J. W. H. RANDALL.

ROTARY RETORT.

APPLICATION FILED APR. 8, 1921.

1,413,779.

Patented Apr. 25, 1922.

2 SHEETS—SHEET 1.

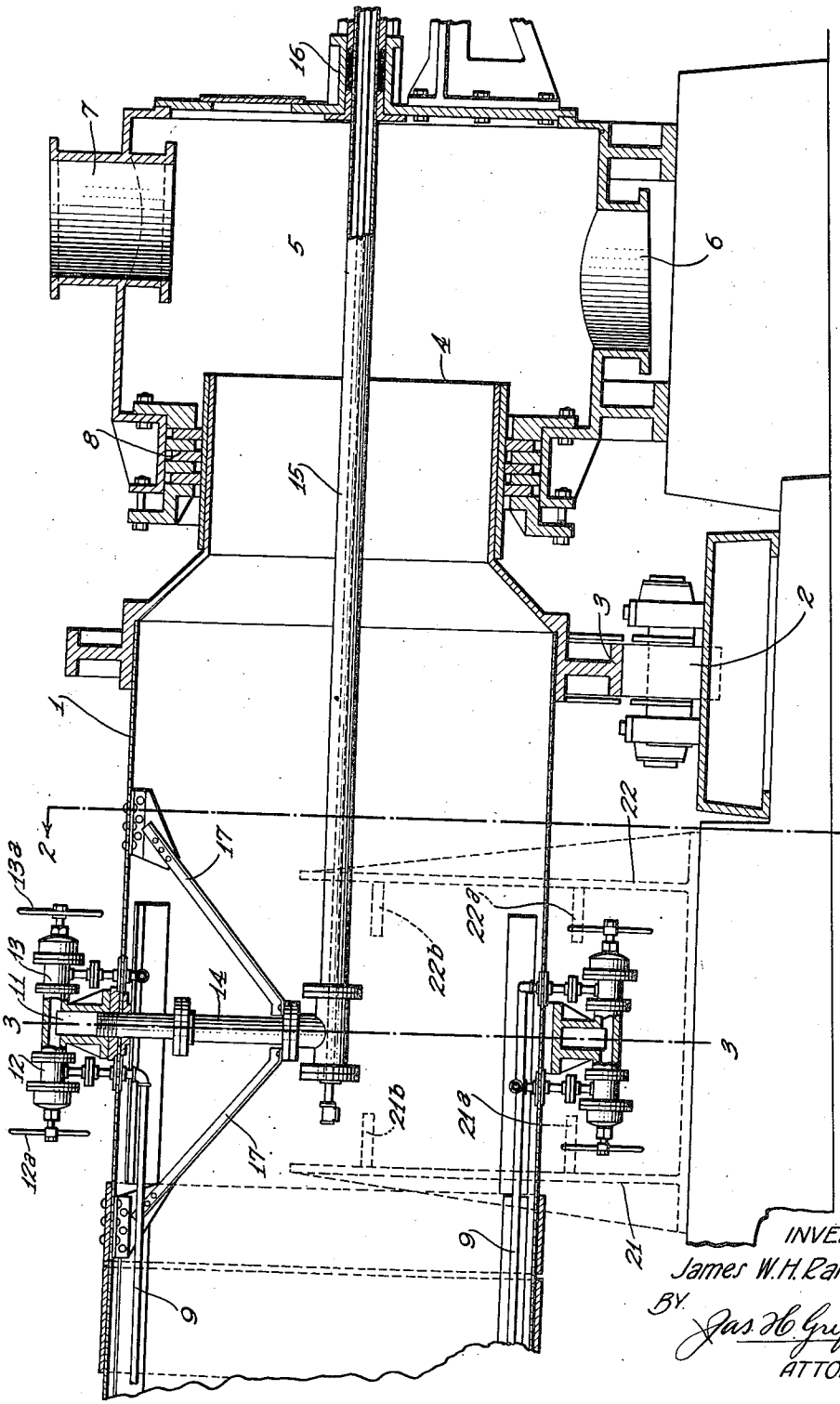


Fig. 1

INVENTOR
James W.H. Randall
BY
Jas H. Griffin
ATTORNEY

J. W. H. RANDALL.

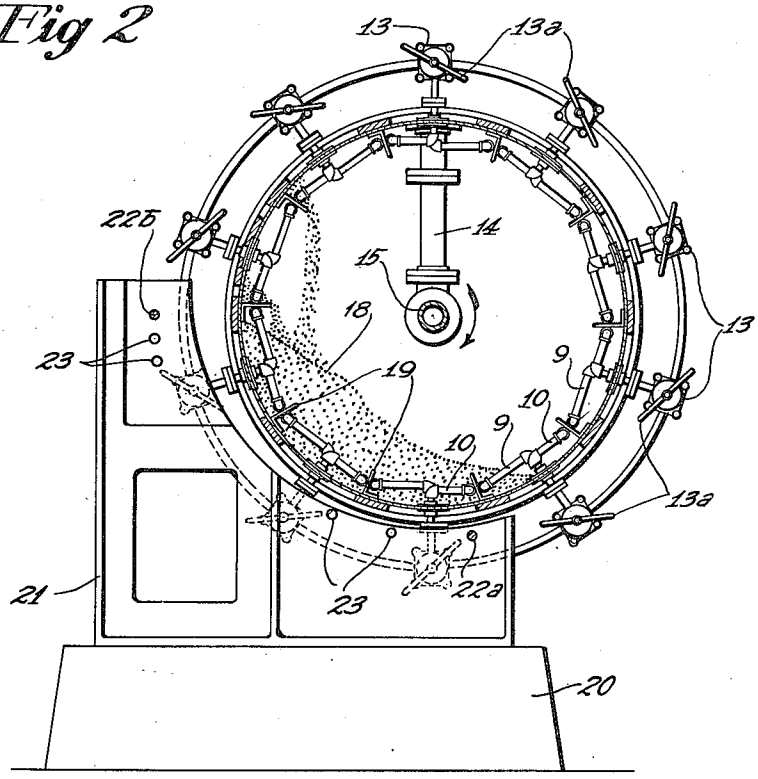
ROTARY RETORT.

APPLICATION FILED APR. 8, 1921.

1,413,779. Patented Apr. 25, 1922.

2 SHEETS—SHEET 2.

Fig 2



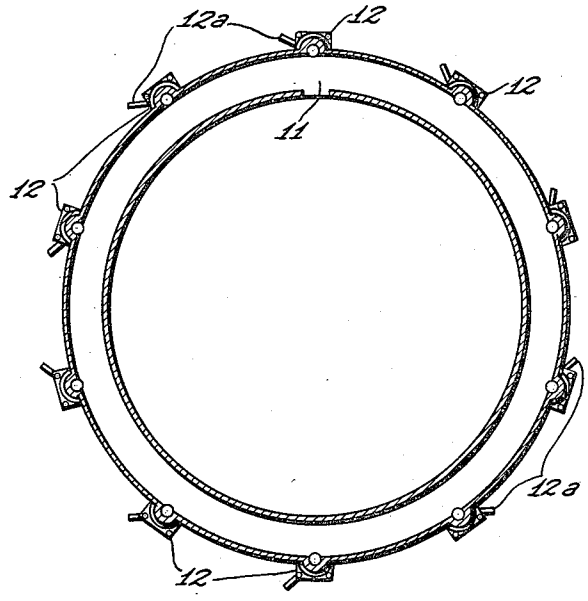


Fig 3

INVENTOR
James W. H. Randall
BY Jas. H. Griffin
ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES W. H. RANDALL, OF NEW YORK, N. Y.

ROTARY RETORT.

1,413,779. Specification of Letters Patent. Patented Apr. 25, 1922.

Application filed April 8, 1921. Serial No. 459,799.

To all whom it may concern:

Be it known that I, JAMES W. H. RANDALL, a subject of the King of Great Britain, (but having taken out his first papers with the intention of becoming a citizen of the United States,) residing at New York city, borough of Manhattan, in the county and State of New York, have invented a certain new and useful Rotary Retort, of which the following is a specification.

This invention relates to rotary retorts, and, while particularly adapted for employment with rotary retorts used for the destructive distillation of oil bearing shale, is capable of general application.

In destructively distilling shale through the employment of a rotary retort, the shale is fed into the upper end of an inclined retort and travels longitudinally of the retort, which is heated externally. During its passage through the retort, the material is fractionated, the volatilized hydrocarbons being drawn off by suitable means and the waste products or ash being fed out of the lower end of the retort.

