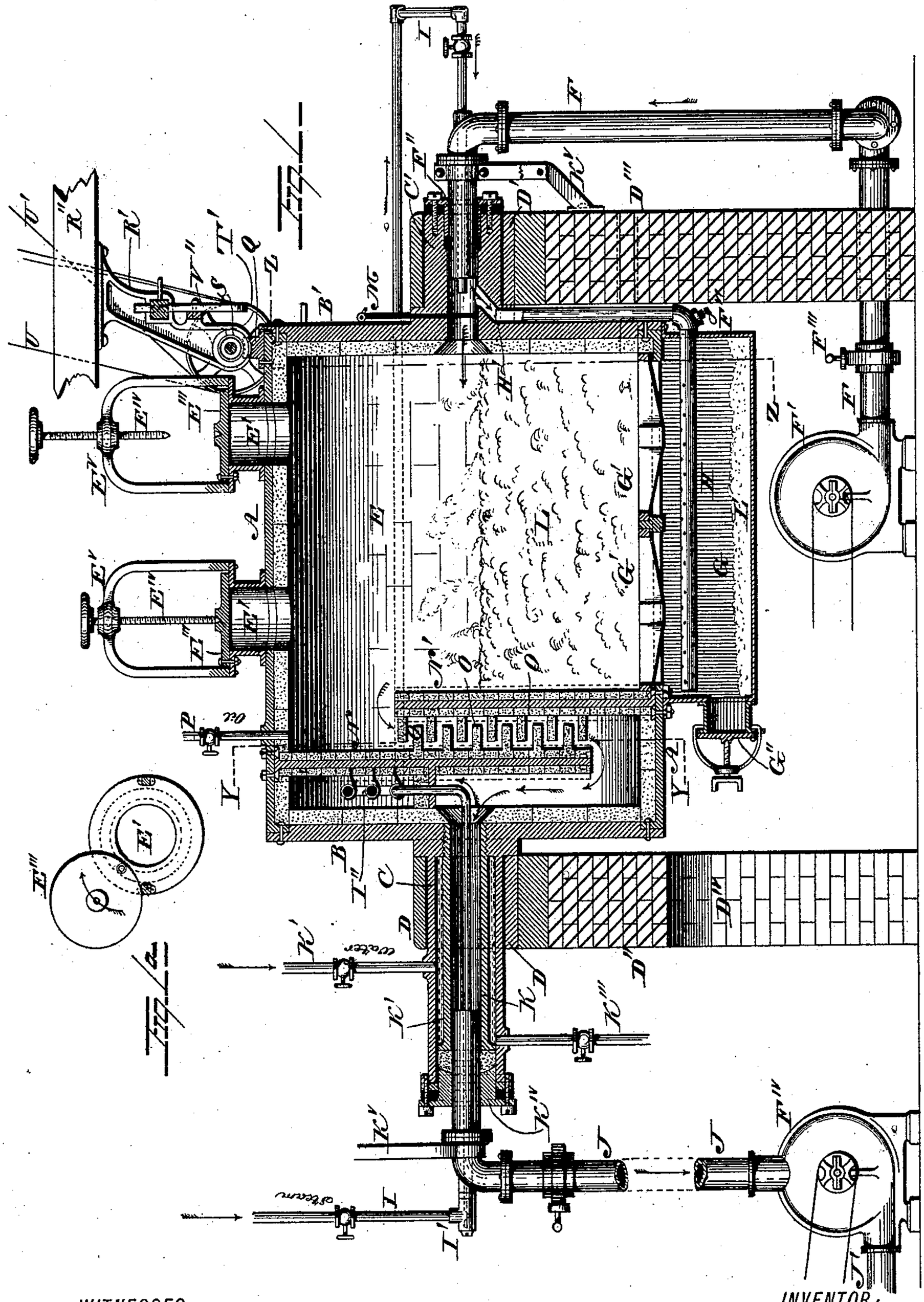
(No Model.)

3 Sheets—Sheet 1.

J. JORDAN.

GAS GENERATOR.

No. 398,051. Patented Feb. 19, 1889.



WITNESSES:

John Nolan.

H. C. Beckley

INVENTOR:

Joseph Jordan

By his Attorney,

Lemuel E. Beckley

(No Model.) 3 Sheets—Sheet 2.

J. JORDAN.

GAS GENERATOR.

No. 398,051. Patented Feb. 19, 1889.

Fig. 2.

