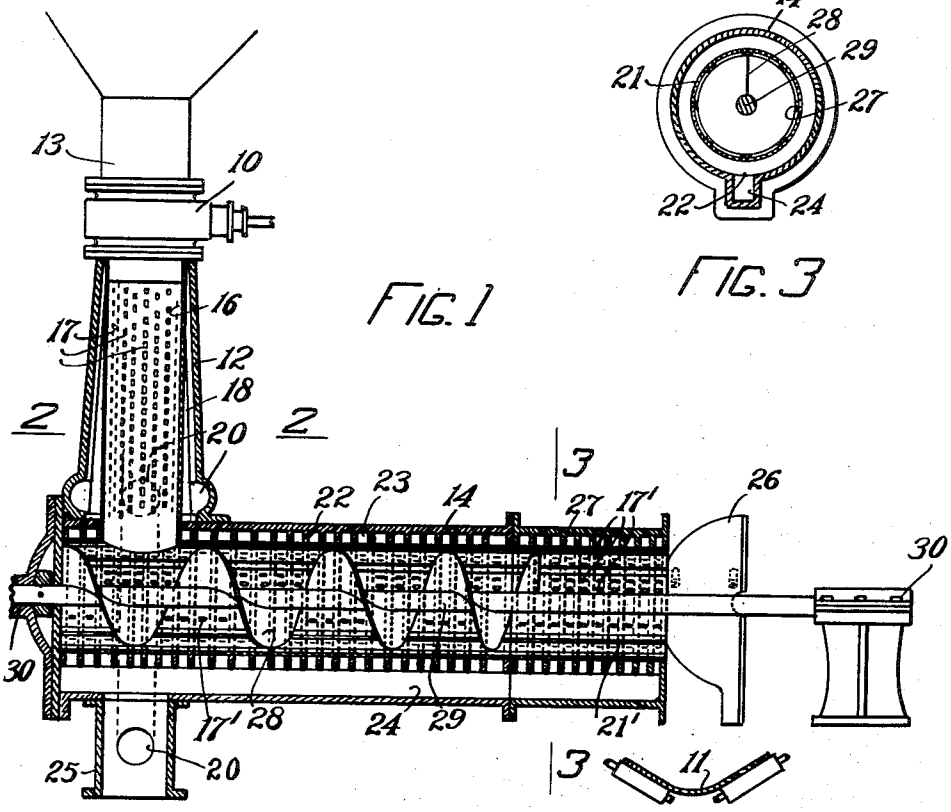


FIG. 1

FIG. 3

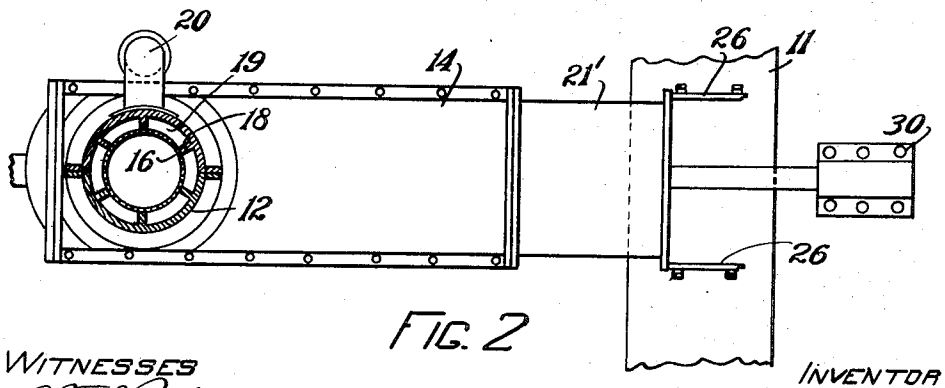


FIG. 2

WITNESSES

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GARBAGE-PRESS.

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To all whom it may concern:

Be it known that I, WILLIAM CONWAY, a citizen of the United States, residing at South Boston, in the county of Suffolk and State of Massachusetts, have invented new and useful Improvements in Garbage-Presses, of which the following is a specification.

This invention relates to improvements in apparatus for separating water out of pulp and the like.

More particularly it is shown as it may be used in the commercial and sanitary disposition of garbage. It is customary to "cook" garbage in order to break up the woody or other cellular structure of the materials composing it. This cooking, which is effected with the aid of added water, produces tankage in the form of a sloppy mass containing a very large portion of water. It is desirable to separate this water from the solids, and to reduce the tankage to a mass as dry as may be, so that its grease can be effectively extracted. As this is done with gasolene or other solvent, which water repels, the importance of eliminating the water is manifest.

