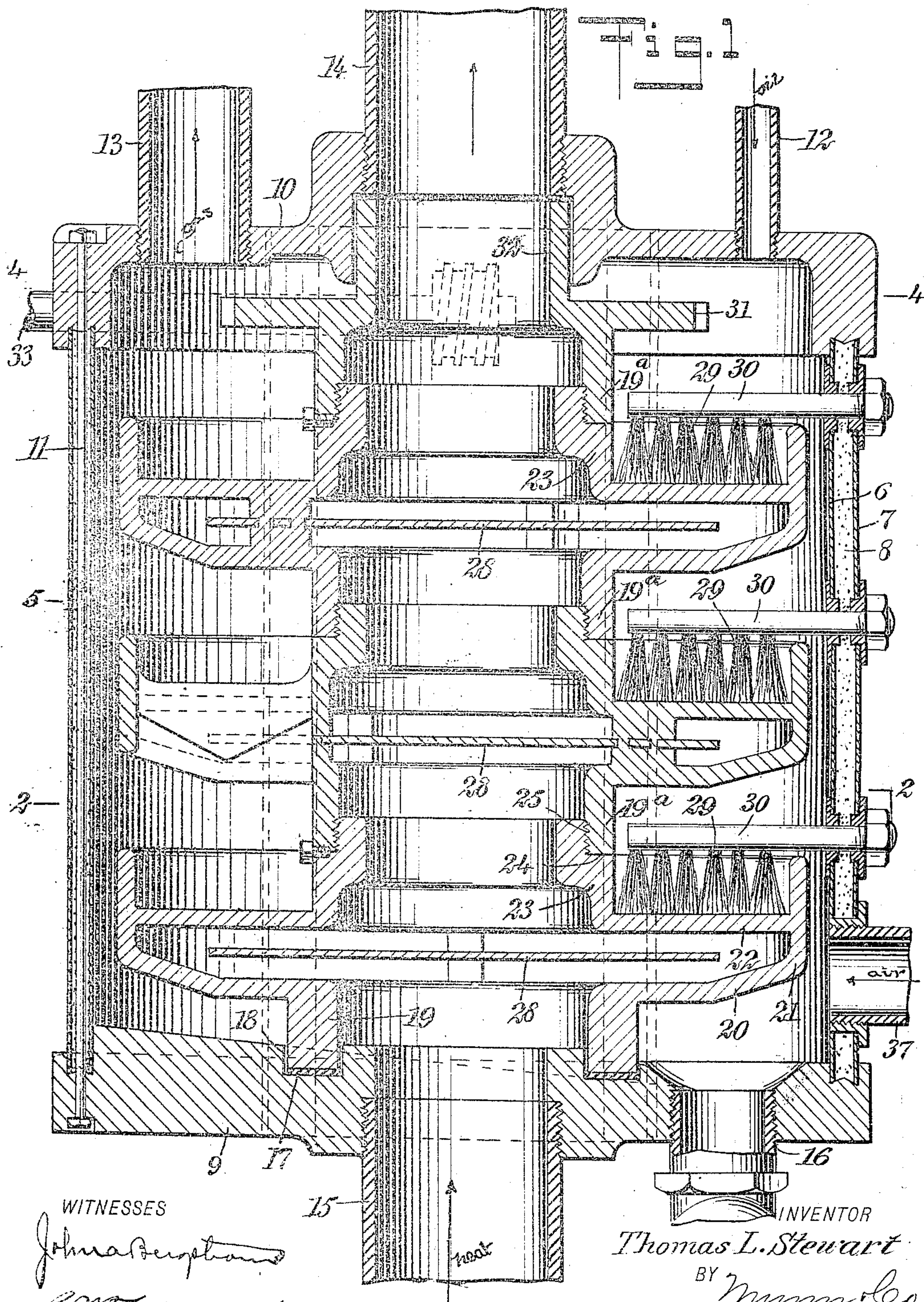


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T. L. STEWART.
GAS GENERATING RETORT.
APPLICATION FILED SEPT. 6, 1906.

PATENTED JAN. 15, 1907.