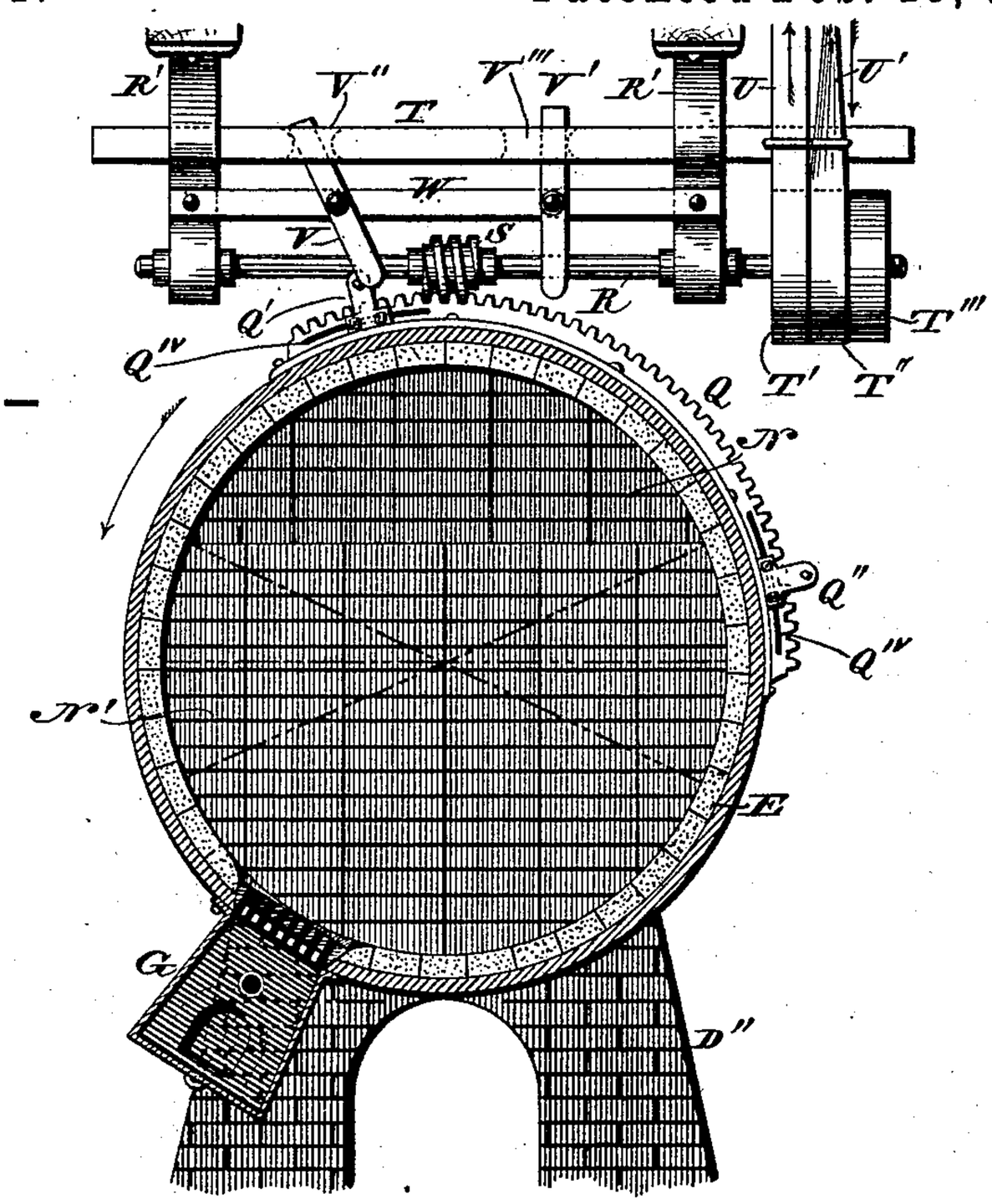