It is the object of the present invention to improve upon apparatus heretofore used for this purpose in order to produce a drier product and a more rapid and less expensive carrying out of the process, and apparatus that is less expensive to build and has a larger output relative to its size and cost than previously known apparatus. An increased effectiveness of separation, as manifest by the greater dryness of the product of the apparatus, reduces the cost of subsequent processes in the treatment of garbage, because it lessens the time and temperature requisite for further drying by evaporation and diminishes the cost of treatment by gasolene. The continuous action of the apparatus with automatic feed and discharge diminishes the cost of labor for attendance. A high efficiency of operation, by which is meant the obtaining of a relatively dry product at a relatively low expenditure of power and of time, makes a saving both in labor and supplies and in cost of apparatus and in requisite capital, overhead charges, etc., which in an installation of any considerable size, may amount to a large sum annually. The machine of the present invention is intended to effect improvements of this sort; and it accomplishes this purpose by providing improved means for the handling of the water, for separating it from the solids suspended in the liquid mass, and for utilizing those solids themselves to aid in separating the water, and for making a press by which a remaining proportion of water is forced out, to any desired degree of dryness within reasonable limits, without undue expenditure either of power or of time.

The apparatus by which this invention is carried out, as here illustrated, includes a horizontal cylindrical chamber containing a screw adapted to force the residual solids progressively onward, and to compress them in a compacted mass at the wide-open discharge end of the cylinder. Provision is made for the automatic and progressive separation of water from the solids in the mass of cooked garbage before they reach this cylinder, and for facilitating the escape of water during progress through this cylinder, under the action of agitation while the mass is loose, followed by pressure with provision for easy escape of the water before the ultimate discharge of the solids through the open end. The pressure is generated by the coherence of the mass itself, co-acting with the structure of the end portion of the cylindrical chamber, whose walls are such as to provide cumulative frictional resistance to the advance of the solidified mass.

Other features will appear hereinafter.

One embodiment of the invention is shown in the accompanying drawings, but variations from the form thus shown may be made within the scope of the appended claims; and the purpose of the patent is to cover in the claims whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings: Figure 1 is a side elevation of apparatus embodying the invention, in medial section; Fig. 2 is a plan of the same in section on the line 2—2 of Fig. 1; Fig. 3 is an end view of the same in section on the line 3—3 of Fig. 1.

The apparatus may be associated with one or more tanks, with or without an intermediate receiver, of any suitable type in which the garbage is cooked, from which the tankage flows, through valve 10, to the apparatus illustrated in the drawings.

Referring to the drawings, it will be seen that the apparatus has two main portions, viz., a vertical settling-separating chamber

12 and a horizontal screw and pressure separating chamber 14. These two are interconnected; and when the entrance valve 10 is open there is ordinarily a free passage for material from the discharge pipe 13 from the cooking tanks or receiving tank where material enters, to the full-sized open end of the horizontal chamber, where the solids pass out and fall upon the conveyer 11 to be removed. In normal operation the valve 10 may stand open continuously, admitting fluid as fast as the apparatus will take it. All the way from the beginning to the end the mass is gradually losing its water. At first it is highly fluid and flows rather rapidly, but the rate of movement and the fluidity of contents become gradually less until at the end of the chamber 14 only the solids are left, and these are packed in a mass and fall out in irregular quantities upon the conveyer 11.

