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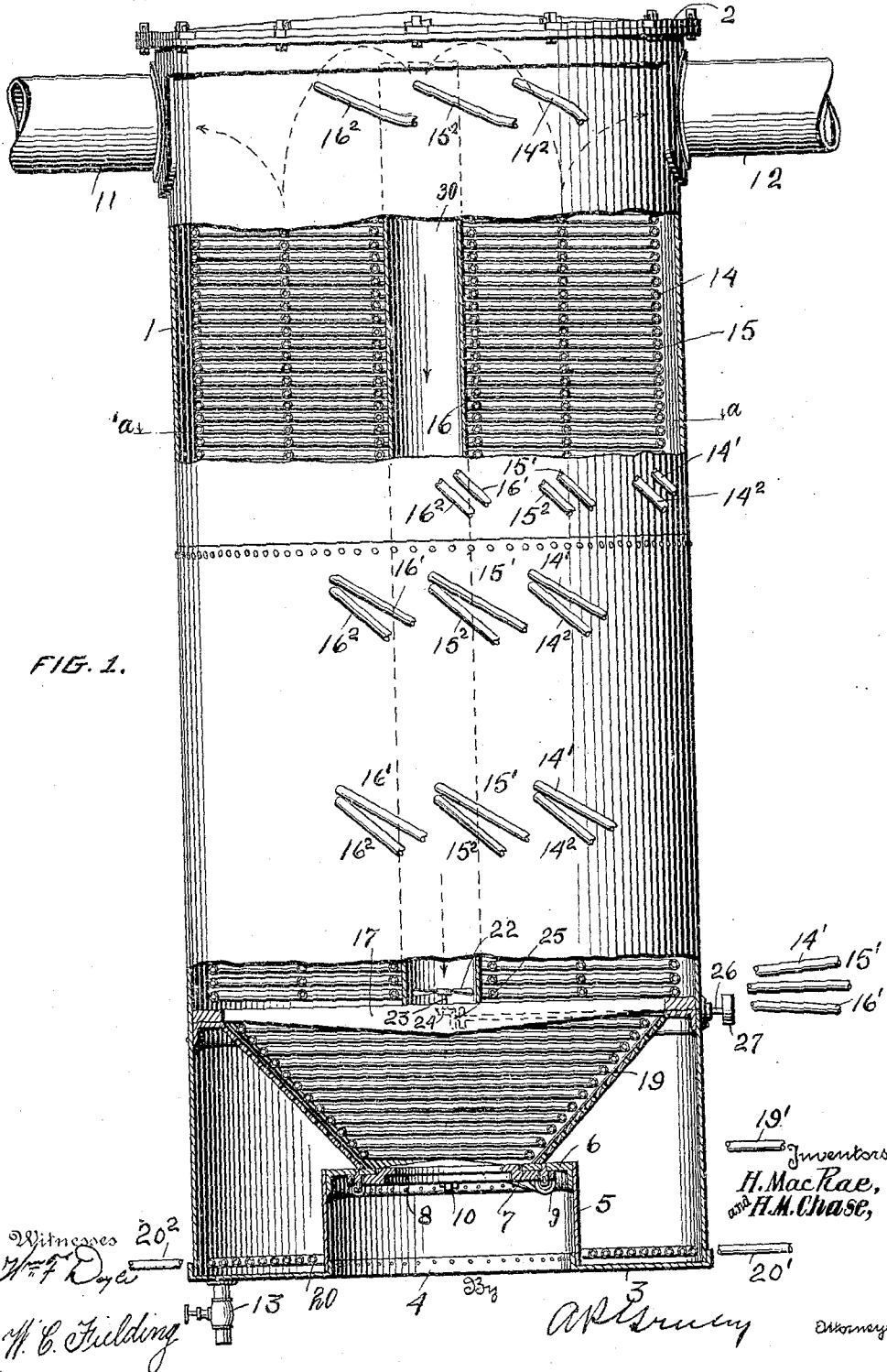


