D. R. YARNALL.

INCLINED ROTARY DIGESTER AND EXTRACTOR.

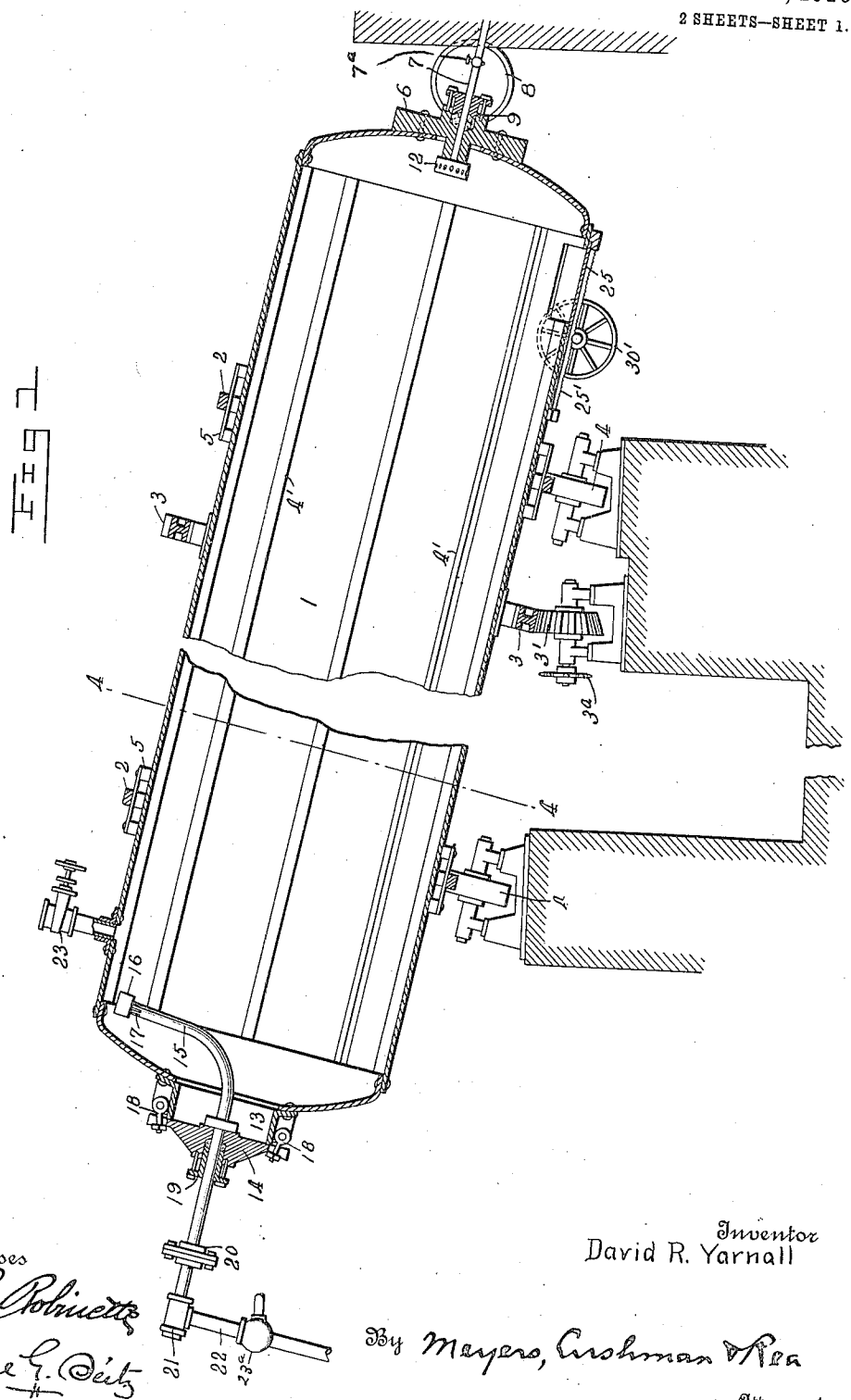
APPLICATION FILED APR. 12, 1907.

952,224.

Patented Mar. 15, 1910.

2 SHEETS—SHEET 1.

Fig 1.



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2 SHEETS—SHEET 2.