The construction by which there is a progressive removal of water is one of the features of the invention. The receiving chamber 12 has a large vertical tube or tubular screen 16 which may conveniently be made of stout sheet metal and which has a vast number of perforations 17. It is necessary to exaggerate these perforations in the drawings but it will be understood that they may be of any suitable form and dimension, preferably rectangular or oval, and narrow enough to prevent outflow of solids suspended in the liquid. This tube is surrounded and supported by ribs 18 which project inward from the wall of the chamber 12 and bear against the outer surface of the tube, the grooves or spaces 19 between the ribs being open for flow of water down to a manifold 20, through which water that has passed out through the perforations 17 may flow out from the apparatus. The chamber 12 is preferably an iron casting, and may be slightly conical, in order to provide greater carrying capacity for the lower parts of the grooves 19, while the perforated tube and the inner faces of the ribs 18 are cylindrical. Thus the central tube is supported and reinforced, so that it may be made of relatively thin metal with proportionately small perforations, if desired. The casting 12 may, if desired, be made in two parts, divided longitudinally, bolted together, and separable for cleaning or change of the tube. The interior of this vertical perforated tube communicates directly with the supply pipe 13 (through valve 10) and with the interior of the horizontal perforated tube or tubular screen 21, which may be likewise of sheet metal. This last is within the chamber 14, and is supported by ribs 22 which preferably extend circularly around it and bear against its exterior, supporting it on all sides. The tube 21 has perforations 17′ preferably of oval or elongated form, communicating with the grooves or spaces 23 between the annular ribs 22. These grooves all connect with the manifold 24 formed in the chamber 14 and extending longitudinally under the tube to a discharge outlet 25. The perforations are arranged in all parts of the cylindrical tube 21, extending to its very end. At its end there may be doors 26, hinged to the terminal portion of the chamber so that they close it when swung together, as will be readily understood from Fig. 2. The other end of the tube 21 is permanently closed in any suitable manner. Within it are longitudinally extending thin slats 27, fixed at intervals around the circumference, and there is also a screw conveyer 28 mounted on a shaft 29 which may be supported in suitable bearings 30 at each end of the machine. The doors 26 are cut out suitably at their centers so that they can close the end of the tube 21 notwithstanding the presence of this shaft. The screw begins under the vertical settling chamber 12 and has a pitch which gradually becomes shorter until the screw terminates at a little distance from the discharge end of the tube 21.

In operation, when the valve 10 is open the matter will flow into the apparatus, which will keep itself filled, taking fluid from the supply pipe 13 automatically as fast as it has cared for that previously taken. Solid material tends to sink down through the liquid in which it is suspended in the settling tube 16. Water in that tube is free to flow out through the lateral perforations 17. In so doing it tends to carry with it the solid matter which is suspended in it; and this results in the clogging of the entrances to the perforations with solid matter, through which the water seeps gradually and continuously, the solid matter which clogs the perforations thus acting as a strainer to prevent the outflow of other solids, and allowing nothing to pass but water which has been through it by a process more or less resembling dialysis. The height of the chamber 12, and of the fluid standing in the pipe 13 and tanks above it, holds the matter under a certain head which provides pressure tending to force the water out, the pressure being greater at the lower perforations, including the perforations 17′ in the horizontal chamber where the fluidity of the mass is less and the accumulation of solids greater. The perforations ought to be small enough to prevent escape of any material quantity of solid matter while permitting as free a flow of water as may be. The accumulations of solids that form about the perforations 17′ in the horizontal tube are repeatedly swept away or reduced by the rotation of the screw 28, which passes as close to the tube as the longitudinally extending slats 27 will admit. If such strips be

about one-fourth of an inch in thickness it will be seen that enough solid matter will be left at each perforation to produce the straining effect while accumulation of too much is prevented. At the same time the surplus accumulation is forced longitudinally along the horizontal tube 21 because of incline of the screw face and because the slats 27 deter the matter which is pressing against the screw face from rotating with the screw. As this action progresses the solidity of the contents gradually increases, because of the escape of water. The variation of the pitch of the screw provides for the slower advance of material which has more nearly reached the place where the solids are compact together, and where, consequently the escape of water is slower. The terminal pitch of the screw may be even shorter if deemed advisable, thus providing for a higher degree of compression, but any excess of material brought up by the screw is free to slip back through the quarter inch space between the edge of the screw and the interior surface of the cylinder 21, or may slip back through the trough of the screw itself, as the material behind it is loose enough to permit of the screw turning idly when pressure is sufficient.

In the initial operation of the machine the doors 26 are closed. Solids then accumulate in the portion of the chamber between the end of the screw and these doors. In a properly designed machine the pitch of the screw and the dimension of other parts will be such that enough moisture has escaped from those parts of the contents which have progressed to the end of the screw so that the mass at the end of the screw can slip back past the screw only with great difficulty, and ordinarily not at all; with the result that the repeated accretions of solid matter to that which is already in the tubular space beyond the end of the screw, which for convenience will be termed 21′, rapidly fill that space; and further additions compact and compress the matter therein. The fact that the perforations surround this compacted matter on all sides permit the water therein to exude under this pressure and to escape easily from the tube, so that the mass becomes both drier and more compactly solid. At the same time portions of it project into the perforations 17′ under stress of the pressure from within. The doors 26 may then be opened, and may thereafter be left open. Continued revolution of the screw brings up fresh matter which is compacted in layers as delivered by the screw-end. The matter already compacted constitutes a sort of plug or wad, which, under pressure, expands into the perforations 17′ and so renders the progress of the mass through this part of the apparatus difficult because of the frictional resistance engendered by the holes 17′. This sets up sufficient resistance to act as a substitute for that which was originally afforded by the doors 26, so that the accretions delivered to this part of the chamber by the screw 28 are compressed strongly against the mass that is already contained there. The degree of this pressure will depend upon the length of the portion 21′ and the number, size and arrangement of the perforations therein, being greater when that portion is longer.

