J. W. BUDMAN.

ROTARY EXTRACTING APPARATUS.

APPLICATION FILED JAN. 13, 1921.

1,424,335.

Patented Aug. 1, 1922.

2 SHEETS—SHEET 1.

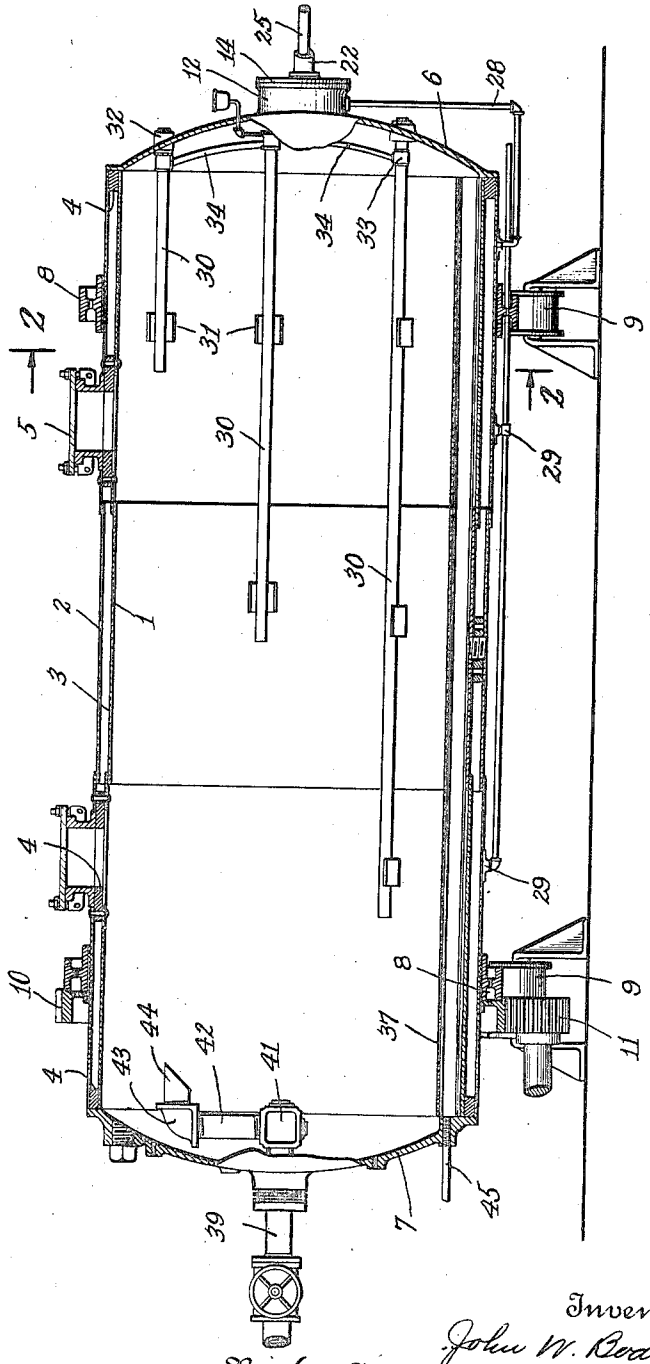


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

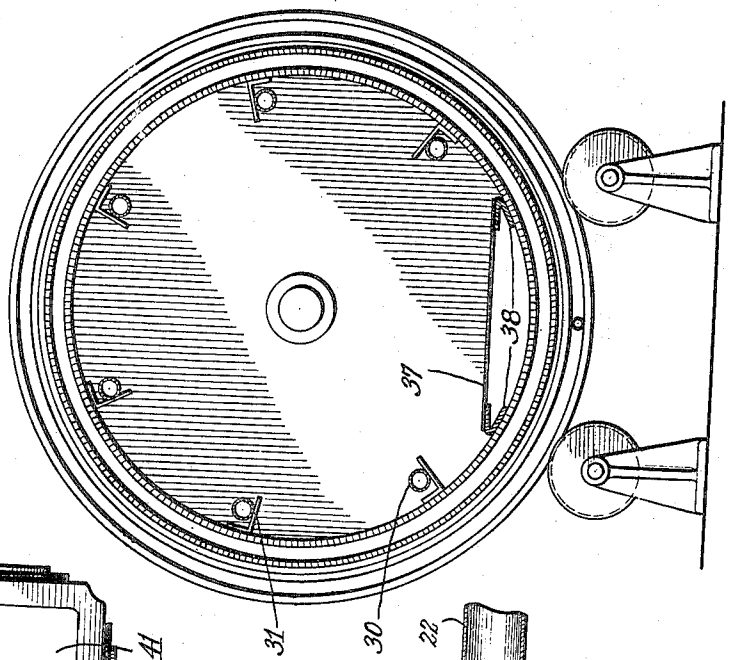


Fig. 3.

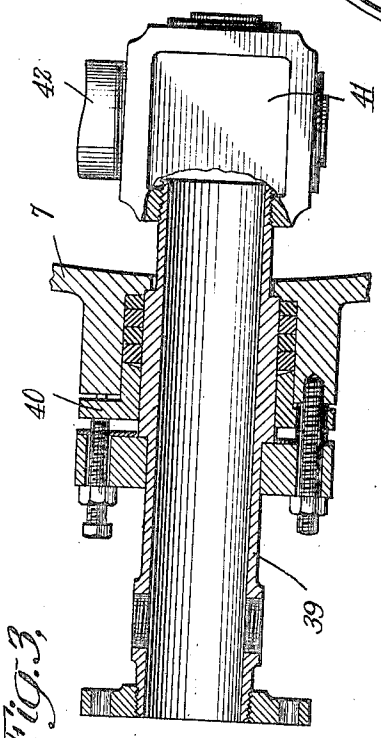
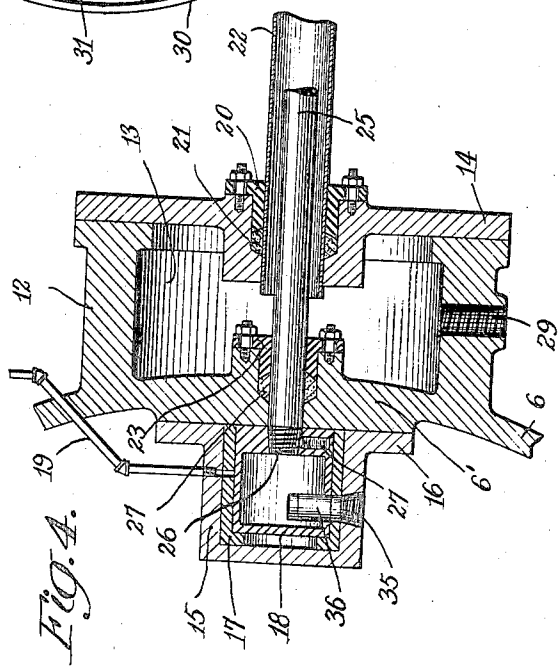


Fig. 4.



Inventor

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UNITED STATES PATENT OFFICE.

JOHN W. BODMAN, OF WESTERN SPRINGS, ILLINOIS, ASSIGNOR TO WILLIAM GARRIGUE & COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ROTARY EXTRACTING APPARATUS.

1,424,335. Specification of Letters Patent. Patented Aug. 1, 1922.

Application filed January 13, 1921. Serial No. 437,015.

To all whom it may concern:

Be it known that I, JOHN W. BODMAN, a citizen of the United States, residing at Western Springs, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rotary Extracting Apparatus, of which the following is a specification.

My invention relates to apparatus for extracting soluble substances, such as grease, from various materials containing the same, by means of suitable solvents such as gasoline or naphtha, and recovering the solvent. My invention is in some respects an improvement upon the apparatus described and claimed in Patent Number 1,282,407, issued October 22, 1918, to William E. Garrigues.