Fig 4

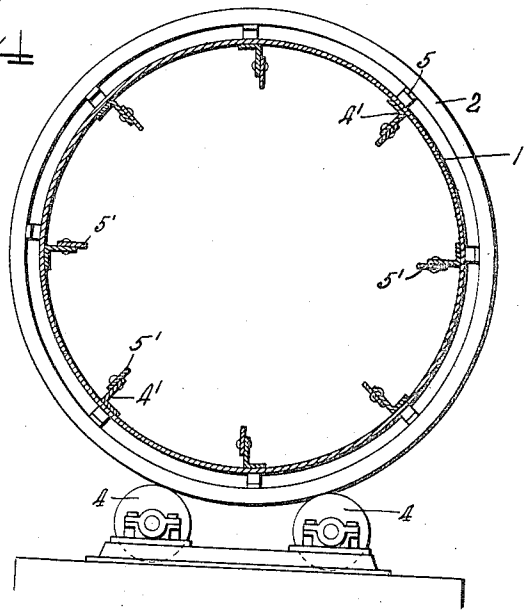
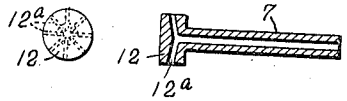


Fig 3



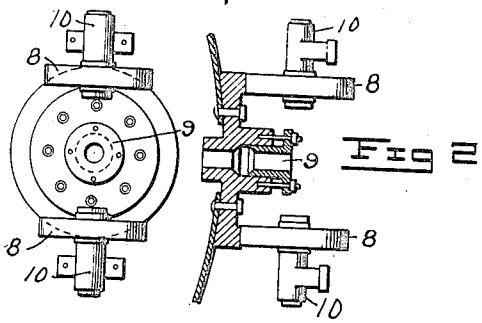
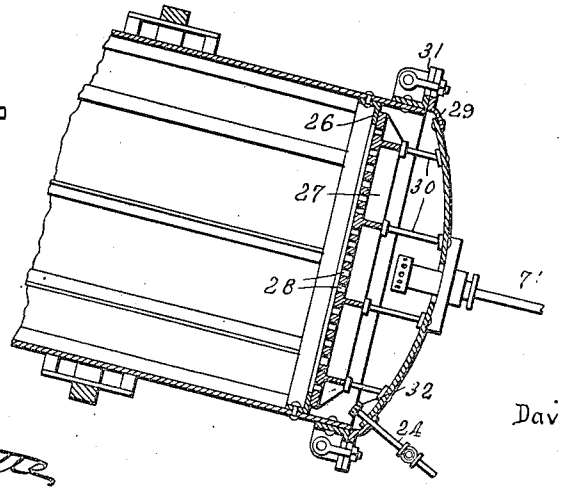


Fig 2

Fig 5



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DAVID ROBERT YARNALL, OF PHILADELPHIA, PENNSYLVANIA.

INCLINED ROTARY DIGESTER AND EXTRACTOR.

952,224. Specification of Letters Patent. Patented Mar. 15, 1910.

Application filed April 12, 1907. Serial No. 367,780.

To all whom it may concern:

Be it known that I, DAVID ROBERT YARNALL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Inclined Rotary Digesters and Extractors, of which the following is a specification.

My invention relates to apparatus for digesting or treating certain kinds of material, or for extracting therefrom certain products, and more particularly, it relates to apparatus of this character in which the material is fed into one end of a closed casing, and discharged from the other end, after being treated.

My invention is particularly designed for use in treating butcher scrap, city garbage, and the like, for the purpose of extracting therefrom certain products, such as grease, but obviously is not confined to such use, as it may be employed with equal advantage in digesting wood pulp, etc.

The object of my invention is to provide a device of the class described, by means of which the treatment of a given amount of material may be accomplished much more rapidly and conveniently than heretofore, and at the same time more effectively and economically.

With the above and other objects in view my invention consists in the construction hereinafter described, and illustrated in the accompanying drawings, in which:—

Figure 1 is a longitudinal sectional elevation, showing the complete device. Fig. 2 shows, in detail, plan and sectional elevation of the thrust bearing, hereinafter described. Fig. 3 shows detail views of the sprayer head, hereinafter described. Fig. 4 is a transverse section along the line 4—4, of Fig. 1, looking in the direction of the arrow. Fig. 5 is a fragmentary view similar to Fig. 1, and showing a modified construction.

Referring to the drawings in detail, the main feature of the device consists of a cylindrical drum, shell, or casing, 1. This is supported in an inclined position, so as to be capable of rotation. To this end the drum carries on its periphery two or more circular rails, 2, supported on expansion pads 5. These rails rest on supporting rolls, 4, suitably journaled in fixed bearings.

