J. DARLING.

GAS GENERATOR.

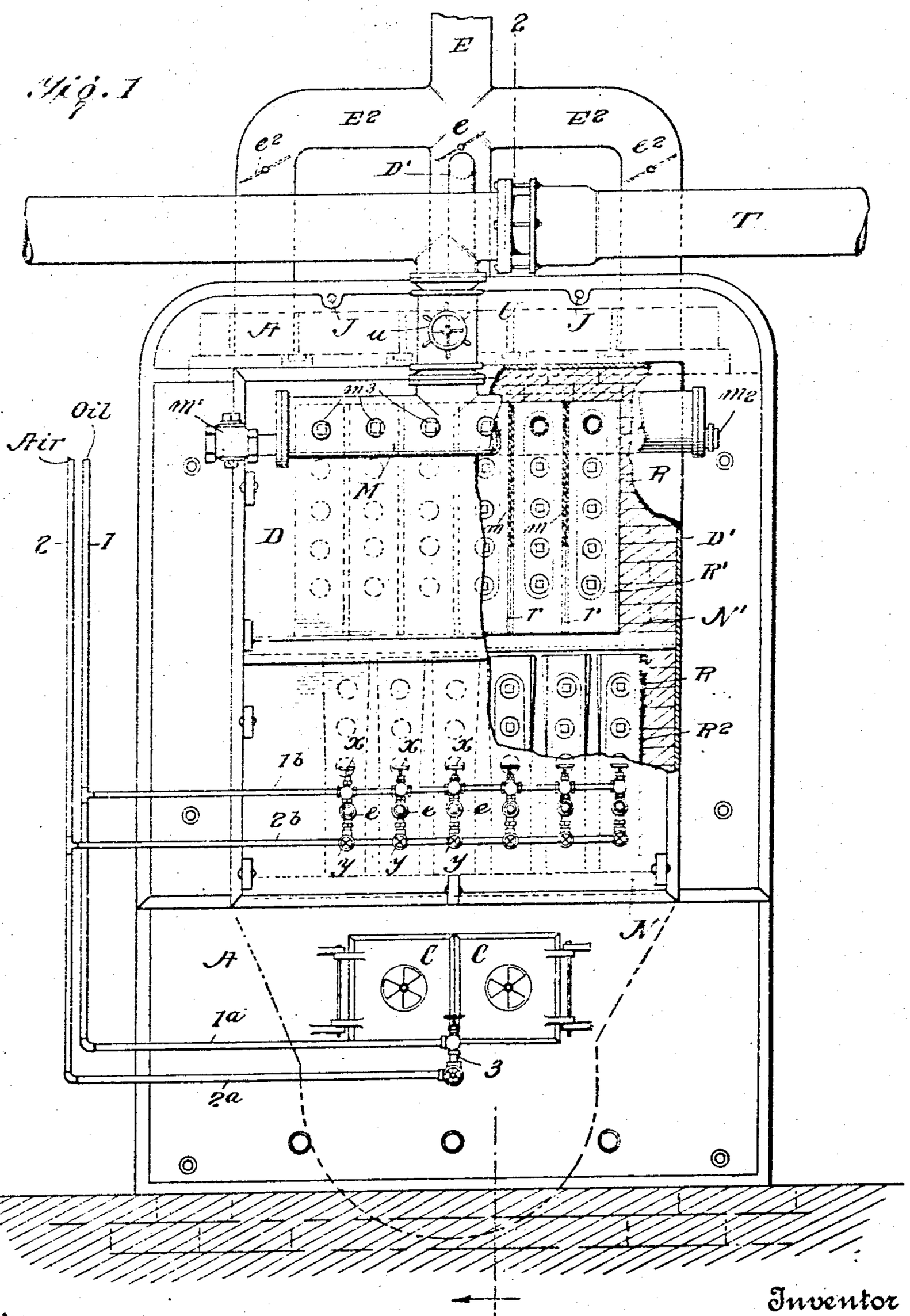
APPLICATION FILED DEC. 30, 1908.

933,828.

Patented Sept. 14, 1909.

3 SHEETS—SHEET 1.

Fig. 1



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3 SHEETS—SHEET 2.