3 SHEETS—SHEET 1.



WITNESSES

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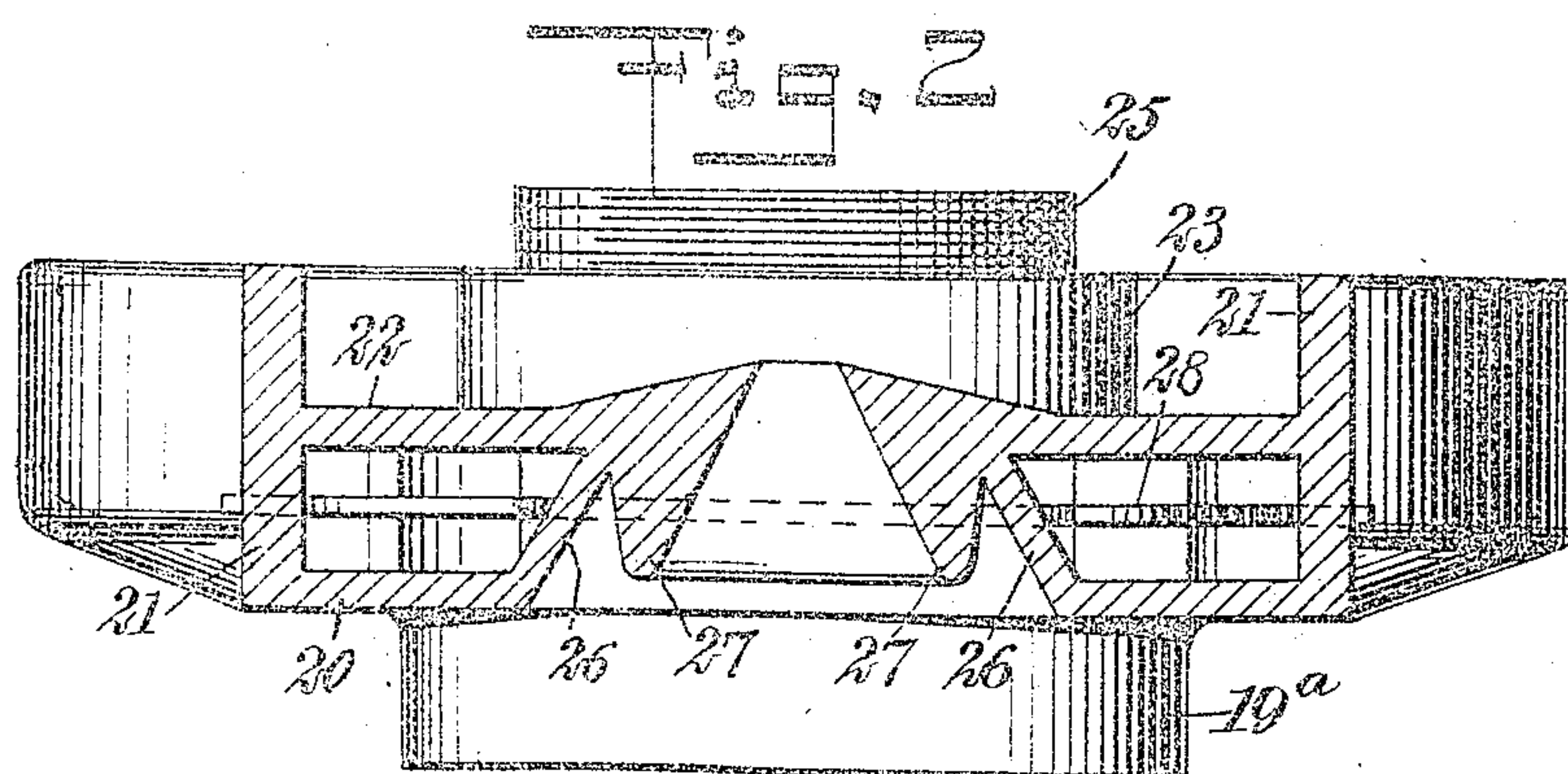
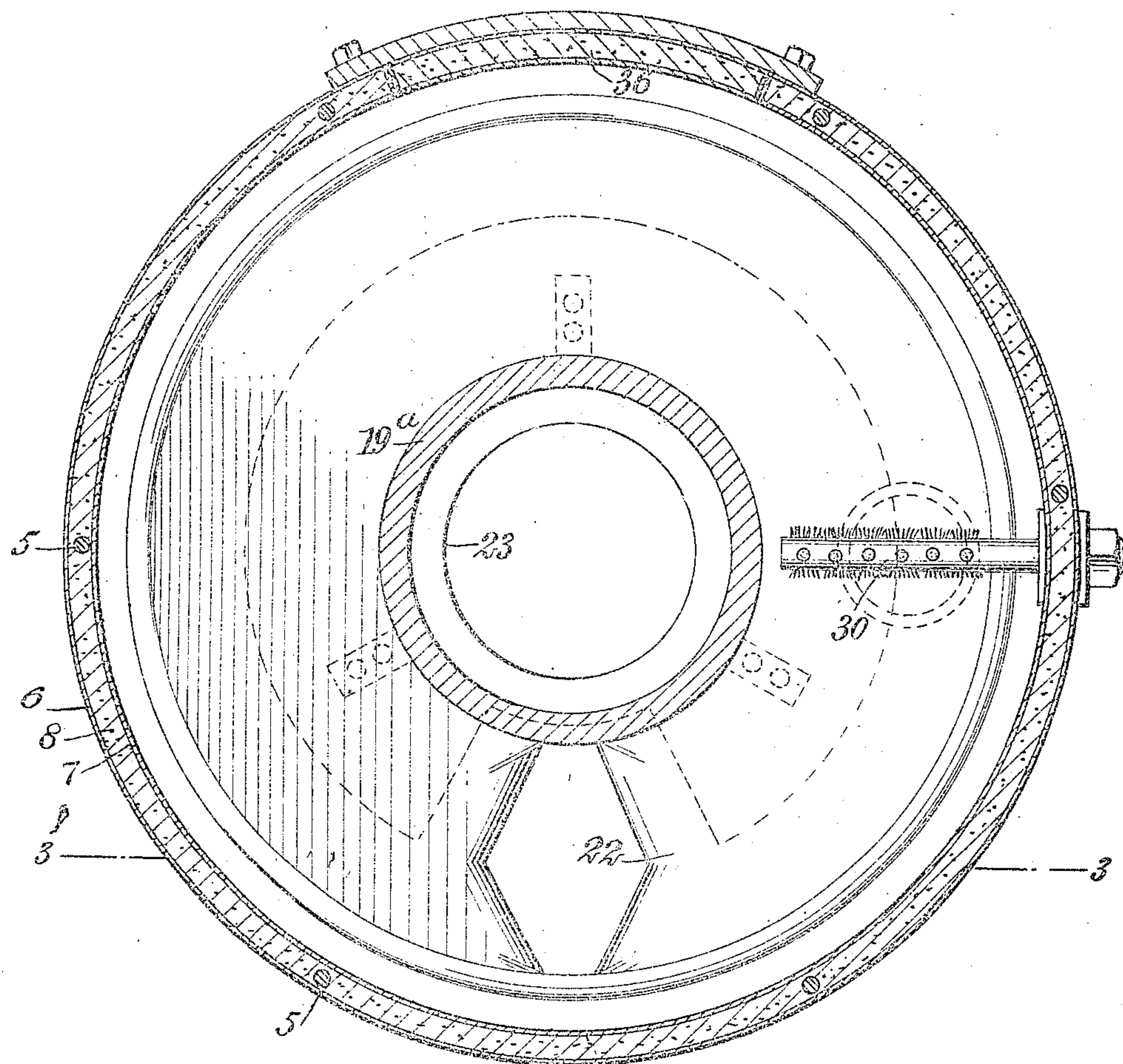
ATTORNEYS