For treatment of different material or to get different results it may be desired to use different lengths or arrangements of perforations for this part of the tube. For that purpose the apparatus illustrated in the drawing is represented as having this part of the chamber separable from the remainder. The entire chamber 14 may conveniently be made in two parts separable on a longitudinal medial plane, thus permitting easy access to the interior. As a result, tankage which is highly fluid at the entrance valve 10, with solids in suspension, becomes separated into water which drains away through the manifolds 20 and 24, passing ultimately into the discharge 25, and into a solid crumbly mass, more or less stratified, which falls out of the discharge end upon the conveyer 11 and is carried away as a solid to a place where it may be subjected to a drying operation for further removal of moisture. This solid may have its moisture removed to any desired extent, within certain limits, depending upon the intensity of pressure applied in the terminal portion 21′ and depending also upon the character of the material and upon the size and frequency of the perforations 17′. Under ordinary compression of an unorganized mass, every particle of water is compressed in its own place, wherever it may be. The stratified character of the mass in this terminal portion 21′ permits moisture to work its way more readily from the interior. This applies both to such of the free water as may have remained and also to such water or moisture as may be within the cellular structure of the solids in the mass. The previous cooking has destroyed this cellular structure to a greater or less extent; and the mechanical pressure to which it is now subjected breaks it down further so that some of the contained moisture escapes.

It will be understood that moisture cannot actually leave the mass except through the perforations in the tube; and that moisture must first get near those perforations before it can pass out through them. The overturning and general mixing which occurs in the middle portion of the screw, where the mass has largely lost its fluidity brings fresh portions constantly into prox-

imity to the perforations, thus permitting such escape of moisture from all parts of the mass; while in the terminal portion the stratified formation, coupled with the longitudinal direction of pressure, permits the water near the perforations to escape, and other water to work its way along to the place where the escaped water was, and thence out, without having to pass through the cells or the membranes thereof as it would if the mass were not organized with some degree of stratification.

Under the high pressure which is easily obtainable in the terminal portion of the tubular screen in this apparatus, a larger proportion of grease is expressed from the solids than in any press which I have known to be used before this. This flows out with the water and is later recovered without extra cost when the water is brought to rest in tanks in order to float the grease which passed out with the water from the more fluid state of the matter. Whatever grease is gained at this stage reduces the amount to be removed from the solid residue by chemical solvents. The superior dryness of the residue as compared with that of other types of garbage presses, permits the subsequent drying, preparatory to treating with a chemical solvent, to be carried out at a lower temperature and this saves some grease which otherwise goes to waste by evaporation before the water has gone, when the high temperature is used.

It will be understood that the dimensions and proportions of the apparatus may be varied at will and that variations in other respects may be made from the precise form of apparatus illustrated.

It is believed that for the ordinary purposes of the handling of garbage a diameter of twenty inches is suitable for the vertical tubular screen, 16, and thirty inches for the screw and horizontal tubular screen. These dimensions have the advantage that while large enough to pass rags, stones and all other foreign matter that is likely to occur, they are small enough so that barrel staves which occasionally occur, have to lie more or less longitudinally and so cannot form a bridge on which rags and other articles might gather and choke the passage. The height of the preliminary chamber gives a considerable area of screening through which water can seep out, so that the fluidity of the mass is materially reduced by the time it reaches the horizontal chamber, thus making the screw effective to advance it; and the height at which water stands in this and in the pipe and tank above it produces a static head, or pressure, on the semi-solid matter in the horizontal tube which causes water to be expressed therefrom in all directions, and assists in the compacting of the mass at the end. The terminal portion 21′ may be designed to produce various degrees of pressure, and to do this within various lengths of tubing. A designer may well bear in mind, however, that the passage of water from the interior of the mass to the vicinity of the perforations will proceed with less expenditure of power if sufficient time be allowed. This is one reason for preferring a design in which the terminal portion is relatively long so that the motion of the mass through it is rather slow, thus giving its water a longer time to work its way out.