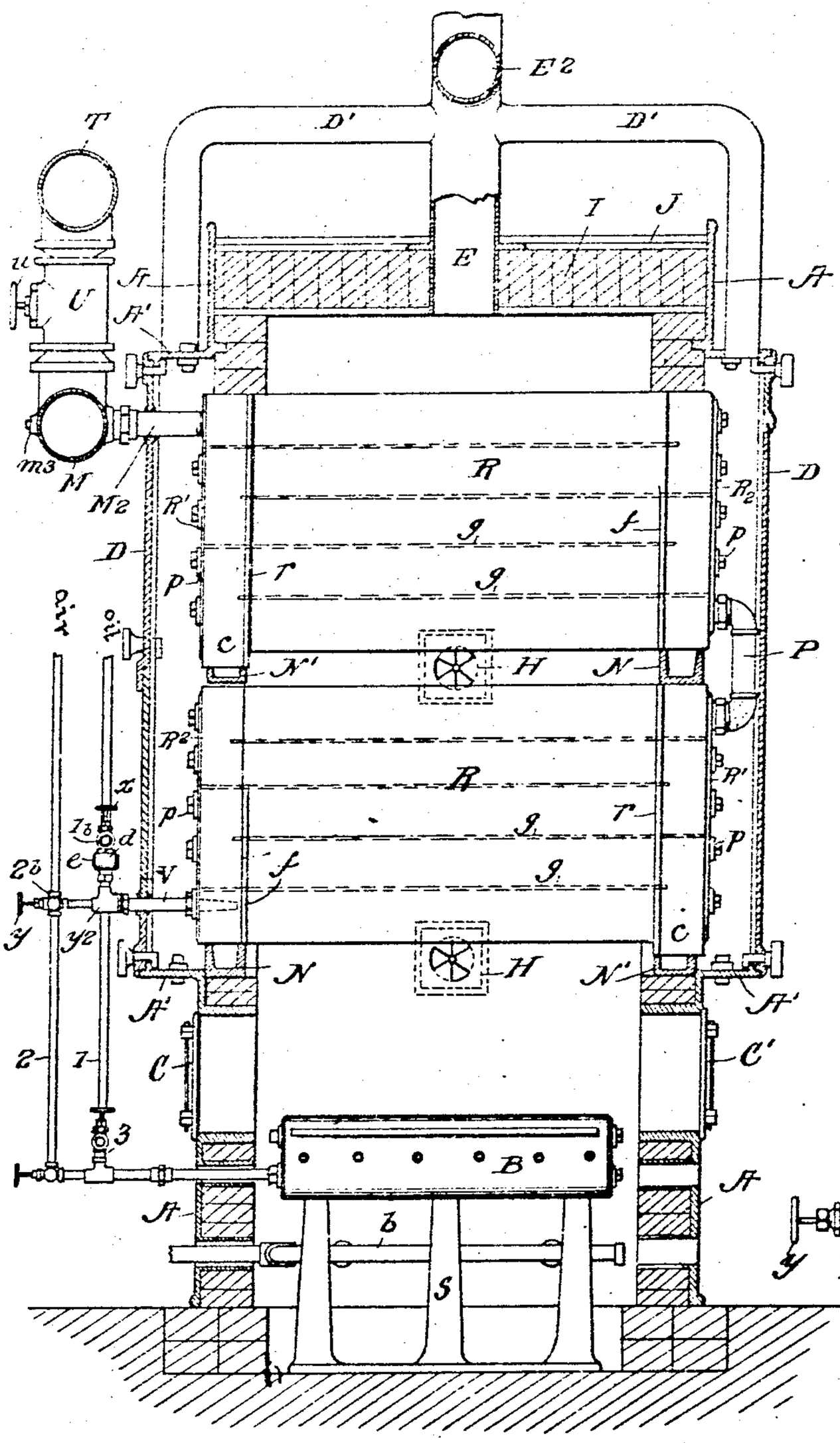

Fig. 2.