No. 841,466.

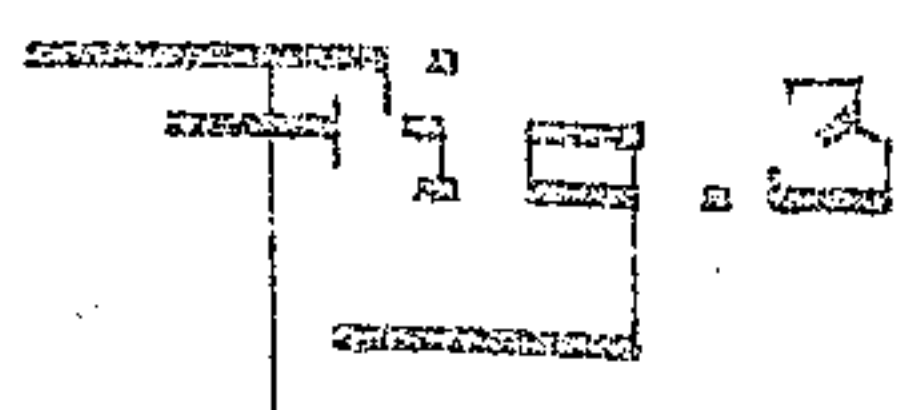
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T. L. STEWART.
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3 SHEETS—SHEET 2.