In the said patent there is described a horizontal rotary drum in which the material containing the soluble substance and the solvent are agitated together and the solvent with the soluble substance drawn off as fully as possible. This may be accomplished by drawing off the solution through a filter. A certain amount of the solvent, however, remains within the mass of material. A feature of the construction disclosed in the said patent consists in means enabling the introduction of hot gas, specifically steam, during the rotation of the drum, only within that portion of the drum which is at any moment lowermost, the steam being thus used for the recovery of the solvent remaining in the mass. By thus introducing steam into the mass of material in the bottom portion of the drum, and not at all into the space within the drum above the material, the pressure within the mass will be greater than that in the space above the same. Accordingly, the hot gas or steam with the volatilized solvent and any particles of the same which may remain liquid, entrained therein, will rapidly rise from the mass and pass out through an axial outlet, to the condenser.

My construction provides various improvements on the type of apparatus referred to. In the construction of the patent referred to steam was introduced in the lower portion of the drum through perforated pipes, and the drum was heated by steam which was circulated through series of closed pipes, to prevent condensation within the drum of the steam injected into the material through the perforated pipes. The entering steam for both series of pipes and the return connection for the closed series of pipes, all passed through the valve construction at one end of the drum. I have found with this construction that wet steam, returning from the closed heating system, is likely to mingle with the entering dry steam which is to be injected within the material, which is undesirable.

With my present construction I keep the steam which is to be injected into the material separated at all times from the steam which is intended for maintaining the temperature of the drum, and so arrange the rotating and stationary parts at and adjacent to the steam passages as to prevent the mixture of wet and dry steam. I accomplish this by providing a heating jacket surrounding the drum in place of the closed pipes within the drum referred to, and providing an enclosed pocket within the head of the drum into which steam passes by an axial opening and from which it is led into the jacket. A smaller inlet pipe carries the dry steam for injection within the material in the drum through the interior of the other pipe referred to and into the interior of a suitable valve construction within the drum, both pipes passing through suitable stuffing boxes which may readily be adjusted to take up wear.

My improved construction also preferably provides improvements in regard to the means by which the dry steam is passed into the mass of material, the filtering means provided within the drum, and the manner in which the volatilized solvent and steam are led from the drum, as will more fully hereinafter appear.

In order that a clearer understanding of my invention may be had attention is hereby directed to the accompanying drawings forming part of this application and illustrating one embodiment of my invention. In the drawings Fig. 1 represents a sectional longitudinal view through a horizontal rotary extractor, embodying my invention, certain parts being shown in elevation, Fig. 2 is a cross section taken on line 2—2 of Fig. 1, Fig. 3 is an enlarged sectional detail showing the outlet of the drum, partly shown in elevation and Fig. 4 is an enlarged vertical section through the steam

head and valve at the entrance end of the drum, partly shown in elevation.

Referring to the drawings the horizontal rotary drum is illustrated at 1, an outer shell 2 surrounding the same to provide a heating jacket 3, the cylindrical shells 1 and 2 being spaced apart by means of suitable rings such as those shown at 4. Suitable man holes are provided as is indicated at 5 for the introduction of the material containing the soluble substance which is to be extracted.

The drum is provided with heads 6 and 7 at the entrance and exit ends of the same. The drum may be provided with peripheral rails 8 which rest in contact with rollers 9, the extractor having a drive gear 10 which meshes with a driving pinion 11.

The head 6 of the drum is preferably divided in the form of a casting having an outwardly extending annular flange 12 enclosing a space or pocket 13. This is covered by an outer plate 14 which may be removably secured in any suitable way to the flange 12.