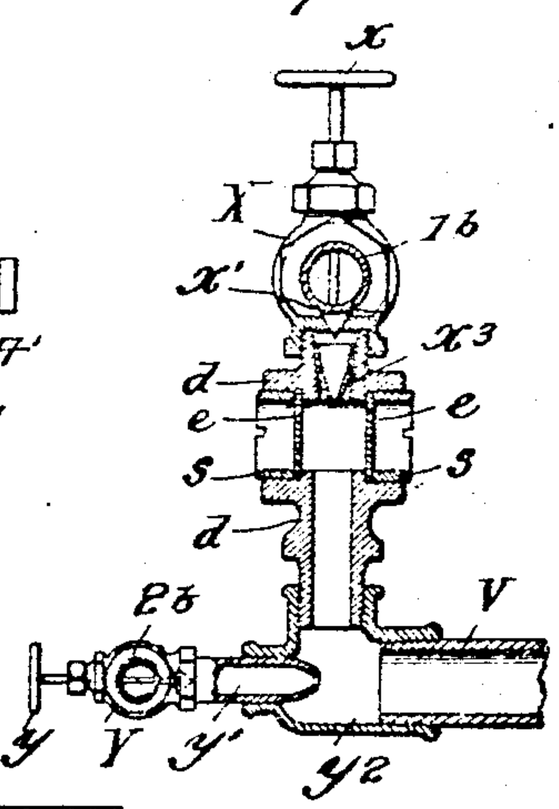

Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 4.

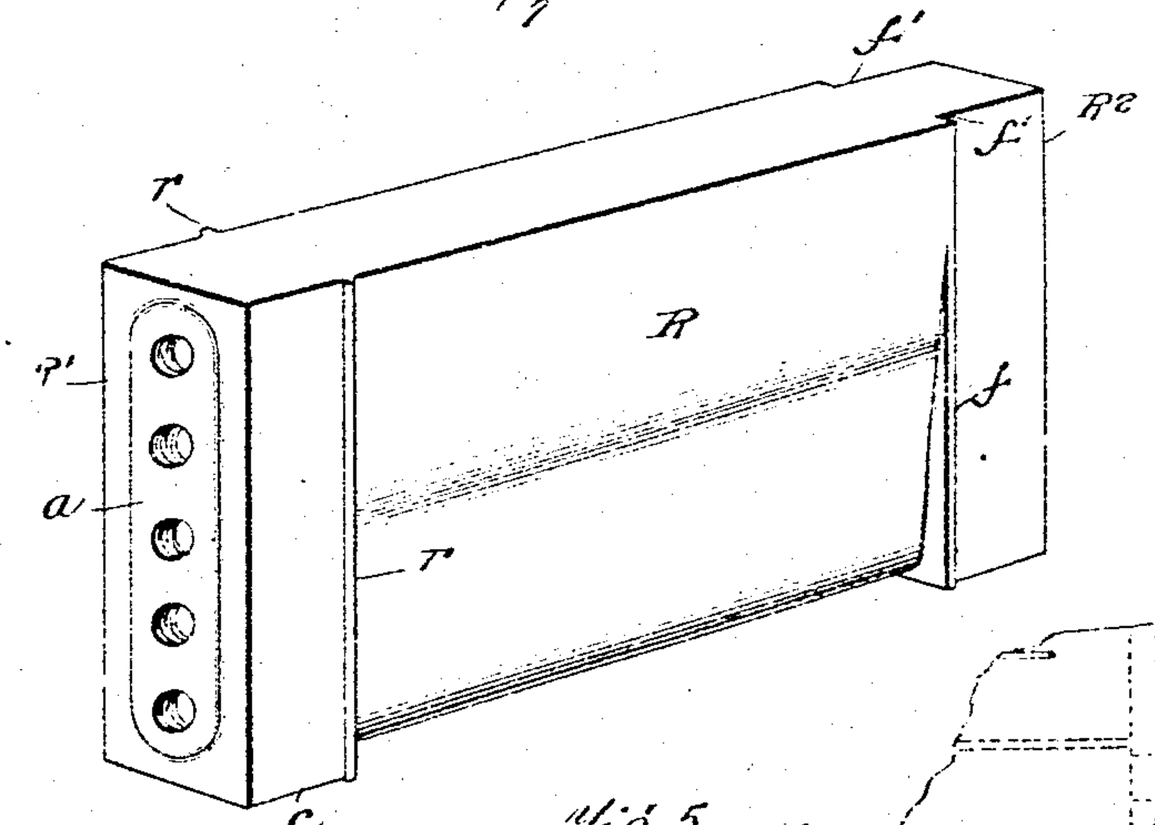


Fig. 8.