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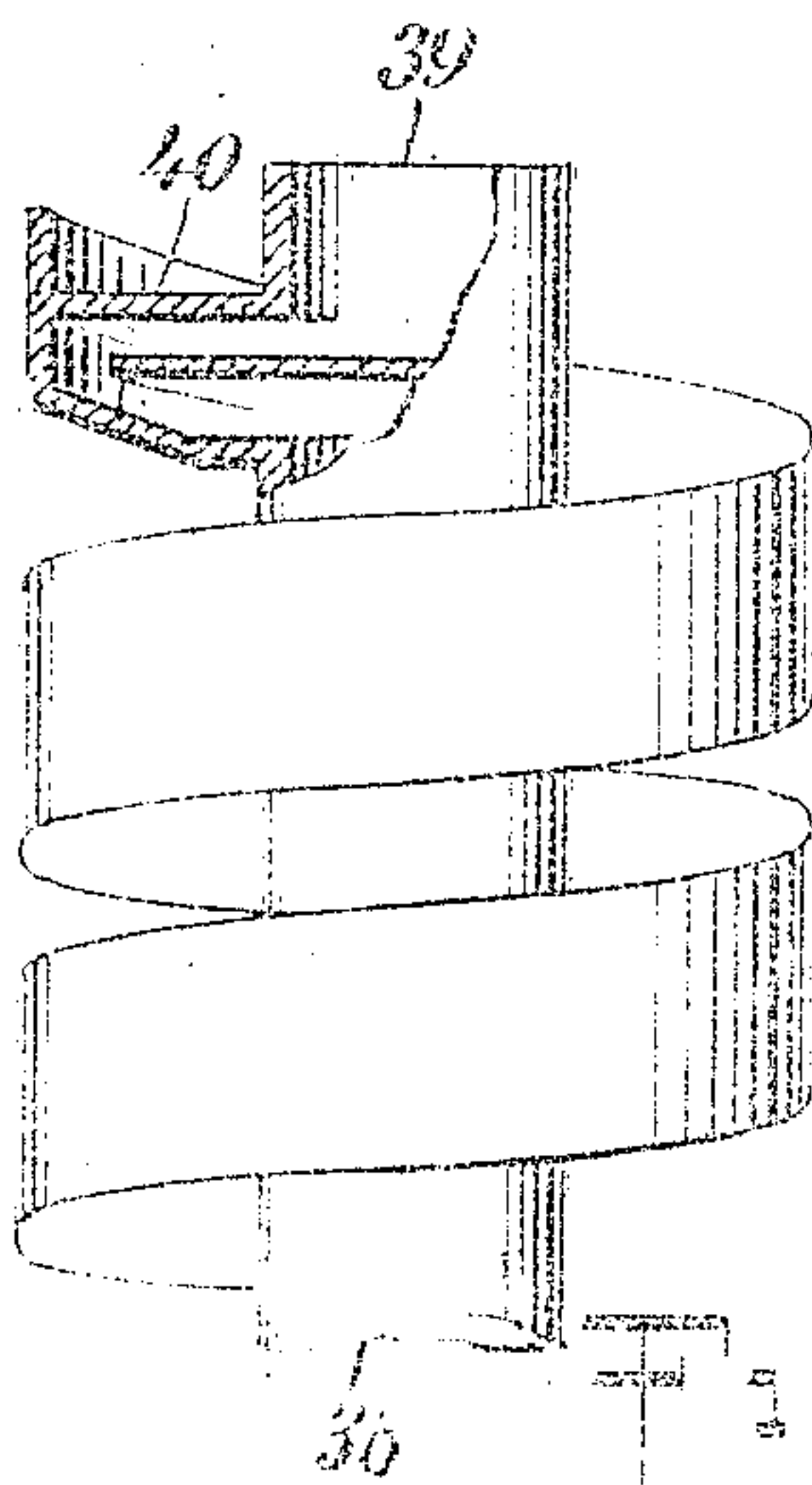
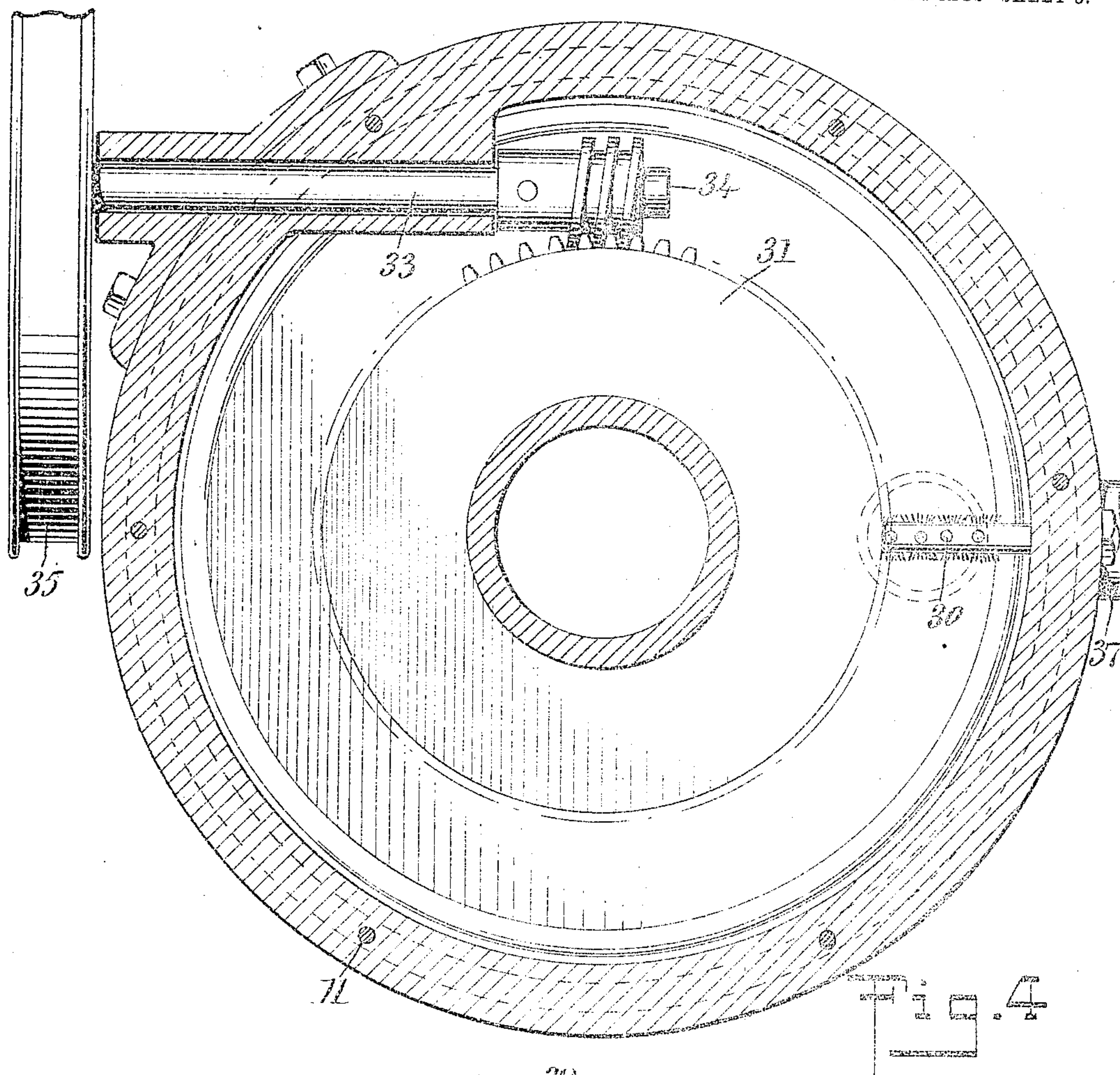
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No. 841,466.