A suitable valve structure is provided on the inner face of head 6. This preferably comprises a rotating member 15 which takes the form of a box-like structure having a flange or flanges 16 secured to the inner face of head 6. This may have a bearing member 17 secured within the same to rotate therewith. A stationary member 18, preferably of box-like construction, is mounted within the rotating bearing member 17, this stationary member being secured in position by means presently to be described. Lubricants may be conducted by a suitable pipe 19 to the adjacent surfaces of members 17, 18 and 6 at which relative rotation occurs. Member 18 may suitably be formed of brass or other suitable bearing material.

The outer plate 14 is provided with an opening extending axially through the same in which a stuffing box is mounted comprising the gland 20 and a packing material 21. A tube 22 extends through this stuffing box into the inner pocket 13.

An axial opening extends through the inner portion 6′ of the head 6 in alignment with the opening through plate 14 and a stuffing box is mounted in this opening, comprising a gland 23 and packing material 24. A pipe 25 of smaller diameter than pipe 22 extends through the interior of pipe 22 and through the stuffing box in the portion 6′ of head 6. The inner end of pipe 25 is securely fastened to member 18 of the valve, to hold the latter stationary, pipes 22 and 25 both being fixed in position. Preferably the inner end of pipe 25 is threaded as is indicated at 26 and is screwed into a suitably threaded opening in the outer wall of member 18. If desired a set screw 27 may also be provided to extend through the wall of member 18 into binding contact with the threaded end of pipe 25, after the latter has been screwed into position.

The heating jacket 3 of the drum is connected by a suitable pipe or pipes 28 with the pocket 13 of head 6. The pipe 28 indicated connects with a tapped opening 29 which extends through flange 12 into pocket 13, pipe 28 at its other end opening in a similar manner into the jacket 3. As stated a plurality of pipes 28 may thus be provided to lead from various points on the periphery of pocket 13 to various points around the steam jacket.

Heating fluid, preferably steam, flows through the pipe 22 into pocket 13 and thence through pipe or pipes 28 into the jackt 3 so as to maintain the drum in a heated condition to prevent the condensation of steam within the drum. When steam condenses in jacket 3 to a sufficient extent, the drum may be stopped and the jacket drained through connections 29.

The pipes for injecting the heating fluid, preferably dry steam, into the mass of material in the drum, preferably takes the form of a plurality of spaced pipes 30, 30 which are secured in parallel spaced relation around the periphery of the drum, by means of the supporting angle members indicated at 31. These pipes are preferably open at their ends which are farthest removed from head 6 and are of varying length as is indicated in Fig. 1 so that the steam delivered thereby will enter the material in the drum at different points lengthwise of the latter. I consider this construction to be preferable to the perforated pipes specifically described in the Garrigues patent referred to for the reason that the latter tend to become clogged.

The various pipes 30 may be secured at their outer ends in bosses 32 provided in head 6.

Each pipe 30 is provided with a T connection 33 from which extends a pipe 34, pipes 34 extending radially inward, their inner ends extending into tapped openings in the member 15 of the rotary valve, one of such tapped openings being indicated at 35 in Fig. 4.

The stationary valve member 18 has a slot or opening 36 through its bottom surface. The tapped openings 35 through the outer member 15 are equally spaced around the periphery of the latter and correspond in number to the pipes 30, pipe connections 34 screwing into each of the same, bearing member 17 also having openings in alignment with the tapped openings 35. As the drum revolves, there will only be communication between the interior of valve member 18 and a pipe 30, when the latter is adjacent to the bottom of the drum, during rotation of the latter, so that the connection 34 of the pipe 30 referred to will be in alignment with slot

36. The latter may extend for a distance sufficient to enable one or two of the pipes 30, for example, to register therewith at a time. Dry steam continuously enters the space within the valve through pipe 25, during the rotation of the drum, and passes through the pipes 30 which are lowermost at any moment into the mass of material within the drum. The solvent which is to be used within the extractor may similarly be introduced through pipe 25.

It will be noted that with the arrangement described the steam which is used in jacket 3 is kept at all times apart from the steam which is to be injected through pipes 30 into the interior of the drum. Glands 20 and 23 may readily be tightened to take up any wear between the same and the pipes 22 and 25.

