

No. 632,794.

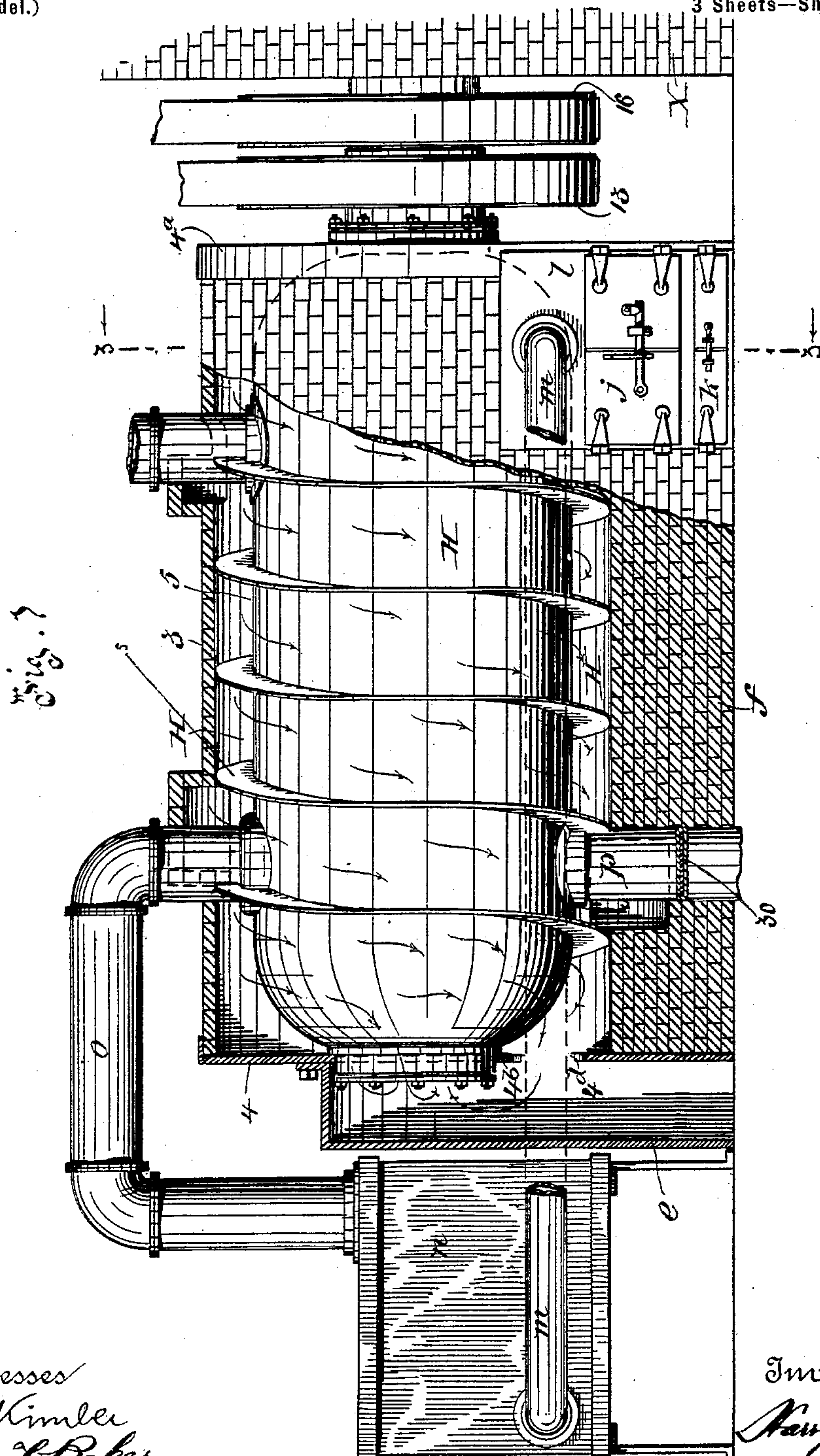
Patented Sept. 12, 1899.

H. SPURRIER.
RETORT.

(Application filed Sept. 10, 1898.)

(No Model.)