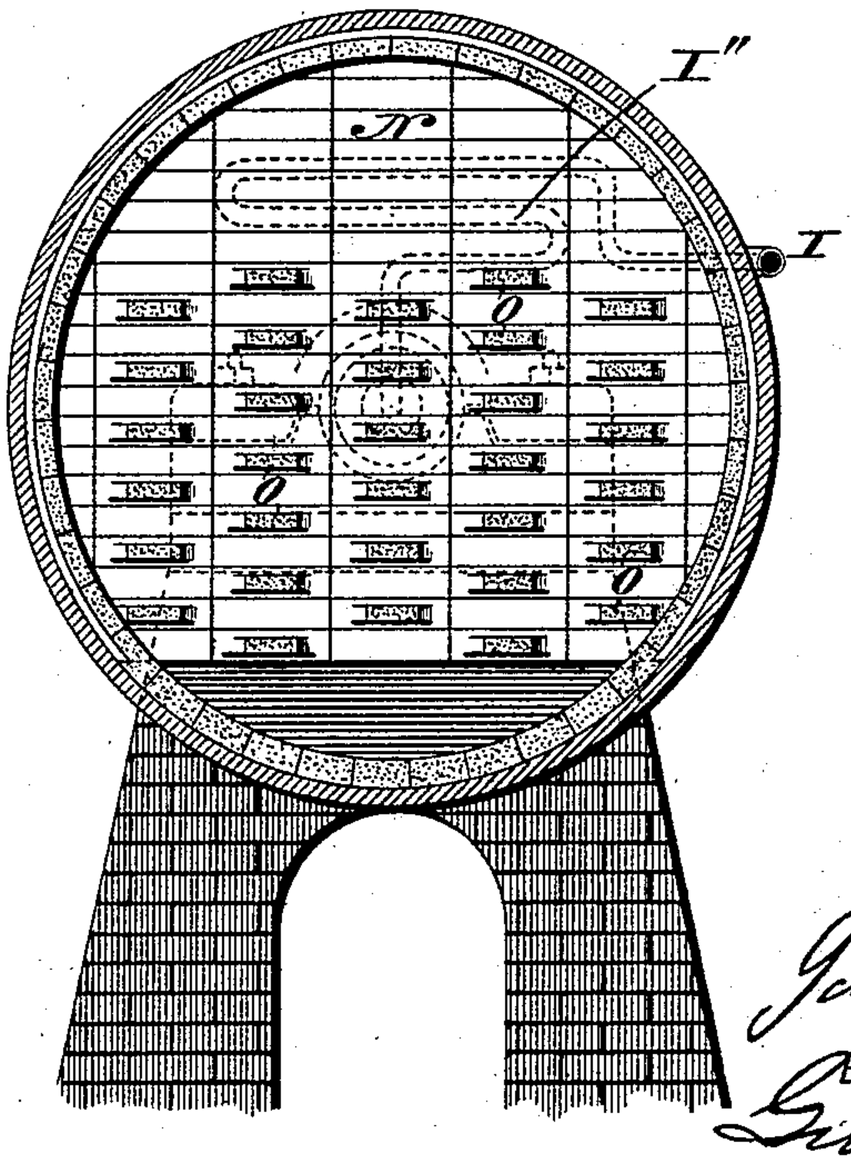