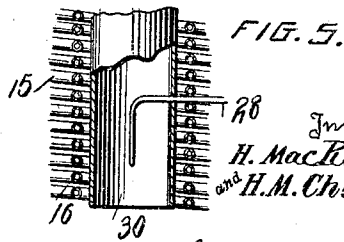
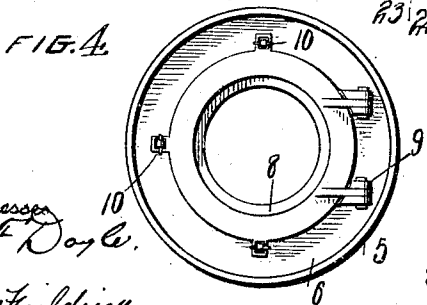
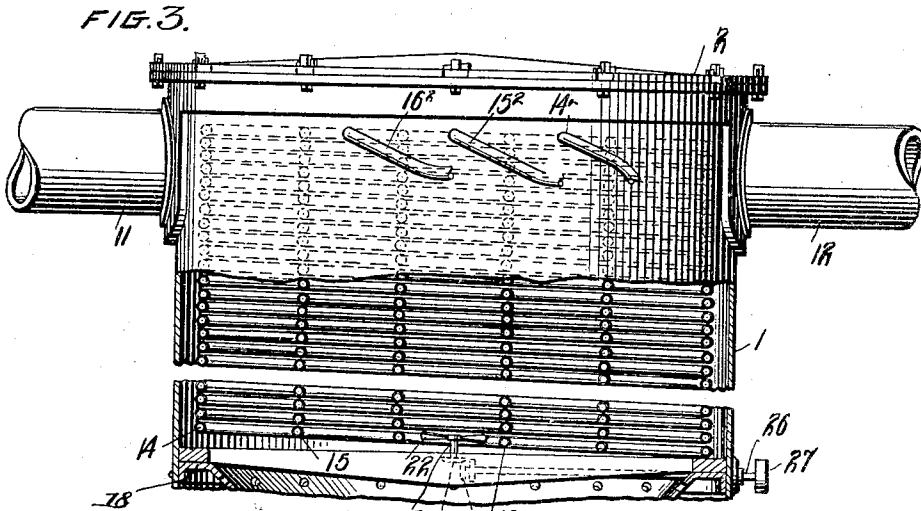
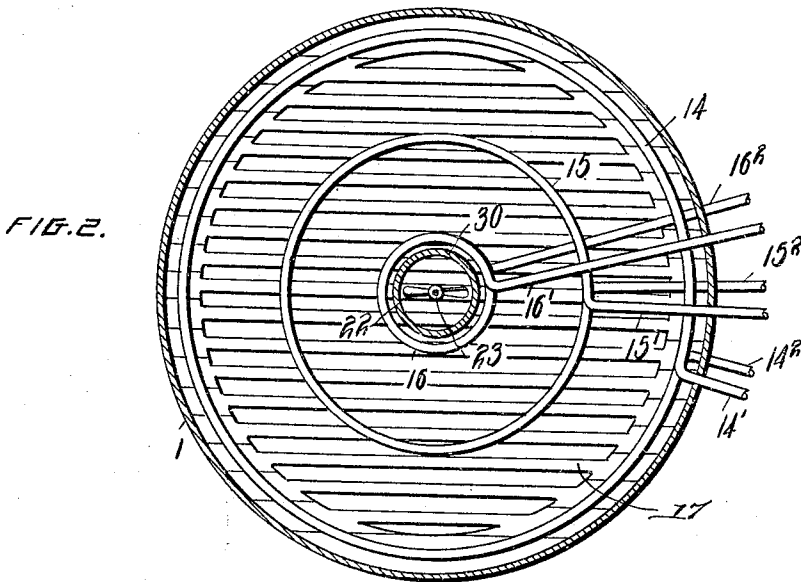
FIG. 1.

H. MACRAE & H. M. CHASE.
 RETORT OR STILL.
 APPLICATION FILED JUNE 22, 1914.

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2 SHEETS—SHEET 2.



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HUGH MACRAE AND HAROLD M. CHASE, OF WILMINGTON, NORTH CAROLINA.

RETORT OR STILL.

1,200,634.

Specification of Letters Patent.

Patented Oct. 10, 1916.

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To all whom it may concern:

Be it known that we, HUGH MACRAE and HAROLD M. CHASE, both citizens of the United States, residing at Wilmington, in the county of New Hanover, State of North Carolina, have invented certain new and useful Improvements in Retorts or Stills, of which the following is a description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to stills or retorts adapted for use in destructive or other distillation of non-liquid materials, such, for instance, as wood of resinous or other trees, and our invention has for its object to provide a construction of retort or still which will permit of and is provided with means for securing circulation of gaseous substances through the material which is being treated, during the distillation process, for the purpose of equalizing the heat throughout the material and facilitating the carrying off of the non-volatile distillation products as they are formed, so as to reduce the time necessary to distil off the products desired.

With these and other objects hereinafter described in view our invention consists in the construction and combination of elements hereinafter described and particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a view partly in elevation and partly in central vertical section of a retort or still embodying our invention. Fig. 2 is a horizontal sectional view on line *a-a* of Fig. 1. Fig. 3 is a view similar to Fig. 1, but showing a construction in which the tube within the interior coils is omitted. Fig. 4 is a bottom plan view of the door through which the residues may be taken out, and Fig. 5 is a fragmentary view in vertical section showing a modified form of the means for creating circulation.