3 Sheets—Sheet 1.



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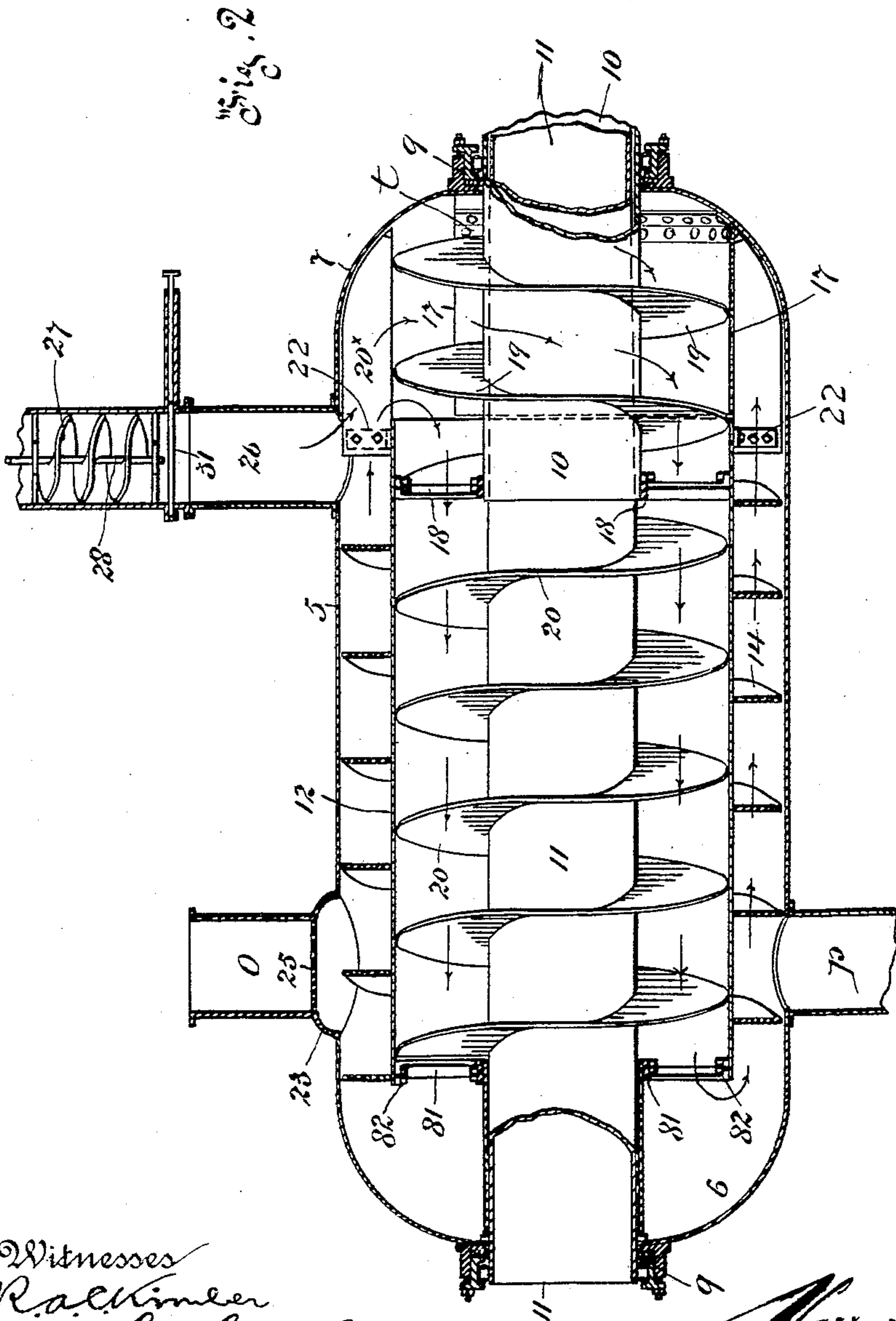
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(No Model.)

3 Sheets—Sheet 2.



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UNITED STATES PATENT OFFICE.

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RETORT.

SPECIFICATION forming part of Letters Patent No. 632,794, dated September 12, 1899.

Application filed September 10, 1898. Serial No. 690,699. (No model.)

To all whom it may concern:

Be it known that I, HARRY SPURRIER, of the city of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Retorts; and I do hereby declare that the following is a full, clear, and exact description of the same.