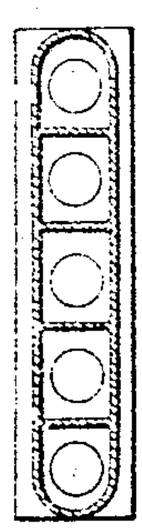


Fig. 5.

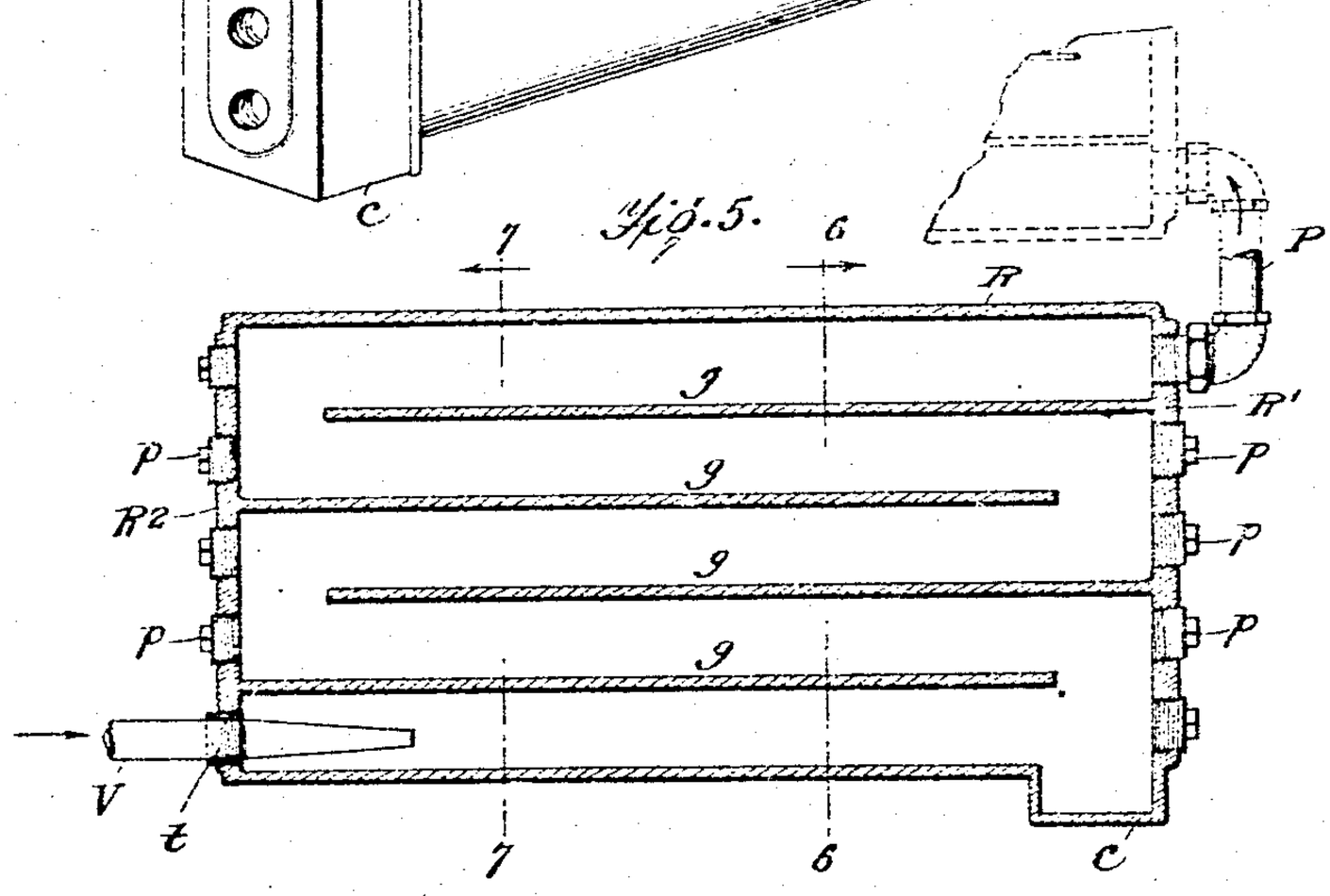


Fig. 6.