In my copending application, Serial No. 380,967, filed May 13, 1920, a rotary retort for carrying out the destructive distillation of shale is described and claimed and in the apparatus of such application, means is provided for introducing steam or other fluid or gas into the interior of the retort for the purpose of driving off the volatilized hydrocarbons and to lower the temperature of distillation whereby the distillation may be accomplished at low temperatures.

In order that the steam or other fluid or gas introduced into the retort for this purpose may function with the highest efficiency, it is necessary that such steam or gas be caused to circulate through the material during treatment and for this reason, the retort of my copending application is provided on the interior walls thereof with perforated pipes through which the steam, etc. is fed. The object of this arrangement is to enable the feeding of steam through the pipes in such manner that it will not only be fed broadcast into the interior of the retort, but that it will also be caused to percolate through such material as is burying certain of the steam feed pipes. During the rotation of the retort, the material is tumbled therein and successively buries the pipes in question and the steam fed through these pipes is adapted to be forced through the material, for the reasons specified.

While the construction described operates with greater efficiency than any prior construction intended for the reasons specified, it is found in practice that while the steam feeds freely through such pipes as are uncovered that the covering of the other pipes serves, in a measure, to hold back the feed. Accordingly, while better results are obtainable in the apparatus of my copending application than have heretofore been possible, I have found that maximum efficiency and the economy of steam consumption can best be obtained if only such steam is admitted as may be passed through the material to be treated. In other words, a relatively small amount of steam can be caused to circulate through the material during the distillation process, better results are obtainable than though a much larger amount of steam were fed broadcast into the interior of the retort.

With the foregoing considerations in mind, the object of the present invention is to provide means for controlling the feed of steam, fluid or other material into a retort of the character specified, in such manner that all of such steam, etc. fed into the retort will be required to pass through the material therein. In this manner, maximum efficiency with minimum consumpation is obtained.

In the preferred practical manner of carrying out this invention, a series of steam pipes are provided on the inner walls of the retort and these pipes are valved and the flow therethrough controlled in such manner that steam will be fed only through such pipes as are actually covered or buried by the material in the retort. In this way all steam fed into the retort is positively required to pass through the material.

Features of the invention, other than those specified will be apparent from the hereinafter detailed description and claims, when read in conjunction with the accompanying drawings.

The accompanying drawings illustrate one practical embodiment of the invention, but the construction therein shown is to be understood as illustrative, only, and not as defining the limits of the invention.

Figure 1 is a vertical longitudinal section

through the discharge end of a retort showing the present invention associated with such retort.

Figure 2 is a section on the line 2—2 of Figure 1; and,

Figure 3 is a sectional view on the line 3—3 of Figure 1, with certain parts of the apparatus omitted.

Referring to the drawings, 1 designates a portion of a rotary retort, only one end of the retort being shown in the interest of clearness. The retort is supported at suitable intervals along its length by rollers 2, which bear against rings 3 extending circumferentially of the retort. The material to be treated is fed into the upper end of the retort (not shown), is tumbled longitudinally of such retort and the ash passes out of the discharge end 4 into a chamber 5, having an outlet 6. A stack 7 is associated with the chamber 5 and functions in a manner well known in the art.

When a retort of the character specified is in operation, the retort 1 is rotated by any suitable means, while the outlet chamber remains stationary, and, accordingly, suitable packing 8 is associated with the outlet casing to preclude leakage in the connection between these parts.

The showing of the retort rotation and its manner of mounting as described forms no part of the present invention, but is advanced in order that the adaptability of the invention to a retort of this character may be more readily understood. The present invention is applicable to any form of inclined rotary retort, now in use and may be associated to advantage with a retort of the character described claimed in my said copending application.

In associating the present invention with an inclined rotary retort, a plurality of perforated pipes are mounted on the interior of the retort and these pipes may be secured in position in any desired manner, such for example as by strapping them to the retort wall. Moreover, they may be formed straight or extend in a curvilinear path, but are preferably so disposed as to extend along the interior of the retort in parallel relation to one another and to the axis of rotation of the retort.

In the construction shown, two series of pipes are illustrated, the pipes of the first series which are designated by the reference character 9 are adapted to feed steam throughout a portion of the length of the retort, while the pipes designated 10 are intended for the feeding of steam to another portion of the length of the retort. This arrangement has been found to work out well in practice, though, if desired, steam may be fed throughout the length of the retort through a single series of pipes 9 or 10 without departing from this invention.