My invention relates particularly to retorts for use in the destructive distillation of sawdust; and it has for its object to provide means whereby the sawdust during the process of distillation will be kept in a constant state of agitation and each particle thereof be brought at intervals into the area of the greatest heat, at the same time providing for the most effective collection of the by-products and the uniform feeding to the retort of the sawdust. I have discovered that the best results are to be obtained by dividing the chamber or main compartment into a number of subchambers or smaller compartments and causing the substance being treated to circulate from one to the other and alternately through each of said compartments. Better results are obtainable from retorts, separators, or the like constructed on this principle for the reason that the mass being treated is always divided, each portion being completely separated from the other, thus enabling one portion to be agitated to a greater degree than the other portions of the complete mass to be continually during treatment subjected to different temperatures.

To these ends the invention may be said to consist, broadly speaking, of a retort or the like comprising a pair of compartments, said compartments communicating with one another, means for supplying the substance to the compartments, means for causing the substance to circulate continuously through said compartments alternately, and a discharge-passage from said compartments.

More specifically speaking, the invention may be said, briefly, to consist of a pair of cylinders located one within the other and one, preferably the inner, of said cylinders being rotary. A pair of helices is located one intermediate of said cylinders and the other inside of the inner cylinder, said helices being adapted to feed the sawdust in different directions. Means for transferring the sawdust

from one to the other of said cylinders is located at one end thereof. A gas-discharge and a gate-controlled discharge for the residue are located, respectively, at the highest and lowest points of the cylinders. An expansion-chamber is preferably located intermediate of the cylinder and the said discharge-passage, and the pipe through which the sawdust is supplied to the cylinders has a helix located therein to facilitate the passage of the sawdust. The fire-chamber of the furnace for heating the retort is connected to the chimney by a spiral flue and a flue extending axially through the cylinders.

For full comprehension, however, of the invention, reference must be had to the accompanying drawings, forming a part of this specification, in which like symbols indicate corresponding parts, and wherein—

Figure 1 is a part side elevation and part longitudinal vertical sectional view of my improved retort and the furnace used in this embodiment of my invention. Fig. 2 is a detail longitudinal vertical sectional view of my improved retort removed; Fig. 3, a transverse vertical sectional view thereof, taken on line 3 3, Fig. 1.

I have illustrated and will hereinafter describe my invention as embodied in a retort for the destructive distillation of sawdust.

The retort is completely inclosed in a furnace, the side walls 2 2^a, Fig. 3, and top 3 of which are built preferably of brick, and the ends 4 4^a, Fig. 1, whereof are constructed of cast-iron and formed with bearings 4^b, and the end 4 with an opening or flue 4^d. A cast-iron box *e* is bolted to the end 4 and incloses said flue 4^d and extends from beneath same to a point above the bearing 4^b.

A bed *f*, preferably of brickwork, supports the retort through the medium of a spirally-arranged vane *s*, which is of sufficient width to extend completely across the space between the retort and the interior of the furnace-casing. This vane provides a spiral flue *H*, extending from the fire-chamber 4^h, Fig. 3, at one end of the casing to the box *e*, Fig. 1, at the opposite end thereof, while access to the fire-chamber is had through fire and ash-pit doors *j* and *k*, respectively, carried in a usual manner by a cast-iron frame *l*, which

also has an opening to receive the end of a pipe *m*, through which the non-condensable combustible gases are fed to the fire-chamber, as will be hereinafter clearly pointed out.

5 A condenser *n* is located adjacent to the end 4 of the furnace and communicates with the adjacent end of the retort through a pipe *O*. The opposite end of said condenser communicates with the fire-chamber by means of
10 a pipe *m*, before mentioned, while a pipe *p* leads from the bottom of the adjacent end of the retort through the bed *f* to any preferred form of water-tank. (Not shown.)