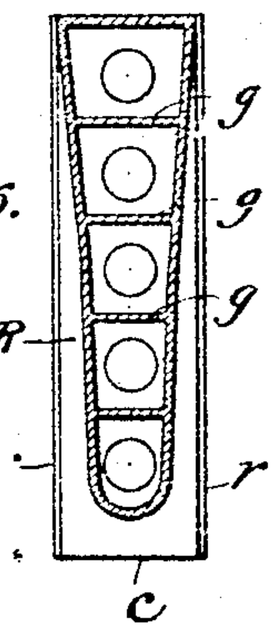
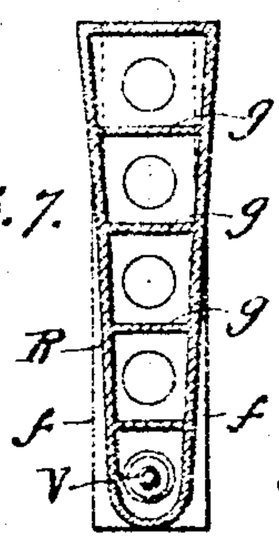


Fig. 7.



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UNITED STATES PATENT OFFICE.

JOSEPH DARLING, OF CHICORA, PENNSYLVANIA, ASSIGNOR TO THE SMOKELESS HEAT & POWER COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

GAS-GENERATOR.

933,828. Specification of Letters Patent. **Patented Sept. 14, 1909.**

Application filed December 30, 1908. Serial No. 469,931.

To all whom it may concern:

Be it known that J. JOSEPH DARLING, a citizen of the United States, residing at Chicora, in the county of Butler and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Generators, of which the following is a specification.

My invention is in the nature of an improved gas generator of that type which produces a gas from crude petroleum, or other similar hydrocarbons, by admixture with air in heated retorts, said gas being designed for heating and lighting generally.

My invention consists in the novel construction and arrangement of the retorts, and in the combination of the same with the inclosing casing, the feed devices, and the accessories of the generator, as will be hereinafter more fully described with reference to the drawing in which.

Figure 1. is a front elevation of the generator with a part of the front casing broken away. Fig. 2. is a vertical section on line 2—2 of Fig. 1. Fig. 3. is an enlarged vertical section taken through the injection devices for supplying oil and air to the retorts. Fig. 4. is a perspective view of one of the retorts. Fig. 5. is a vertical longitudinal section through the same. Fig. 6. is a transverse section through the retort taken on line 6—6 of Fig. 5. and looking in the direction of the arrow on said line. Fig. 7. is a similar section on line 7—7 of Fig. 5. looking in the direction of the arrow on that line and, Fig. 8. is a cross section of a modified form of the retort.

In the drawing, Fig. 2., R R represents two series of retorts, one series being placed above the other and the retorts of the upper series being placed above the spaces between the retorts of the series below, as seen in Fig. 1. The retorts are placed within a furnace casing with their ends built within the masonry walls of the front and back walls of the casing as hereafter described. Below the retorts is the fire chamber within which is arranged the burner B, Fig. 2. which may be of any suitable construction, but is preferably of the retort type which volatilizes oil and makes its own gas. This burner is mounted upon a stand S and has beneath it a gas pipe *b* to supply the starting heat to get the burner B into action.

The retorts R are constructed as seen in Figs. 4 to 7. They are cast in one piece with upright rectangular ends, of which the front end R^1 is both wider and deeper than the rear end R^2. The heads of both ends have a central zone *a* of increased thickness to provide for screw threaded holes which when the retort is in service are closed by screw plugs *p* which have square wrench heads to enable them to be turned in or out. The retorts are also cast integrally with baffle plates *g* each of which alternately at one end joins on to a head and at the other end stops short of the other head, thus forming a vertical series of horizontal channels which open into each other alternately at opposite ends. The holes in the end heads are arranged, one opposite each end of each channel. These holes serve a double purpose. In the first place they permit of the proper support of the cores at both ends in order to render possible the casting of the baffle plates and heads in one piece with the sides of the retort. These holes also serve an important function after the retort is put in service, as they permit, by the removal of the screw plugs, of the introduction of scrapers for cleaning out the deposits of carbon and other residuum which accumulates from time to time in the retort. As seen in Figs. 4, 6, and 7, the body of the retort between the ends is flat at the top and gradually narrows toward the bottom and has a rounded bottom, but, if desired, the cross section may be round at both top and bottom as seen in Fig. 8. The larger end R^1 has, at a little distance from the end, a vertical rib *r* on each side which is parallel to the end and is set back from the end a distance approximately equal to the thickness of the masonry wall in which the retort ends are carried. At the smaller end R^2 of the retort there is a corresponding rib or flange *f*, but this does not extend all the way to the top of the retort, but tapers to nothing near the top coincidently with the recesses f^1 f^1 which reduces the thickness of this end of the retort. The larger end R^1 of the retort descends at *c* below the level of the middle of the retort, as seen in Figs. 5 and 6, while the smaller end R^2 terminates at the bottom coincidently with the bottom of the middle of the retort. The construction of the retort as thus described, has reference to the setting of the retorts and the removal of any one of them without disturbing the others. Thus the retorts are set with their ends in the front and back walls and with their ribs *r* abutting