Fig. 3.



WITNESSES

John Coen.

A. V. Buckley.

INVENTOR.

Joseph Jordan

By his Attorney

Giron E. Buckley

(No Model.) 3 Sheets—Sheet 3.

J. JORDAN.

GAS GENERATOR.

No. 398,051. Patented Feb. 19, 1889.

Fig. 4.

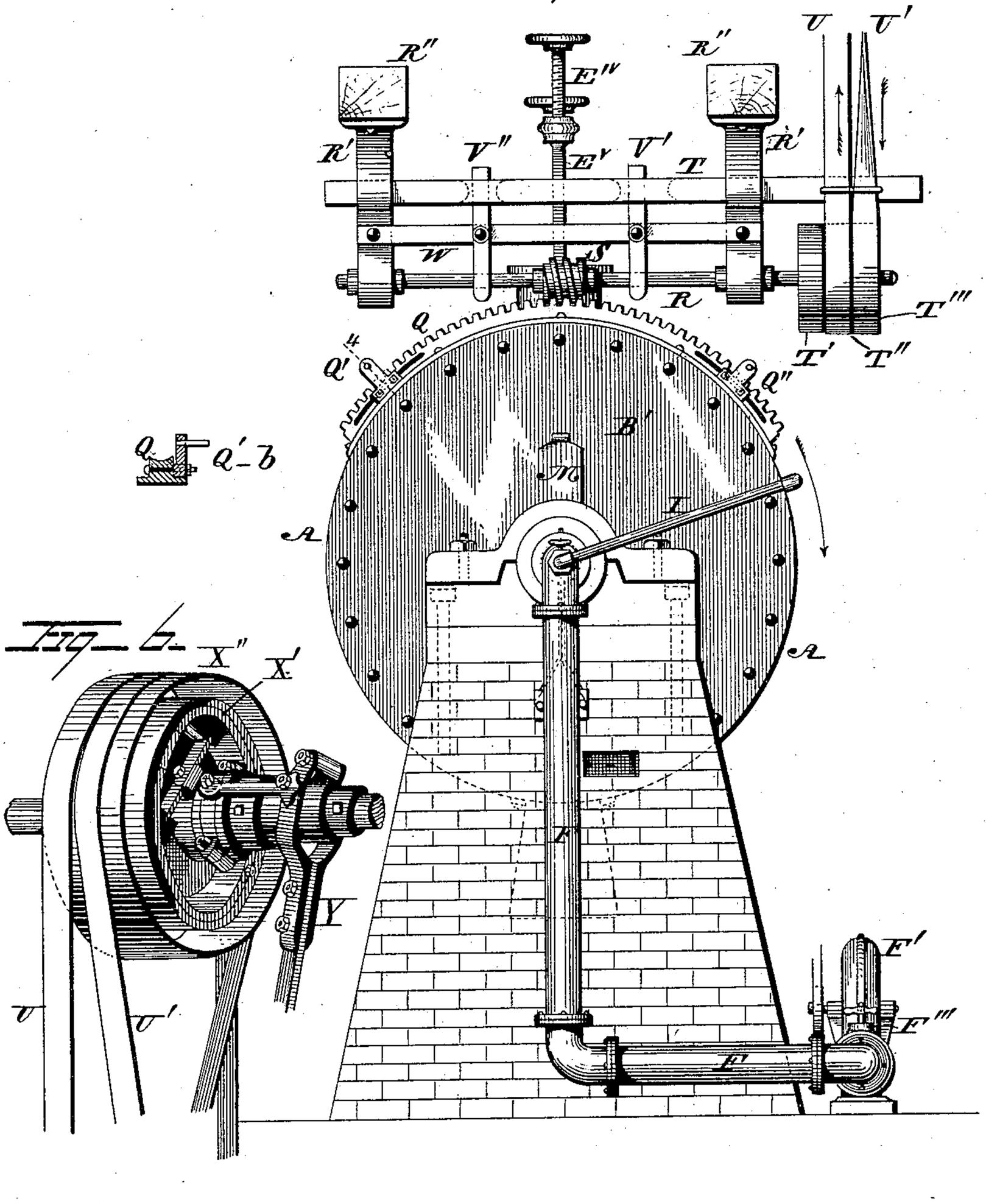
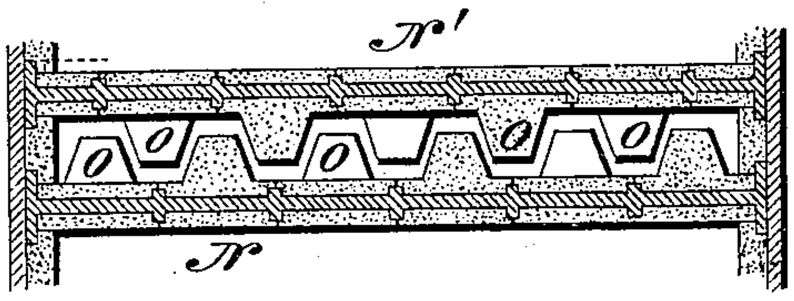


Fig. 5.



WITNESSES,

John Solan.

D. V. Buckley

INVENTOR,

Joseph Jordan

By his Attorney

George E. Buckley

UNITED STATES PATENT OFFICE.

JOSEPH JORDAN, OF BRIDGEPORT, PENNSYLVANIA.

GAS-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 398,051, dated February 19, 1889.

Application filed November 14, 1888. Serial No. 290,781. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH JORDAN, a citizen of the United States, and a resident of Bridgeport, Montgomery county, Pennsylvania, have invented certain new and useful Improvements in Gas-Generators, of which the following is a full, clear, and exact description, reference being had to the annexed drawings, making part hereof.

The nature of my invention will appear from the following description and claims.