The stationary outer cylinder of the retort
15 consists, preferably, of a tubular section 5, having hemispherical ends 6 and 7 bolted thereto, Figs. 1 and 2. These ends are formed with bearings 9, in which rest the tubular trunnion in the form of a sleeve 10 of the
20 open-ended inner rotary cylinder 12 and one end of a hollow shaft or tube 11, which latter extends therethrough from the box *e* and through said hollow trunnion 10 and into the chimney *X*. A pulley 13 is rigidly mounted
25 upon said tubular trunnion 10, and a helix 14 is rigidly mounted upon the exterior of the inner cylinder 12, the vanes thereof being of sufficient width to have their radially outer
30 surface of the outer cylinder, while the hollow shaft or tube 11 has a pulley 16 mounted rigidly thereon. An open-topped horizontally-arranged cylindrical section 17 of corresponding diameter to the inner cylinder 12
35 is secured rigidly to the interior of one end of the outer cylinder by means of an angular strip *t*, riveted at its side edges, respectively, to the interior of the end of the outer cylinder 7 and to the adjacent end of said cylindrical section 17. The trunnion 11 is of sufficient length to extend a short distance
40 within the inner cylinder, to which it is rigidly connected by a spider 18, Fig. 2, located at the inner end thereof, while a second spider 81 maintains the other end of said cylinder (to which it is rigidly connected, as at 82) in its proper position relatively to the hollow shaft. A left-hand helix 19 is mounted
45 rigidly upon this trunnion 10 and winds about same from end to end of the portion thereof within the cylinders, while the inner end thereof is connected to one edge of one of the spider-arms, which latter are set in a plane corresponding to the plane of the helix. A
50 third helix 20, Fig. 2, is carried rigidly by said hollow shaft 11 and extends from end to end of said cylinder, the interior of which it closely fits.

Two vanes 20^x are secured by angle-braces
60 22 upon the exterior of the inner cylinder 12, diametrically opposite one another and at the end thereof adjacent to the open-topped cylinder 17, along the full length of which they extend.

65 The surface of the outer cylinder 5 is formed adjacent to one end thereof to present a dome-like extension 23, Fig. 2, to the upper end of

which the pipe *o* is connected and conducts the gases to the condenser *n*, before mentioned, this pipe having a perforated diaphragm 25 secured transversely thereof. A
70 supply-pipe 26, having a helix 27 mounted therein and driven from any suitable source by a shaft 28, is connected adjacent to the other end of said outer cylinder and preferably communicates at its upper end with any
75 suitable form of hopper (not shown) adapted to carry the supply of sawdust to be distilled, while the pipe *p*, Figs. 1 and 2, before mentioned, enables the residue after the distillation has been effected to be discharged and is
80 provided with a gate 30, Fig. 3, the supply-pipe 26 being also provided with a gate 31.

The area of spaces intermediate of the tube 11 and the inner cylinder and the latter and
85 the outer cylinder, respectively, are equal.

The operation of my improved retort is as follows: The gate 31 is opened and the helix 27 started, which will break up any lumps that might occur in the sawdust and feed
90 same uniformly into the outer cylinder, the greater part of it falling into the open-topped cylindrical section 17 and the balance into the space between the cylinders. The helix 19 then acts upon the sawdust within said
95 cylindrical section 17 and causes the same to travel from right to left (see Fig. 1) along the interior of the inner cylinder, while the outer helix acts upon the sawdust between the inner and outer cylinders and causes
100 the same to travel from left to right, and when it reaches the right-hand end is acted upon by the vanes 20^x and lifted over the open top of said cylindrical section 17 to be again acted upon by helix 19, as just described. When the retort is filled, the feeding-helix 27 is stopped and the gate 31 closed, after which the entire mass is kept continually in motion, one half moving in one direction and the other half moving in an opposite
110 direction until complete destructive distillation has taken place, the dome 23 serving as an expansion-chamber for the gases and the perforated diaphragm 25 preventing the escape of any particles with the gases
115 through the pipe 24, while upon the gate 30 being opened the residue will be discharged therethrough by the action of the helix.

The hollow shaft 11 constitutes a flue, as is clearly shown in Fig. 1, which conducts the
120 products of combustion from the spiral flue to the chimney, thus providing a heating-surface at the center or what would otherwise be the coolest portion of the distilling area.

The pulleys 13 and 16 are caused to turn in
125 opposite directions in order to insure the greatest possible agitation of the substances being distilled.

My object in making the helix 19 a left-hand one in contradistinction to the right-hand helix 20 is to cause said helix 19 while
130 turning in an opposite direction to 20 to impart motion to the substance being distilled in the same direction as said helix 20.