Steam is fed to the pipes 9 and 10 from an annular header 11, which extends circumferentially of the retort and is rigidly secured in place thereon in any suitable manner. This header is shown in section in Figure 3. Each pipe of each series, however, is connected with a header through a valve, which valves are designated 12 and 13, respectively, with reference to the pipes 9 and 10. The valves may be of any desired construction, but are preferably of the rotary type to the stems of which are secured operating handles 12^a and 13^a, respectively. Through the manipulation of the operating handles, the valves 12 and 13 may be sealed and unsealed, so as to permit or preclude the passage of steam from the header 11 through either or both series of pipes 9 and 10.

Steam is fed to the header 11 through a pipe 14, which leads from a supply pipe 15 disposed coaxially of the retort. The pipe 15 extends through the chamber 5 and into the retort and is rotatable with the latter. A suitable stuffing box 16 may be associated with the pipe where it passes through the wall of the chamber 5 to preclude leakage at this point and said pipe may be rigidly braced with reference to the retort by means of struts, such as show at 17.

By this construction, the pipe 15 is rigidly carried from the walls of the retort, rotates with the retort coaxially therewith, while the walls of the outlet chamber 5 remain stationary. This construction permits of the feeding of steam through the supply pipe 15 and branch 14 to the header 11 at all times, and through the manipulation of the valve steam handles 12^a and 13^a, the feed of such steam to the respective pipes 9 and 10 may be controlled.

My experience has shown that when shale or analogous material is being treated in an inclined rotary retort, the shale is tumbled about the interior of the retort, during its passage longitudinally thereof and while gravity tends to hold the shale on the invert of the retort, the rotation of the latter effects a banking of the material upon the receding surface, so that the material ordinarily assumes the position shown at 18 in Figure 2. This material is in the form of a constantly moving mass, and baffles or ribs 19 preferably extend from the inner surface of the retort to effect a pronounced agitation of the mass, but, in practice, the transverse outline of such mass does not materially vary from the showing of Figure 2.

When a retort functions in the manner described, it will be apparent that at any particular time, the mass of material 18 will cover certain of the pipes 9 and 10, while the remainder of such pipes will be uncovered. If steam is allowed to flow into all of the

pipes simultaneously, I have found that it feeds rapidly through the perforations of the uncovered pipes, while the resistance of the material on the covered pipes retards the feed through these pipes to a suitable extent, with the result that the steam is not circulated through the material with such degree of efficiency as would result if this state of facts were reversed. The best results are obtainable if practically all of the steam which passes into the retort is required to circulate through and into intimate contact with all parts of the material under treatment and it is the object of this invention, as hereinbefore stated, to accomplish this result. The mechanism shown in the drawings is so constituted as to enable such mode of operation to be practiced and this end is obtained through the proper control of the valves 12 and 13 to the end that steam will be fed through only such pipes as are covered and will be restrained from such pipes as are uncovered by the material under treatment.

It will be noted from the drawings that the handles 12^a and 13^a of the respective valves are peculiarly formed in that they embody radially extending arms. The valves, being mounted on and supported by the retort, bodily rotate therewith and such bodily rotation of the valves is availed of to effect their operation and sequence by the means next to be described.

Supported in any suitable manner, such for example as upon a foundation 20 are a pair of standards 21 and 22 spaced apart, as shown in Figure 1 and convexly shaped at their upper parts to embrace a portion of the circumference of the retort. These standards form supports for tripping pins or projections 21^a, 21^b, 22^a and 22^b, which projections extend in a direction parallel to the axis of rotation of the retort and into the path of the arms of the valve handles 12^a and 13^a. The positioning of the pins or projections described is such that as the retort rotates, the radial arms of the handles 12^a and 13^a are brought into engagement with the projections 21^a and 22^a, respectively, which tend to arrest the movement of the arms as the bodily movement of the valves continues and in so doing operate the valves to unseal them and permit feed of steam through the pipes 9 and 10. As the rotation of the retort continues and the arms of the valves pass free from engagement with the pins 21^a and 22^a, the valves are left open and remain open, until such arms engage with the pins 21^b and 22^b, during the passage of which, the valves are operated in a retrograde direction and resealed. The pins or projections 21^a, 21^b, 22^a and 22^b are so positioned that the steam will be turned on to a pipe at about the time it becomes covered or buried by the material under treatment and will be turned off at about the time the pipe becomes uncovered. The steam fed to the pipes is under sufficient pressure to overcome the weight or resistance of the material under treatment, and, accordingly, practically all the steam fed into the retort is passed through the material.