I claim as my invention:

1. Apparatus for separating water out of a pulpy mass, comprising the combination of a chamber having means for continuous separation of water and its escape by gravity; another chamber into which the first discharges the unseparated matter, having means for continuous separation and escape of water and having a continuously open outlet for the residue; and means in the second chamber to propel the mass toward said outlet while the water is gradually escaping from it; the whole being organized and arranged so that the solids become compacted together under pressure before reaching said outlet and at a place having the said provision for escape of water.

2. Apparatus for separating water out of a pulpy mass, comprising the combination of two chambers constantly connected and constantly open at inlet and outlet in normal operation, each having means to separate the water from the solids and the second chamber having an open outlet for the solid residue; and means in the second chamber to propel the mass toward said outlet; the whole being organized and arranged so that the solids become compacted together under pressure before reaching said outlet and at a place having the said provision for separation of water.

3. Apparatus for separating water out of a pulpy mass, comprising the combination of a chamber extending downward and provided with a screen through which the water but not the solids may escape laterally, and another chamber into which the residue of the first chamber is discharged extending horizontally and having a screen through which water but not the solids may escape; means therein for propelling the mass along the surface of the screen; the said second chamber having an open end for escape of the solid residue and having a portion between said open end and the end of said propelling means wherein the residue is compacted together and retarded and its moisture expressed through said screen.

4. Apparatus for separating water out of a pulpy mass, comprising the combination of a chamber through which material passes downward having a screen through which

water but not solids escape laterally; another chamber into which the first discharges, extending horizontally, and having a screen, for escape of water but not solids; a screw conveyer in the second chamber; the end of the second chamber being open for escape of solids and the screen thereof extending between the end of the conveyer and the end of the chamber whereby the escape of water continues under pressure of the screw against the material compacted at the end of the screw.

5. Apparatus for separating water out of a pulpy mass including in combination a chamber, a tubuluar screen therein, a screw conveyer within the screen, and slats on the inner surface of the screen extending longitudinally thereof, the screw fitting close to the slats.

6. Apparatus for separating water out of a pulpy mass, including a screen, through which water but not solids may escape, arranged so that the mass moves past it with water seeping out through solids accumulated on its surface; the said screen having a portion which extends approximately vertically, the action of gravity tending to clear solids from its surface, and having another portion arranged to be passed by the residue; combined with means moving over the surface of the second portion to prevent the accumulation thereon of more than a predeterminate thickness of solids.

7. Apparatus for separating water out of a pulpy mass, including in combination a chamber having a top entrance and a bottom discharge, both of which are constantly open in normal operation; a lateral screen through which water but not solids may escape, the said solids settling by gravity to the said discharge; and means continuously operating on the mass discharged from said chamber to separate water therefrom through a screen and by pressure.

8. Apparatus for separating water out of a pulpy mass, comprising the combination of a chamber having provision for lateral escape of fluids and simultaneous settling of solids, thereby materially reducing the fluidity; a second chamber arranged to receive the said solids from the first by gravity; a screw in the second chamber adapted to convey through it a mass that is becoming more nearly solid; an open outlet whence the solidified mass may escape by gravity; and means on the way along for the gradual escape of water.

9. Apparatus for separating water out of a pulpy mass, including in combination a tubular screen, a rigid-walled chamber surrounding it, having ribs supporting it externally, the tube formed by the screen having an open and unobstructed interior for the flow of the pulpy mass in continuous body through it under pressure of a supply column of said mass above it, the spaces between the said ribs constituting channels for passage of water forced through the screen by the said head of pressure.

10. Apparatus for separating water out of a pulpy mass comprising the combination of a vertically extending tubular screen and a horizontally extending tubular screen, the former discharging into the latter; a rigid chamber surrounding the first having ribs extending inward to support it and channels between said ribs for flowage of water that escapes through the screen, a manifold with which the bottoms of all of said channels connect, a rigid walled chamber surrounding the second screen having annular ribs extending inward to and supporting the said second screen and a manifold joining the channels between said ribs, through which water flowing out through the second screen may escape.

Signed by me at Boston, Mass., this tenth day of July, 1914.

WILLIAM CONWAY.

Witnesses:
EVERETT E. KENT,
ANNA B. LINDSAY.