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APPLICATION FILED SEPT. 6, 1906.

PATENTED JAN. 15, 1907.

3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

THOMAS LEE STEWART, OF OAKLAND, CALIFORNIA, ASSIGNOR TO
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GAS-GENERATING RETORT.

No. 841,486.

Specification of Letters Patent.

Patented Jan. 15, 1907.

Application filed September 6, 1906. Serial No. 333,433.

To all whom it may concern:

Be it known that I, THOMAS LEE STEWART, a citizen of the United States, and a resident of Oakland, in the county of Alameda and State of California, have invented a new and Improved Gas-Generating Retort, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in gas-generating retorts, and particularly that type of retort in which the gas is generated by the heating of heavy hydrocarbon oils or residues and at the same time mixing the gas produced with air.

My device is especially adapted for use in connection with gas-engines, heating, lighting, or other uses for which gas may be applied. When used to produce gas for use in gas-engines, the heat in the waste gases drawn off through the exhaust-pipe may be used to convert the gasolene, distillate, crude or other hydrocarbon oils into gas for such use and for any other purpose for which gas is desired.

My improved retort is designed to produce the maximum evaporation of the hydrocarbon oil from a minimum of heat, such heat being the waste heat from the gas-engine, a stove, or other suitable source provided for the purpose.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures, in which—

Figure 1 is a vertical section through the retort. Fig. 2 is a cross-section on the line 2 2 of Fig. 1. Fig. 3 is a vertical section on the line 3 3 of Fig. 2. Fig. 4 is a horizontal section on the line 4 4 of Fig. 1, and Fig. 5 is a diagrammatic view of a modified form of the apparatus.

My improved retort comprises a main casing 5, made up of an inner wall 6, an outer wall 7, and a filling of insulating material 8, preferably asbestos, between the inner and outer walls. The ends of the casing are closed by a suitable bottom 9 and top 10, which are held together and to the casing by long bolts 11, extending the entire length of the casing between the inner and outer walls thereof. The top 10 is provided with a

small pipe 12 for the admission of the gasolene, oil, or other material from which it is designed to produce the gas, a larger gas-outlet pipe 13, through which the gas is drawn off to the storage-reservoir or point at which it is desired to use the same, and with a large outlet-pipe 14 for the exhaust-gases which have been used to heat the retort. The bottom 9 is provided with a large inlet-pipe 15, through which the hot gases are admitted to the retort, and with a draw-off pipe 16 for the heavier portions of the oil or residue which have not been evaporated and toward which the upper surface of the bottom 9 slants to facilitate the drainage.

Within the casing and resting upon the bottom is a column or series of pans over which the oil flows and within which the hot gases circulate to volatilize the oil. All of these pans are substantially alike, and each rests upon and is carried by the pan below, while the bottom one rests upon a brass plate 17 at the bottom of an annular groove or recess 18 and the upper surface of the bottom 9 and surrounding the inlet-pipe 15. Each of the pans comprises a cylindrical hollow body portion having an annular collar 19, by which it is supported or secured to the pan below, and extending outward from this collar is a radial partition 20, by which the collar 19 is connected to the main cylindrical side walls 21. Above the partition 20 and substantially parallel to it is the bottom wall 22 of the pan, which is carried by the side walls 21 and extends inwardly therefrom to the cylindrical collar 23, extending upwardly from the bottom 22 and substantially in alignment with the annular-collar 19. The collar 23 is provided with a shoulder 24, adapted to support the collar 19 of the pan above and may, if desired, be provided with a screw-threaded portion 25, by which the pans may be secured together. The wall or bottom 22 is designed to be supported in substantially a horizontal plane, and the material to be volatilized rests on this bottom between the outer vertical side wall 21 and the inner annular collar 23; but to permit of the passage of this material from one pan to the next an opening is provided through the bottom 22 and wall 20, as shown in Figs. 2 and 3. The bottom 22 of the pan is inclined upward

toward the opening, so that a small amount of material will normally remain on the bottom of the pan without falling through the opening, and to prevent communication between the central space within the pan and the upper surface thereof I provide partitions 26, connecting the bottom 22 and the wall 20 and surrounding the discharge-opening. Surrounding the opening on the lower side is a downwardly-extending lip or flange 27, which serves to prevent the material which flows through the opening from adhering to the bottom of the pan and causes it to drop directly into the pan below. Within the inner space of each pan is a horizontal partition 28, suitably supported and extending entirely across the main axial passage of the pan and out into the space between the wall 20 and the bottom 22.