In the drawings 1 indicates a still or retort having its outer wall preferably formed of sheet metal in cylindrical form and preferably arranged with its axis vertical.

2 indicates a cover for the retort, constructed so as to be in whole or part removable to permit the material which is to be subjected to the distillation process to be introduced.

3 indicates the lower end of the retort, having an opening 4, here shown as centrally arranged, through which the residue result-

ing from the destructive distillation may be taken out. A flange 5 extends upward about this opening 4, having at its upper end a plate 6, with central opening 7 adapted to be closed by a door 8, hinged at 9 and arranged to swing downward to permit the residue to be discharged through it. A securing device 10, of any convenient construction, serves to hold the door 8 closed.

Near the upper end of the retort or still 1 are arranged off-takes 11 and 12, preferably two in number, though more or less than two may be used, through which the products of distillation may be led off to suitable condensers, not shown. In the bottom 3 a valved outlet 13 is provided for drawing off any liquid residues which may accumulate about the flange 5.

Within the retort are arranged heating coils 14, 15 and 16, of which the coils 14 are near the walls of the retort; the coils 16 are near the axial center of the retort and the coils 15 are between coils 14 and 16, and are preferably concentric with them. The distance between coils 14 and 15 and between coils 15 and 16 is such as to permit of introducing the material to be treated in pieces or fragments of such size as the material can conveniently be cut or broken into.

The coils 14, 15 and 16 are supported by cross bars 17 arranged near the lower end of the retort, supported at their ends in any convenient manner, as by brackets 18. Below these cross bars is arranged a heating coil 19, the coils of which are preferably so arranged as to form a cone, the diameter of the upper end of which is nearly the same as that of the interior of the retort, and the diameter of the lower end of which rests on the plate 6 about the opening 7, so as to form a funnel to direct the solid portions of the residue to the opening, the spaces between the coils being sufficient to permit any liquid residue to escape into the space surrounding the flange 5. At the extreme lower end of the retort or still is arranged a heating coil 20 surrounding the flange 5.

The heating liquid is supplied to the coils 14, 15, 16, 19 and 20 by intakes 14', 15', 16', 19' and 20', extending through the walls of the retort, and the liquid passes out through outlets 14², 15², 16², 19² and 20², the intakes and outlets being connected with a suitable supply pipe and return pipe (not shown) leading from and to the heater. In a retort or still of any considerable height

the several coils 14, 15 and 16 will preferably be formed in sections, each having its inlet and outlet so as to avoid the cooling which would result from forcing the heating liquid to pass through too great a length of pipe.

In actual construction, particularly where the retort or still is to be used for the destructive distillation of resinous wood the spaces between the coils 14 and 15 and between the coils 15 and 16 and the interior diameter of the coil 16 should not be greater than two or three feet, in order to get the best heating effect on the material to be treated. The space within the interior coils 16 is not intended to be filled with the material to be subjected to distillation, but is left open to form a passage for circulation of gases, and at any suitable point in this passage we provide means for creating a current of gas.

In Figs. 1, 2 and 3 we show a fan 22 arranged near the lower end of the retort or still arranged on a vertical shaft 23 having thereon a bevel gear 24 with which meshes a bevel gear 25 on a horizontal shaft 26, which extends through the wall of the retort, and is provided outside the wall with a pulley 27 to which power may be supplied.

In Fig. 5 we have shown a steam pipe 28 arranged within the passage formed by the interior coils 16. The fan or steam pipe may be placed at any desired part of the passage formed by the interior coil 16.

In Figs. 1, 2 and 5 we have shown a tube 30 arranged within the interior coils 16, while in Fig. 3 we have shown a construction in which this tube is dispensed with.

In operation the material to be subjected to distillation is introduced from above, the cover 2 being open, into the spaces between coils 14 and 15 and coils 15 and 16, leaving the space within coils 16 empty. Heated fluid is then supplied to the coils 14, 15 16 and 19. Heated fluid may also be applied to the coil 20 throughout the entire process, but ordinarily this is not done until the later stage of the process when the coil 20 is submerged with liquid products, the distillation of which is hastened by means of coil 20. As soon as the volatile products begin to be driven off, or sooner if desired, the fan or other means for creating circulation is started. The fan or other means for creating circulation is preferably arranged to draw the gases downward through the passage formed by the interior coils 16, so that they pass into the space below the cross bars 17 and then upward through the material in the spaces between the coils 14 and 15 and 15 and 16. By this circulation of the gases the heat is caused to circulate through the material subjected to distillation, causing it to be heated more evenly throughout and facilitating the bringing of