I also find it advisable to use a longitudinal screen or filter in place of the vertical filter which is illustrated as extending across the exit end of the drum in the Garrigues patent referred to. Such a vertical filter cuts off the end portion of the drum and therefore decreases the space within the drum which is effective for containing the material to be treated. Furthermore, difficulty sometimes arises because of the clogging of the vertical screen in the prior construction referred to.

Accordingly I have provided a longitudinal screen indicated at 37 as secured upon parallel longitudinal angular members 38 secured to the inner curved surface of the drum. The filter thus extends the length of the drum and across the curved surface of the drum, so as to form a chord of a small arc of the periphery of the drum.

The space between the filter and the adjacent curved surface of the drum is quite small and accordingly the greater portion of the interior of the drum is available for containing the material to be operated upon. With this construction the vapor outlet through head 7 of the drum takes the form of a stationary pipe 39 which extends through a stuffing box 40 in the head 7 of the drum. At its inner end pipe 39 is provided with a suitable connection 41 into which extends the upwardly directed pipe 42 having an elbow 43 at its upper end with an inwardly directed open end portion 44. With this construction the end 44 of the outlet is always above the upper surface of material being treated in the drum. During the solvent recovery operation, the vapor tension within the mass of material causes the steam to rise with a considerable portion of volatilized solvent and to pass out through pipes 44, 42, and 39, to a suitable condenser.

In the operation of the apparatus the extractor is partly filled with a material containing the soluble substances to be extracted, and the solvent, preferably preheated, is continuously run in through pipe 25 while the extractor is rotated. The rotation is then stopped, a pipe or tube connected to the draw off connection indicated at 45, leading to the space between filter 37 and the adjacent peripheral surface of the drum, and the solvent with dissolved soluble substance drawn off as fully as possible. Connection 45 is then closed, the pipe leading therefrom being removed, the extractor again rotated, and steam allowed to flow through pipes 22 and 25, with the recovery of solvent remaining in the mass, as above described.

What I claim is:

1. In extracting apparatus, the combination of a horizontal rotary drum having a head at one end with an enclosed pocket therein, a jacket surrounding said drum, connecting pipe means leading from said pocket to said jacket, a valve comprising a rotary and a stationary member and having an interior space, at the inner side of said head, spaced steam delivery pipes secured within said drum, connected to said valve to open into said space only when they occupy the lower portion of the drum, during the rotation thereof, an axial pipe leading through the outer portion of said head into said pocket, and a pipe of smaller diameter extending through said first pipe and into said space within said valve.

2. In extracting apparatus, the combination of a horizontal rotary drum having a head at one end with an enclosed pocket therein, a jacket surrounding said drum, connecting pipe means leading from said pocket to said jacket, a valve comprising a rotary and a stationary member and having an interior space, at the inner side of said head, spaced steam delivery pipes secured within said drum, connected to said valve to open into said space only when they occupy the lower portion of the drum, during the rotation thereof, said pipes having open ends at varying distances from said head, a pipe leading from the exterior into said pocket, and a pipe leading from the exterior into said space within said valve.

3. In extracting apparatus, the combination of a horizontal rotary drum having a head at one end with an outwardly opening pocket therein, an outer plate secured thereto to cover said pocket, a jacket surrounding said drum, connecting pipe means leading from said pocket to said jacket, axially disposed stuffing boxes mounted in openings through said plate and the inner portion of said head, a pipe extending through said plate stuffing box into said pocket and a smaller pipe extending through said first pipe and through said inner stuffing box, a valve within said drum having a member rotating with said head

and a stationary member and having an interior space into which said last named pipe extends, and spaced delivery pipes within said drum, connected to said valve to open into said space only when they occupy the lower portion of the drum during the rotation thereof.

This specification signed and witnessed this 6th day of December, 1920.

JOHN W. BODMAN.

Witnesses:
GUY S. BURTIS,
W. E. SANGER.