As the hot gases rise through the pipe 15 they come in contact with the partition 28 and are caused to flow radially toward the outer circumference of the pan until they get beyond the edges of the partition 28 whereupon they flow back toward the central portion of the pan and directly in contact with the bottom 22 until they reach the central portion again, where they may rise through the passage within the collar 23 and upward until they come in contact with the partition 28 of the pan directly above.

In order that the material to be volatilized may be prevented from collecting in large quantities on the pans should it become too thick to flow readily, I provide a plurality of brushes 29, supported upon the side wall of the casing and extending inwardly and in engagement with the bottom 22 of each pan. These brushes may be of any suitable design, but preferably comprise a back member 30, extending through the wall of the casing and provided with a nut upon the outside and having a plurality of bunches of wires extending downwardly and adapted to brush the entire bottom 22 of the pan as the latter rotates. As shown in the drawings, all of these brushes are in the same vertical line and all of the same specific character; but it is evident that they may be located upon any side of the casing desired and be supported in any suitable manner. The openings for the passage of the material from one pan to the next are preferably not arranged in alinement; but the opening of each pan is slightly behind that of the pan directly below, so that the material passing through any opening strikes the next pan just back of this opening, and thus has to travel nearly the entire circumference of the pan before it can pass to the pan beyond.

For rotating the pans any suitable device may be employed; but preferably I provide a gear-wheel 31, having a downwardly-extending collar 19^a, similar to the downwardly-

extending collars of the pans below, and having an upwardly-extending collar 32 fitting within the recess within the top 10 of the retort and adapted to act as a journal as the pans rotate. Supported within the top 10 of the retort and extending through the wall thereof is a shaft 33, having a worm-wheel 34 on its inner end adapted to engage with the gear-wheel 31, while the outer end of the shaft 33 is provided with a pulley 35 or any other suitable means whereby it may be rotated.

The side of the casing is provided with a door 36 of any suitable character and adapted to be closed gas-tight to prevent the escape of gas from the retort. This door is preferably made up of inner and outer walls and intermediate insulating material similar to the casing of the retort, and as the door is normally closed it may be bolted in position in any suitable manner. At the lower end of the casing is an air-inlet pipe 37, which may be either in the wall of the casing or in the door, as may be desired.

In the operation of my improved gas-generating retort the material to be volatilized is admitted through the pipe 12 on the upper pan, and the entire series of pans are rotated by means of the shaft 33 and worm-wheel 34. The pipe 15 is connected to any suitable source of heating medium, preferably to the exhaust of a gas-engine, if the gas produced is to be used in such engine, and air is admitted through the pipe 37. The air rising around the pans mingles with the gas produced by the vaporization of the material upon the pans, and the mixed air and gas escape through the pipe 13, while the exhaust heating medium escapes through the pipe 14. As the pans rotate the material passes from one pan to the next through the discharge-openings and is caused to flow almost entirely around each pan before passing to the next one. The brushes facilitate the circulation of the oil, and particularly in case the oil is thick and heavy or the retort is cold and it is first started in operation.

It is evident that any number of pans may be employed, and in use I prefer to use a much larger number than that employed in the device illustrated in the drawings. If desired, no air need be admitted through the pipe 37, and the gas produced may then be employed for lighting or heating, for when air is admitted through the pipe 37 the resultant gas is an explosive mixture adapted for use in gas-engines, in which case I heat the retort from the exhaust-gases from the engine and, in fact, employ it as a muffler. If desired, the air may be admitted through the pipe 13 and the gas produced be drawn off through the pipe 37, and it is evident that other changes in the operation, as well as in the specific structure, may be made

without departing from the spirit of my invention.

In the form of my invention illustrated in Figs. 1 to 4, inclusive, the flow of the heating medium is in a zigzag course upward through the device, while the flow of the material to be vaporized is in an interrupted flow around each pan and to the next pan.