it to the heat necessary to drive off the volatile products and also carrying off these products as they are formed. It also permits of a better regulation of temperature than is possible without it, which is of particular importance where, as in the distillation of resinous woods, an exact regulation of the heat is necessary while drawing off the more volatile products, such as turpentine, in order to avoid including products which are driven off at a higher temperature and which would contaminate the turpentine. In case the tube 30 is used, the volatile products of distillation will be drawn into the upper end of the tube and will be discharged from the lower end of the tube to find their way upward through the material which is being subjected to distillation. If the tube 30 is dispensed with the main current will be as before, but more or less of the gaseous products will be drawn into the passage formed by the coils 16 through the spaces between contiguous coils. The amount so drawn in will of course depend upon the extent of the spaces between contiguous coils. In case the steam pipe shown in Fig. 5 is used for creating the circulating current the steam may be used as wet steam or as superheated steam, and may be used to modify more or less the action of the heat in driving off the distillation products. The circulation of the gases will be found of special importance in the driving off of the lighter or more volatile distillation products, and may or may not be continued in the later stages of destructive distillation. As the process of destructive distillation is carried out, the heat being raised through successive stages to the point at which the wood is carbonized, the charcoal, as well as the tar and other liquid or semi-liquid residue, falls through between the bars 17 into the lower part of the retort, the charcoal falling down within the conical coil 19 and being taken out as desired through the opening closed by the door 8 and the liquid or semi-liquid residues being drawn out through the outlet 13. It will, of course, be understood that we do not desire to be limited to the arrangement in which the circulating current is directed downward, nor do we desire to be limited to the arrangement of the passage for the current in the center of the retort, it being possible to arrange the passage elsewhere than in the center, provided that it is so arranged that in use it will be surrounded by the material which is being subjected to distillation. It should also be understood that the use of the invention is not limited to the distillation of resinous wood, as it is applicable to the distillation of any material which is capable of being fed into the retort or still in fragments or pieces, so that circulation of gases through the ma-

terial is possible. It should further be understood that we do not desire to be limited to the particular means for heating the retort or still shown, as it is obvious that
 5 other heating means may be used, provided only that the tube 30 or some equivalent of it is arranged within the retort or still to form an inner wall between which and the
 10 outer wall of the retort or still space is afforded for the material to be subjected to distillation, the inner wall forming the passage for the circulating current.

Having thus described our invention, what we claim is:

15 1. A retort or still comprising an outer wall and an inner wall parallel with the outer wall so arranged as to provide space between them to receive material to be subjected to distillation, said inner wall being
 20 so arranged as to provide a passage within it, means extending across said space at its lower end adapted to support non-liquid material but adapted to permit gases to pass
 25 through, means for heating the retort, and means for creating a current of gas in the passage within the inner wall.

2. A retort or still comprising an outer wall and a heating coil arranged to form an inner wall parallel with the outer wall so arranged as to provide space between it and
 30 the outer wall to receive material to be subjected to distillation, said heating coil being so arranged as to provide a passage within it, means extending across said space at its
 35 lower end adapted to support non-liquid material but adapted to permit gases to pass through, means for heating the retort, and means for creating a current of gas in the passage within the heating coil.

40 3. A retort or still comprising an outer wall and a heating coil arranged to form an inner wall parallel with the outer wall so

arranged as to provide space between it and the outer wall to receive material to be sub-
 45 jected to distillation, said heating coil being so arranged as to provide a passage within it, means extending across said space at its lower end adapted to support non-liquid material but adapted to permit gases to pass
 50 through, means for heating the retort, a tube extending through the passage within the heating coil, and means for creating a current of gas in the tube.

4. A retort or still comprising an outer wall, a plurality of concentric heating coils
 55 arranged within the retort or still with spaces between them to receive material to be subjected to distillation, one of the heating coils being arranged to form an inner wall parallel with the outer wall surround-
 60 ing a passage, and means for creating a circulating current of gas in the passage so formed.

5. A retort or still comprising an outer wall, having an off-take at one end for the
 65 products of distillation, and an inner wall parallel with the outer wall so arranged as to form a passage open at its ends within the retort or still and so arranged as to leave space between it and the outer wall to re-
 70 ceive a non-liquid material to be subjected to distillation, means for heating the retort and means for creating a circulating current of gas through the passage in a direction toward the end of the retort or still opposite
 75 to that at which the off-take is arranged.

This specification signed and witnessed this 18th day of May, A. D. 1914.

HUGH MACRAE.
 HAROLD M. CHASE.

In the presence of—
 M. P. BELL,
 R. M. SHEPPARD.