against each other. The space between the large ends of the retorts formed by the abutting ribs *r r* is filled with mortar at *m* Fig. 1., the ribs holding the mortar against falling into the furnace thus forming a tightly luted joint. In like manner, the ribs or flanges *f*, *f*, at the small end are abutted together and the space between these ends outside of the flanges *f* is also filled with mortar, the flanges serving to prevent the mortar from passing into the furnace. It will be seen, however, that as the end R^2 is both narrower and shallower than the end R^1, the retort can, by simply loosening the mortar at front and back, be easily slipped out, the end R^1 foremost, for any repairs or cleaning that may be required. In setting the retorts in the masonry walls the upper tier of the retorts occupy a reversed relation to those in the lower tier, as seen in Figs. 1 and 2; thus in Fig. 1. the large ends R^1 of the retorts in the upper tier and the small ends in the lower tier appear at the same end of the masonry walls.

At the front side of the furnace are arranged the oil pipe 1 and the air pipe 2. These descend vertically at one side of the furnace and through horizontal branches 1^a and 2^a supply the feed devices 3, of the burner, which may be of any desired type. At a point higher up and opposite the lower ends of the lower tier of retorts are two other branch pipes 1^b and 2^b which supply the feed devices for the retorts, the oil passing through the pipe 1^b and the air through 2^b. Each retort has an independent feed device, the construction and arrangement of which is shown in detail in Fig. 3. its relation to the retort being shown in Figs. 2 and 5. The feed tube V, Figs. 3 and 5, is made with an external screw thread *t* which is screwed into a bushing in the head R^2 of the retort and terminates within the retort in a tapered nozzle. The outer end of the feed tube V, Fig. 3, is screwed into a T-coupling y^2, into the horizontal nipple of which is screwed the air nozzle y^1 taking air from the coupling Y which is placed in the length of the air pipe 2^b, one opposite each retort, and which pipe extends past and supplies all the retorts of that series. The valve *y* has its seat between the coupling Y and the nozzle y^1 so that any retort can be cut off from the air pipe without interfering with the passage of air past that retort to others in the series. In the upper nipple of the T-coupling y^2 is screwed an upright tubular frame *d* of special form which receives oil from the oil pipe 1^b through valve $x\,x^1$, the seat x^1 of which is at the bottom of the coupling X placed in the length of oil pipe 1^b, one opposite each retort, so that the cutting off of oil from any retort does not interfere with the free passage of oil past that retort to others in the series. The coupling X is screwed on to the top of tubular frame *d* and within the latter is a tapered bushing x^3 which causes the oil in descending to pass down in a centralized stream. To make the passage of the oil visible for adjustment purposes, I provide in the tubular frame *d* a special form of sight feed constructed as follows. On opposite sides of the tubular frame *d* are formed circular flanged openings screw threaded interiorly and having circular glass plates *e e* clamped in the same by means of externally screw threaded rings *s s* which are provided with nicks or notches to receive a tool by which they may be turned. By means of these rings the glass plates are clamped in place on opposite sides of the tubular frame *d* so as to form windows through which the passage of oil in a stream from the tapered bushing x^3 may be observed, thus enabling the operator to regulate the feed of oil and determine whether any one of the retorts is acting properly, or whether it is clogged. As the oil and air are fed into the smaller ends of the lower series of retorts, it becomes gasified as it passes through the prolonged channelway formed by the baffle plates *g* and as it issues from the top of each lower retort it passes through a by-pass pipe P which connects the upper screw threaded opening of each lower retort with the lower screw threaded opening of each upper retort, the retorts being thus coupled in pairs vertically to secure a perfect gasification of the oil. This by-pass is made with a union joint where it connects with the retorts, so that it may be quickly uncoupled to permit any one retort to be taken out without disturbing the others. As the newly formed gas issues from the upper tier of retorts it passes by pipes M^2 into a large manifold pipe M which runs along the full length of the upper tier of retorts and from which an up-take pipe U with valve *u* leads to a large horizontal trunk pipe T that may connect with any number of generators and then extend to the gas holder or point of utilization.