In the commercial machine, the pins 21^a—22^b are secured in any suitable manner within apertures 23 and a series of these apertures is provided for each pin, so that the position of the pins may be varied to open and close the valves earlier or later as occasion may require. This adjustment may be obtained by merely shifting the pins to obtain the proper opening and closing, which, of course, will depend largely on the amount of material passing through the retort.

In the foregoing detailed description of the preferred embodiment of the invention, two distinct series of pipes are embodied for feeding steam to different portions of the length of the retort, and, accordingly, two sets of valves are shown for feeding these series of pipes from the header. It will be understood that if only one series of pipes is employed to feed the retort throughout its entire length, only one set of valves will be required and that, if desired in practice, the several portions of the length of the retort may be fed by different headers positioned at spaced distances along the retort and with each of which a single set of valves is associated. These different alternate forms do not effect the underlying principle of the present invention, which is directed broadly to passing steam or other fluid or gas through the moving material within the rotary retort in such manner that in order to enter the retort, the steam must pass through the material. The present invention is accordingly not restricted to the particular showing made, but is to be construed as broadly novel as is commensurate with the appended claims.

Having thus fully described the invention, what I claim as new and desire to secure by Letters Patent is:

1. The combination with a rotary retort, of a plurality of pipes extending longitudinally of the retort and positioned interiorly thereof, a source of fluid supply and means controlled by the rotation of the retort for permitting or precluding the flow of fluid from the source of supply into such pipes.

2. The combination with a rotary retort, of a plurality of valved perforated pipes extending longitudinally of the retort and interiorly thereof, and means controlled by the rotation of the retort for effecting the operation of such valves.

3. The combination with a rotary retort, of a plurality of pipes positioned interiorly of the retort, valves associated with said pipes and rotatable with the retort and rela-

tively stationary means adapted for cooperation with the valves to effect an unsealing and sealing of the valves when the retort is rotated.

4. The combination with a retort, of a plurality of pipes within the retort, a valve associated with each pipe and mounted for rotation with the retort, a movable operating member associated with each valve and fixed operating means adapted for cooperation with the operating members of the valve to effect a sealing or unsealing of the valves as the retort is rotated.

5. The combination with a rotary retort, of a header carried thereby, a plurality of valved pipes adapted to be fed from said header and extending into the retort, and mechanical means cooperating with the valves when the retort is rotated to effect a sealing and unsealing of the valves.

6. The combination with a rotary retort, of a header carried thereby, a plurality of pipes leading from the header into the interior of the retort, a valve in each pipe, movable operating means associated with each valve and fixed tripping means adapted to be engaged by the valve operating means, when the retort is rotated to effect a sealing or unsealing of the valve.

7. The combination with a rotary retort, of an annular header circumferentially embracing the retort, a plurality of pipes leading from the header into the retort, and perforated interiorly thereof, a valve in each of said pipes, an operating arm associated with each valve and fixed projections, mounted in the path of the operating arms and adapted to be engaged thereby when the retort is rotated for the purpose of successively sealing and unsealing the valve.

8. The combination with a rotary retort, of a plurality of perforated pipes positioned interiorly of the retort, a feed pipe extending coaxially of the retort and communicating with all of the perforated pipes, a valve associated with each of the perforated pipes for controlling the feed of fluid from the feed pipe to the perforated pipes, and means operable by rotation of the retort for successively sealing and unsealing the valves.

9. The combination with a rotary retort, of a plurality of perforated pipes positioned interiorly of the retort, a feed pipe extending coaxially of the retort and communicating with all of the perforated pipes, a valve associated with each of the perforated pipes for controlling the feed of fluid from the feed pipe to the perforated pipes, an operating member associated with each valve, and tripping means positioned in the path of the operating members when the retort is rotated to successively seal and unseal the valves.

10. The combination with a rotary retort, of an annular header embracing the retort, a supply pipe extending coaxially of the retort for feeding fluid to the header, a plurality of perforated pipes extending from the header into the interior of the retort and longitudinally thereof, a valve associated with each of the perforated pipes, an operating member associated with each valve, a trip positioned in the path of the operating member when the retort is rotated to effect an unsealing of the valve, and a second trip also positioned in the path of the valve operating member to subsequently effect a sealing of the valve.

In testimony whereof I have signed the foregoing specification.

JAMES W. H. RANDALL.