In the drawings, Figure 1 is a vertical longitudinal sectional view of my device. Fig. 1ª is a detached view of the swinging pivoted covers. Fig. 2 is a vertical cross-sectional view on the line Z Z of Fig. 1, looking to the right. It illustrates the rocking mechanism. Fig. 3 is a similar view on the line Y Y of Fig. 1, and simply illustrates one side of the fixing-chamber within the retort-cylinder; Fig. 4, an elevation showing the exit end of the retort; Fig. 5, a detached horizontal sectional view of the fixing-chamber; Fig. 6, a perspective view of the friction-pulley.

A is the iron cylindrical part of the retort, made of heavy boiler-iron or steel sheeting; B B′, the heads thereof.

C C′ are hollow trunnions set at the centers of the respective heads, resting in bearings D D′.

D″ D‴ are supporting-walls for the bearings; Dⁱᵛ, an arched opening in wall D″; E, the fire-brick lining of the retort; E′ E″, two openings through which the retort is charged with coal. They are provided with swinging pivoted covers E‴. (See Fig. 1, and also small detached view *a*, Fig. 1.)

Eⁱᵛ are two screws passing through supporting-yokes Eᵛ, to hold the covers in place when closed.

F is an air-blast pipe connected with air-pump or fan F′, and passing into the middle of the trunnion C′, where it terminates. Its joint with the journal is securely packed, the stuffing-box F″ being for that purpose.

F‴ is a valve.

G is an ash-pit attached to the cylinder A and swinging with it; G′, the grate-bars; G″, the cover to the ash-pit opening. It swings and is secured in place similarly to covers E‴.

H is a branch air-blast pipe passing along in the ash-pit beneath the longitudinal grate-bars, and it is perforated above for so much of its length as is in said pit. This pipe runs into a swell set on the outer face of head B′ of the retort. This swell opens above into a passage-way, H′, in trunnion C′, and terminates in front of the end of main air-blast pipe F.

I is a steam-pipe provided with a metallic ground joint, I′.

J is the gas-exit main.

Within hollow trunnion C, which is elongated for the purpose, is a tube, K, leaving a water space or chamber, K′, between it and the interior of the trunnion, as shown. Tube K″ supplies this chamber with water, and tube K‴ carries the water off. The joints at the end of this trunnion are secured by packing and stuffing box Kⁱᵛ.

Kᵛ Kᵛ are mere supports.

Steam-pipe I enters pipe J, as shown, and, passing through it, is highly heated by the outgoing products of combustion. It passes on through trunnion C, and enters the interior of the retort, where it forms a coil, I″. (See Fig. 1 and also Fig. 3 in dotted lines.) Thence it passes out of the retort, the steam within it being superheated within the retort, and, passing outside, it is carried around and enters air-blast pipe F, as shown, terminating within the hollow trunnion C′ near the end of pipe F.

L represents the coal, and L′ the ashes.

M is a gate, by the raising and lowering of which the flow of air and steam into the retort is regulated. All the pipes are provided with suitable cocks and valves.

N N′ are two walls of a gas-fixing chamber. I form them each of iron plates N″ N″, protected by fire-brick casings N‴ N‴. Wall N reaches the upper part of the retort and leaves a large opening below, (see Fig. 3,) while wall N′ projects from the bottom, leaving an open space above. The two opposing faces of these walls are provided with alternated and zigzagged projections O O O, which retard the generated gas in its outward movement.

P is an oil-pipe with its cock, and is used to inject oil into the retort directly above the heating-chamber to carburet the gas.

Q is a curved cog-rack set upon the top of one end of the retort.

R is a shaft suspended by hangers R′ from a beam or beams, R″.

S is a short worm engaging with the cog-rack.

Q′ Q″ are two lugs set near or at the respective ends of rack Q.

T is an ordinary belt-shifter.

T′ T″ T‴ are three pulleys, the middle one, T″, being a tight pulley, the other two being loose.

U U′ are two belts running in opposite directions and engaging with neighboring pulleys.

V V′ are two short bars engaging in long slots V″ V‴ in shifting-bar T, (see dotted lines, Fig. 2,) and pivoted at about their middles to stationary bar W, their lower ends projecting downwardly in close proximity to rack Q. When the retort has reached the position shown in Fig. 2, the belt U′ will, as shown, be thrown onto the tight pulley T″, and, traveling in the direction of its arrow, it will revolve the shaft and worm in the direction to drive the cog-rack and revolve the retort to the left. Then when lug Q″ strikes the bar V′ the reverse action occurs, as belt U′ will be thrown upon loose pulley T‴ and belt U upon the fixed pulley T″, belt U running in the direction of its arrow. Thus a regular rocking of the retort will be sustained and the contents of the retort be kept in a regular state of disturbance, though the grate G will not be thrown sufficiently high to return its ashes to the burning mass within.