In the manifold pipe M opposite each outlet pipe M^2 is a removable screw plug m^3 Figs. 1 and 2, which permits a long scraper tool to be passed straight through the manifold pipe and through the pipe M^2 and into the upper channelway of the retort to clean out of the same any deposits of carbon. For the same purpose the manifold pipe has in its closed end a removable screw plug m^2 Fig. 1, arranged at the bottom of the manifold and in alinement with the outlet pipe m^1, thus permitting the manifold to be cleaned of its deposits. The pipe m^1 leading from the manifold is provided with a valve and may be employed for taking off gas to any desired point.

The flames and hot gases from the burner B circulate around and between the retorts,

which by the spacing of their abutting ribs *r* and *f*, and the shape of their middle portions, allow the currents to pass up between the same, thus uniformly, and thoroughly heating the same. The products of combustion pass out at three points *i. e.* from a central smoke flue E. and two side smoke flues E^2 E^2, Fig. 1, which connect with the furnace at the center and two sides and which smoke flues are provided with dampers e e^2 by which the draft through any part of the furnace and any portion of the retorts may be regulated to suit the conditions of the gasification.

The two series of retorts have their ends visible through the end walls of masonry, the crevices between the retorts being closed by lutings of mortar. This gives great facility for the removal of the retorts individually, and constitutes one of the practically valuable features of my invention. As, however, there may be some leakage of gas past the heads of the retort, or through the numerous plugs in the ends of the same, I provide at each end of the furnace a housing or breeching D of heavy sheet metal which extends around and in front of both tiers of retorts, and these housings I connect by off-take pipes D^1 D^1 with the smoke flue, so that no offensive gases may find their way out to foul the atmosphere for the operatives. These housings are made in sections which join on horizontal lines on the level of the inlet and outlet pipes V, and M^2, so that the housing may be conveniently removed when it is necessary to clean out or remove any one of the retorts.

The roof of the furnace is formed of fire bricks I carried on inverted T-beams, as seen in Fig. 1, with a covering plate and cross rods J connecting the two face plates A A of the furnace. These face plates or furnace fronts are cast with marginal flanges A^1 to which the housing plates are attached.

The two tiers of retorts are sustained at their ends upon cross bars of channel iron N N^1. The cross bars N^1 which sustain the large ends of the retorts are of less height than the bars N which sustain the small ends, so as to hold the retorts level. It will also be seen that by having the large ends of the upper tier of retorts reversed to that of the larger ends of the lower tier, the same pattern of retorts serves for both tiers, only requiring that the retorts of the two tiers be taken out from opposite ends.

In the sides of the furnace on a level with the bottoms of the retorts are peep holes H H, provided with rotary damper doors for observing the color and temperature of the retorts.

In defining my invention more clearly, I would state that the ends of the retorts are rectangular and upright or with a greater vertical dimension than the horizontal dimension, and have parallel sides which fit close up to the sides of the ends of the adjacent retorts with a straight vertical joint which is filled with mortar without the cutting and fitting of bricks between, and the removal of which mortar joint permits the convenient removal of any retort without tearing out brick work or disturbing the adjacent retorts. It will also be seen that the plugs which close the holes in the heads of the retorts are simple imperforate screw plugs with square ends and are wholly disconnected from each other so that any one may be removed to clean out an obstructed channelway without disturbing or opening the others.

I claim,

1. A gas generator comprising vertical furnace walls, retorts arranged in the same and having an upright rectangular cross section at both ends, the two sides of said ends being parallel and adapted to fit up to the sides of the ends of the adjacent retorts, with straight vertical joints and both ends being embedded in the furnace walls and extending through the same.

2. A gas generator comprising vertical furnace walls, retorts arranged in the same, and having an upright rectangular cross section at both ends, the two sides of said ends being parallel and adapted to fit up to the sides of the ends of adjacent retorts with a straight vertical joint one rectangular end being made wider and deeper than the other end and both ends being embedded in the furnace walls and extending through the same.