It is obvious that although I have illustrated and described my device as principally applicable for use as a retort for the destructive distillation of sawdust, it may be used with advantageous results in the distillation of other material or as a means to thoroughly mix any granular or liquid substance, in which latter case the gas-discharge pipe and heating appliances may be dispensed with without departing from the spirit of my invention.

What I claim is as follows:

1. In a retort or the like, the combination of a pair of cylinders located one within the other, means within the inner cylinder for imparting motion in one direction and means located between said cylinders, for imparting motion in an opposite direction; the outer cylinder being of greater length than and inclosing the inner cylinder and having its ends closed, the inner cylinder having one end open and its other end closed by the adjacent closed end of the outer cylinder, the portion of said inner cylinder adjacent to its closed end having an opening in its upper side; means for lifting and carrying substance from said outer cylinders to the said opening in the upper side of the inner cylinder; a feed-pipe leading to and a discharge-pipe leading from said cylinders, substantially as and for the purpose set forth.

2. In a retort or the like, a pair of cylinders located one within the other, the outer cylinder having its ends closed and being of greater length than the inner cylinder a non-rotatory cylindrical section secured to one end of said outer cylindrical section and having its top open, a series of vanes carried by said inner rotary cylinder and projecting along the full length of said stationary cylindrical section; a tube extending from end to end of said outer cylinder, a pair of helices located one between the inner and outer cylinders and the other between said inner cylinder and said tube and a third helix located within said stationary cylindrical section; a furnace, a spiral flue encircling said outer cylinder and connecting said furnace to one end of said tube, the other end of said tube being connected to the chimney, a condenser, a pipe for connecting the interior of said retort to said condenser, a pipe for connecting said condenser to the fire-chamber of the furnace, and means for rotating said helices to impart movement in opposite directions, for the purpose set forth.

3. In a retort or the like, a pair of cylinders located one within the other, the outer cylinder having its ends closed and being of greater length than the inner cylinder a non-rotatory cylindrical section secured to the interior of one end of said outer cylindrical section and having its top open, a series of vanes carried by said inner rotary cylinder and projecting along the full length of but free from said

stationary cylindrical section; a shaft extending axially through said cylinders, means for supporting said shaft, a right-hand helix located between the inner and outer cylinders and carried rigidly upon said inner cylinder, a second right-hand helix located between said inner cylinder and said shaft and carried rigidly by said shaft; a sleeve encircling said shaft and extending through said stationary cylindrical section from within said inner cylinder near the adjacent end thereof to the exterior of the cylinders a left-hand helix located within said stationary cylindrical section and carried rigidly upon the inner portion of said sleeve; a series of diagonally-arranged bracket-arms connecting the adjacent part of said inner cylinder to said sleeve, means for supporting the opposite ends of said inner cylinders and means for rotating said sleeve and shaft in opposite directions, for the purpose set forth.

4. In a retort or the like, a pair of cylinders located one within the other, the outer cylinder having its ends closed and being of greater length than the inner cylinder a non-rotatory cylindrical section secured to the interior of one end of said outer cylindrical section and having its top open, a series of vanes carried by said inner rotary cylinder and projecting along the full length of but free from said stationary cylindrical section; a shaft extending axially through said cylinders, means for supporting said shaft; a right-hand helix located between the inner and outer cylinders and carried rigidly upon said inner cylinder, a second right-hand helix located between said inner cylinder and said shaft and carried rigidly by said shaft; a sleeve encircling said shaft and extending through said stationary cylindrical section from within said inner cylinder near the adjacent end thereof to the exterior of the cylinders a left-hand helix located within said stationary cylindrical section and carried rigidly upon the inner portion of said sleeve; a series of diagonally-arranged radial bracket-arms connecting the adjacent end of said inner cylinder to said sleeve, means for supporting the opposite ends of said inner cylinder; a furnace, a spiral flue encircling said outer cylinder and connecting said furnace to one end of said tube, the other end of said tube being connected to the chimney, a condenser, a pipe for connecting the interior of said retort to said condenser, a pipe for connecting said condenser to the fire-chamber of the furnace, and means for rotating said sleeve and shaft in opposite directions, for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

HARRY SPURRIER.

Witnesses:

WILLIAM P. MCFEAT,
FRED. J. SEARS.