The drum 1 is provided with dished or dome shaped ends, to the lower one of which is riveted a circular plate 6, constituting an end bearing. This plate abuts against and coöperates with a pair of parallel rolls, 8, arranged at right angles to the plate 6, and journaled in bearings 10, carried on a fixed abutment. The plate 6 has mounted at its center a packing gland or stuffing box 9, and a fixed pipe 7 extends through and is journaled in this gland. This pipe 7 carries at its inner end a sprayer head, 12, which consists of a cylindrical head, provided with a plurality of radial passages 12^a, communicating with the pipe 7. To the other end of the drum or casing is attached a collar 13, against which seats a charging door 14, held against its seat by means of swinging eyebolts, 18, taking in notches in the door, in a well known manner. A packing gland 19 is mounted in the head or door 14, and journaled in this gland is a pipe 15, bent upwardly, and carrying at its upper end a cap 16, just below which, perforations 17 are formed in the pipe. Outside of the head 14, the pipe 15 is provided with a union, 20, which connects it, through an elbow 21, with another pipe 22, connecting with a suitable jet condenser indicated conventionally at 23^a in Fig. 1. The pipe 15 constitutes the exhaust, while the pipe 7 constitutes the supply means for the casing. A stub pipe and hand valve 23, may also be mounted in the casing, if desired.

Secured to the inside of the drum or casing, and extending longitudinally thereof are a number of baffle plates 4′, preferably consisting of angle irons riveted to the casing. As clearly shown in Fig. 4, I secure wear strips, 5′ to each of the baffle plates, and these, when worn, can be readily removed, and new ones substituted, thus greatly facilitating repairs, and reducing the cost of maintenance of the apparatus.

In the side of the casing near its lower end is mounted a discharge gate, 25, and secured thereto is a rearwardly extending rack, 25′, coöperating with a pinion (not shown) connected with a hand wheel 30′.

Means for rotating the drum or casing are provided, and, as shown, consist of a large annular pinion, 3, secured to the drum, and meshing with a pinion 3′, connected with a sprocket wheel 3^a, which, in turn, may be driven by any suitable means.

The operation of the device is as fol-

lows:—The union 20 being uncoupled, and the head 14 being removed, the material to be treated is charged into the drum either from a conveniently arranged conveyer, or by hand, through a hopper, temporarily placed in the opening. At the same time the driving means is thrown in, and the drum started revolving. The baffle plates pick up the material, as it enters, and, as the drum continues to revolve, the material is dropped, and picked up again, and dropped, each time nearer the lower end. This process continues, until the drum is finally filled, up to the edge of the door 14, and the material establishes itself along some such level as that indicated by the line A—A of Fig. 1. The driving mechanism is now thrown out of gear, and the head 14, and attached pipe, replaced and secured in position. The digester is now started revolving again, and steam is admitted to the casing through pipe 7. The sprayer head 12 causes the steam to escape in diverging jets and to throughly permeate the mass of material. In practice it is found advantageous to use reducing valves in the pipe 7, to supply superheated steam at comparatively low pressure. Any vapors or obnoxious fumes are carried off through the exhaust line 15, 21, 22; a conventional form of valve for this purpose is indicated at 7^a in Fig. 1. By having the digester inclined but slightly from the horizontal, it will be seen that there is a very small pressure on the material at the lower end, due to the weight of superposed matter, and therefore it is found in practice, that the particles are carried up and over by the steam, and thus caused to circulate, thereby bringing constantly fresh portions of the charge into contact with the steam jets. Thus it will be seen that the time for treating a charge is comparatively short. After the material is properly digested, steam is turned off, the drum stopped and relieved of all pressure, through exhaust line 15, and try valve 23, (the latter providing an auxiliary or additional pressure relief to more rapidly reduce the pressure within the digester) and the gate valve 25 opened by means of the rack and hand wheel. The contained mass then runs out into a suitable receiving tank, where the grease and water are pressed out by any well known methods. If the material tends to clog, it may be dislodged by turning the digester back and forth through 90 degrees.

In Fig. 5 I have shown a modification of my device designed for use as an extractor. In this construction, the lower end of the drum, instead of being riveted on, as in Fig. 1, is riveted to a cast iron ring, 29. This is adapted to seat against a cast iron flange 31, attached to the drum, and to be secured to said flange by means of swing or eye-bolts. To the dished head is riveted by means of stay bolts 30, a circular header, 27, perforated over its entire surface with small holes, 28. An annular internal flange, 26, preferably formed of an angle iron, is secured to the shell or drum at such a distance from the lower end thereof, that when the head is bolted on tight, the edge of the perforated header 27 will seat snugly against said flange 26. At the extreme bottom of the drum, a discharge pipe 24 is fixed in the head, and is provided with a cap 32, and perforations, similar to the pipe 15 in Fig. 1. In operation, the drum is filled with the material to be operated upon, as in the previous case, but in this case, the space between the head and perforated header is empty. A suitable solvent is now admitted through pipe 7', to any desired depth, and the device is then rotated. After the solvent has had time to dissolve out the grease or other product, the pipe 24 is opened, and the liquid run out into suitable tanks. Pressure may now be applied to the contents of the drum by admitting steam through the valve 23, (shown in Fig. 1). This pressure tends to drive out the grease held in solution in the mass through the perforated header, and from thence it flows out through the drain pipe 24. After the grease has been extracted, the lower head of the drum is removed, and the solid matter is run out into suitable receptacles.