3. A gas generator comprising vertical furnace walls, retorts arranged in the same, and having an upright rectangular cross section at both ends, the two sides of said ends being parallel and adapted to fit up to the sides of the ends of the adjacent retorts with a straight vertical joint adapted to be filled with mortar.

4. A gas generator comprising vertical furnace walls and retorts of upright cross section with rectangular ends, having vertical ribs set back a distance from the ends and adapted to butt against each other to space the retorts away from each other and form mortar joints outside the ribs.

5. A gas generator comprising vertical furnace walls, retorts arranged in the same, and having an upright rectangular cross section at both ends, one rectangular end being made wider and deeper than the other end and both ends being embedded in the furnace walls and extending through the same, said retorts being arranged in two series one above the other and by-pass pipes connecting the retorts vertically in couples.

6. A gas generator comprising vertical furnace walls, retorts arranged in the same, and having an upright rectangular cross

section at both ends, one rectangular end being made wider and deeper than the other end and both ends being embedded in the furnace walls and extending through the same, said retorts being arranged in tiers, the upper ones of which are connected to the lower ones in couples and the retorts having their larger ends reversely placed in the alternating tier.

7. A gas generator comprising vertical furnace walls, and a smoke pipe, retorts having closed ends embedded in the walls and protruding through the same, and fitting close to each other at the ends with only a mortar joint between, and a housing inclosing the mortar joints at the ends of all the retorts and provided with an off-take pipe connected to the smoke pipe to carry off gas leakage.

8. A gas generator comprising vertical furnace walls, and a smoke pipe, retorts having closed ends embedded in the walls and protruding through the same, and fitting close to each other at the ends with only a mortar joint between, and provided with detachable end plugs, and a housing inclosing the mortar joints at the ends of all of the retorts and provided with an off-take pipe connected to the smoke pipe to carry off the gas leakage.

9. A gas generator comprising a series of upright retorts, a single manifold pipe extending horizontally across the outlet end of each retort and connected to each by a right angularly arranged communicating pipe, and detachable plugs arranged in the side of the manifold pipe, one in alinement with each pipe connecting the manifold with the retorts.

10. A gas generator comprising a series of upright retorts, a single manifold pipe extending horizontally across the outlet of each retort and connected to each retort by a communicating pipe, and a detachable plug arranged in the end of the manifold on a level with the bottom side of said manifold pipe.

11. In a gas generator, the combination with the retort and its induction nozzle; of a horizontal air pipe, a horizontal oil supply pipe and a sight feed for the oil for each retort arranged at the junction of the oil pipe, the air pipe and the induction nozzle.

12. In a gas generator, the combination with the retort, its induction nozzle, and the air and oil supply pipes; of a sight feed for the oil consisting of an air nozzle with air valve opening into the induction nozzle, an oil valve arranged above the air nozzle and an intermediate tubular frame having a glazed window in the side.

13. In a gas generator, the combination with the retort, its induction nozzle and the air and oil supply pipes; of a sight feed for the oil consisting of an air nozzle with air valve opening into the induction nozzle, an oil valve arranged above the air nozzle and an intermediate tubular frame having a glazed window in its side consisting of a circular screw threaded flange, a circular screw threaded ring and a circular glass panel clamped within the flange by the said ring.

14. A retort for a gas generator having upright rectangular ends and interior baffle plates arranged one above the other, one end of the retort being wider and deeper than the other.

15. A retort for a gas generator having upright rectangular ends and interior baffle plates arranged one above the other, one end of the retort being made wider and deeper than the other, and both ends having ribs at the sides set back from the heads in parallel position thereto.

16. A retort for a gas generator, having upright rectangular ends and its middle portion tapering to a smaller width at its lower edge than the width of the rectangular ends.

17. A retort for a gas generator, consisting of an upright casing, with rectangular ends, and a vertical series of alternating baffle plates forming channelways all made in one piece with the head portions and said head portions being formed with openings in the same at each end of each channelway and detachable closures for said openings, each closure being imperforate and formed with a square end and wholly detached and disconnected from all of the others to permit the individual cleaning of any channelway without disturbing the closures of the other channelways.

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

JOSEPH DARLING

Witnesses:
E. W. Byrn, Jr.,
C. M. Forrest.