It is evident that the pans may be arranged in a spiral path and the heating medium circulated up through the center, and I have illustrated such a form of the device in Fig. 5. When the heating medium passes upward from the bottom 38 to the upper outlet 39, the material to be vaporized flows within the spiral passage 40. Of course it is to be understood that the device shown in this figure is to be supported within a casing having inlets and outlets similar to those shown in Fig. 1; but it is thought unnecessary to illustrate them in connection with the detail shown in Fig. 5.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an apparatus of the class described, the combination of a casing having openings in its top and bottom, a column within said casing and having a passage therethrough communicating with said openings, a plurality of annular pans carried by said column, and means for rotating said column and pans.

2. An apparatus of the class described, comprising a casing, a hollow column, a plurality of annular pans carried by said column, each of said pans having a hollow bottom communicating with the hollow supporting-column and a passage through the bottom but independent of the column, and means for circulating a heating medium through said column and pan-bottoms.

3. A retort, comprising a casing having centrally-located openings in its top and bottom, respectively, a plurality of pans having hollow bottoms and arranged one above the other, hollow connections between said pans, and means for rotating said pans and hollow connections, the openings in the casing and the hollow connections constituting means whereby the pans may be heated by the circulation of a heating medium.

4. A gas-generating retort, comprising a cylindrical casing, a sloping bottom member attached thereto, said bottom member being provided with an annular groove and a bearing-plate located therein, a pan having an annular collar adapted to fit within said groove, means for internally heating said pan, means for delivering thereto a material to be vaporized, and means for rotating said pan.

5. A gas-generating retort provided with a pan having a horizontal bottom, a wall below and spaced therefrom, a baffle-plate be-

tween said wall and said bottom, means for delivering a heating medium to said pan below the baffle and drawing it off above said baffle, and means for rotating said pan.

6. A gas-generating retort, comprising a casing, a plurality of pans mounted one above the other, hollow axial connections between said pans, means connected to one of said pans whereby all may be rotated, means for internally heating said pans, means for delivering a material to be vaporized to one of said pans, and means for admitting air to the casing and in contact with said pans.

7. A gas-generating retort, comprising a stationary casing, a hollow rotating body located therein and provided with an evaporating-surface and a hollow support, a plurality of brushes secured to said casing and arranged to agitate the material upon said evaporating-surface, and means whereby a heating medium may be delivered through the hollow support into said rotating body.

8. A gas-generating retort comprising a casing, having an inlet for the material to be vaporized, an opening for admitting air, an outlet for the gas produced and for the residue, a rotating body within said casing, and means whereby said rotating body may be internally heated.

9. A gas-generating retort, comprising a cylindrical casing having inner and outer walls and a layer of non-conducting material therebetween, a sloping bottom closing the lower end of the casing, said bottom having an inlet for a heating medium and an outlet for the residue, an annular groove surrounding the inlet for the heating medium, a pan located within said casing and having a collar within said groove and having a passage therethrough, a baffle located between said passage and adapted to bring the heating medium in more intimate contact with the walls of the pan, and means for rotating said pan.

10. A gas-generating retort, comprising a cylindrical casing, an annular pan located therein and provided with a cylindrical outer wall, a cylindrical inner wall, and a hollow bottom, having a centrally-located inlet for delivering a heating medium to said bottom, means for rotating said pan, and means carried by the casing adapted to engage with the bottom of the pan for agitating the material located thereon.

11. A pan for a gas-generating retort, comprising a cylindrical outer wall, an annular bottom wall, an annular wall substantially parallel thereto and spaced therefrom, a cylindrical supporting-collar connected to said last-mentioned wall, a cylindrical wall carried by said first-mentioned bottom wall, a baffle located intermediate the two annular walls whereby a heating medium may be admitted to one side of said baffle and circu-

lated to the outer cylindrical wall and around the edges of said baffle, the pan being provided with a discharge-passage extending through the two annular walls, and a downwardly-projecting lip surrounding said passage.

In testimony whereof I have signed my

name to this specification in the presence of two subscribing witnesses.

THOMAS LEE STEWART.

Witnesses:

E. J. STEWART,
C. A. OLSON.