It will thus be seen that I have provided a simple and highly efficient apparatus for the treatment of grease bearing and other material, and it is thought the many advantages of my construction will be readily appreciated by those skilled in the art.

What I claim is;—

1. In a device of the class described, an inclined drum or shell, means for rotating the same, and a thrust bearing secured to the end thereof, and supported on a pair of rollers carried by a fixed abutment, one disposed on each side of the axis of the drum.

2. In a device of the class described, an inclined cylindrical drum, means on its periphery for rotatably supporting the same, a thrust bearing secured to one end of the drum, rollers coöperating with the same, and a stuffing box carried by said thrust bearing.

3. In a device of the class described, an inclined cylinder provided with dome shaped ends, means for rotating said cylinder, a plurality of annular rails surrounding the same, rollers supporting said rails, and a thrust bearing independent of said rails carried by the lower end of said cylinder.

4. In a device of the class described, a closed, inclined, rotary casing, means for charging thereinto material to be treated, a feed pipe for supplying fluid under pressure to the center of the interior of said casing through the lower end thereof, a spray nozzle carried by said pipe, and a removable

exhaust pipe communicating with the interior of said casing at the highest point thereof.

5. In a device of the class described, an inclined cylindrical casing provided with dome shaped ends, means for rotating said cylinder, a thrust bearing secured to one end, a packing gland mounted in said bearing, a removable head secured to the other end, and a packing gland also mounted in said head.

6. In a device of the class described, a closed, inclined, rotary drum, means at the upper end for inserting a charge of material to be treated, means at the lower end of and movable with the drum for discharging such material after treatment, and means for supplying fluid under pressure to the interior of the body of the drum through the lower end thereof, so as to thoroughly diffuse the fluid through said charge of material.

7. In a device of the class described, a closed, inclined, rotary drum and means for supporting and rotating the same, means for charging material into the upper end of said drum so as to fill the lower portion thereof, a fluid supply pipe journaled in the lower end of the drum and arranged to discharge directly into the material being treated, and a removable fluid exhaust pipe journaled in the upper end of said drum, and communicating always with the highest point thereof, such point being above the level of the material being treated.

8. In a device of the character described, a closed, inclined rotary cylinder, a fluid supply pipe journaled in the lower end thereof, a head detachably connected to the upper end of the cylinder to permit changing thereof, a packing gland mounted in said head, and a fluid exhaust pipe journaled in said gland and removable with the head, said exhaust pipe having its inlet end substantially at the highest point of the interior of the cylinder.

9. In a device of the character described, a rotary inclined cylinder, a detachable head secured to the upper end thereof, said head forming an opening through which the cylinder may be charged, a packing gland mounted in said head, a pipe journaled in said gland, a union carried by one end of said pipe, the opposite end of said pipe extending within the cylinder and opening therein substantially at the highest point within the cylinder, and a perforated cap at the inlet end of said pipe, said pipe being removable with said head.

10. In a device of the class described, a closed, rotary, inclined drum, a charging door at the upper end of said drum so situated that a horizontal line through the edge thereof lies wholly above the lower head of the drum, a packing gland centrally mounted in said lower head, a supply pipe journaled in said gland, and a sprayer head carried by the end of said pipe and arranged to discharge directly into the material being treated, and below the horizontal line through said charging door.

11. In a device of the class described, an inclined casing, a packing gland mounted in said casing, a fluid supply pipe journaled in said gland, and a sprayer head secured to the end of said pipe, said head being provided with a plurality of radial openings, and located below a horizontal line through the center of said casing, whereby the fluid is discharged directly into the mass of material being treated.

12. In a device of the class described, an inclined closed receptacle having a filling opening positioned to limit the amount of space occupied by the material within the receptacle to provide a permanent space at the top of the receptacle free from the material, means for normally closing said filling opening, a feed pipe for supplying fluid under pressure to the lower end of said receptacle beneath the material, and a removable exhaust pipe communicating with said permanent space.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DAVID ROBERT YARNALL.

Witnesses:
WILLIAM BANSBACK,
GEO. H. PEIRCE.