Q′ *b* in Fig. 4 is a sectional view on the line 4 of that figure of the lug Q′. It shows the pin on the lug. This pin engages with the pivoted rod V′.

X′ in Fig. 6 represents the expansion friction part of the friction-pulley therein shown and the clutch mechanism Y′. This pulley, however, is the ordinary friction-pulley well known to mechanics, and requires no special description here further than to say that when, by moving the clutch-lever, the friction part X′ is released from contact with the inner shell of the pulley X″ the latter becomes a loose pulley on its shaft, and when part X′ is thrown into contact with it the pulley X″ revolves with the shaft and actuates belts U and U′, the latter belt being crossed to impart a motion to the pulleys it actuates the reverse of that imparted by belt U.

The fan-pump F^{iv} draws the products of combustion from the generator and drives them onward through pipe J′. (See Figs. 1 and 4.)

Cock F^{vi}, Fig. 1, enables me to close or open the pipe H at will.

The operation is as follows: Feed-openings E′ E′ are opened and the retort E is charged first with kindling material and above this with bituminous coal or the fuel desired for producing gas. Covers E‴ are then closed, and the cover G″ of the ash-pit is then removed and the kindling material is ignited from the ash-pit, after which cover G″ is replaced. Gate M is closed and air-blast fan F′ and fan F^{iv} are started. A current of air is thus induced through perforated pipe H, and this is sustained until the mass of fuel becomes ignited. The retort is then rocked and stopped occasionally by throwing the friction-pulley X″ into and out of operation. This pulley X″ is of a width equal to the combined widths of the three pulleys T′ T″ T‴, the two belts U U′ passing over it. This rocking motion is so decided and rapid as to so disturb and shake the particles or pieces of coal as to change them in their relative positions one to another, and shakes the ashes and refuse matter into the ash-pit beneath. At the same time this rapid rocking prevents clinking and prevents the coal from adhering to the lining of the retort. Thus the coals are kept free and clear for the passage of vapors and fluids through them. A thorough and uniform ignition of the mass is thus insured. After the mass of the fuel has reached the point of incandescence I proceed to make either water-gas or carbureted burning gas. Ordinary heavy generator gas will be produced during the progress of the mass toward incandescence. The pipe J′ may be subdivided, the subdivisions being provided with valves or dampers, so that the smoke resulting from the first ignition of the fuel may be carried off. This is not shown in the drawings, as it is a common device and one which will suggest itself to the mind of any ordinary mechanic. After the fuel is ignited the smoke damper or valve will be shut off and the gas produced from the bituminous fuel will be utilized. It will pass through the pipe J′. Being a heavy gas, it is used only for fuel purposes—for instance, to burn beneath steam-boilers and for analogous uses. Another form of gas may be produced by my apparatus—viz., water-gas. I do this by shutting off air-valve F‴, opening valve F^{vi}, closing gate M, and driving steam through pipe I, which, passing up through the perforations of pipe H, is decomposed and becomes hydrogenated in the mass of burning fuel, the latter having, when this operation is begun, reached the point of incandescence. This hydrogen or water gas leaves the mass of fuel and eventually passes off through pipe J′, after which it is directed to the point desired. Either this gas or the heavy gas from the coal alone can be carbureted by opening the valve of the oil-pipe P. The high heat will vaporize the oil, and this vapor will unite with any hydrogen or coal gas from the mass of fuel, and be "fixed" in the tortuous chamber formed by walls N N′ and projections O O. This carbureted gas will also pass off through pipe J′ to its destined point.

The rocking of the retort can be started or discontinued at the will of the operative, as described above, thus dispensing with the necessity of opening the retort to stoke to pre-

vent clinking. If it is desired to inject steam both through and over the fuel, the gate M may be partially raised, so that steam may pass beneath it over the fuel at the same time that steam is projected through pipe H, as described.

As described above, the outgoing products of combustion are cooled by the water-jacket formed by trunnion C and tube K around the gas-exit passage, and the incoming steam is superheated in this gas-exit passage and in the coil I''.

In practice I provide the pipe I with a good non-conducting-heat covering from its point of exit from the side of the retort to its point of entry into pipe F. It will be observed that lugs Q' Q'' are mounted in slots Q^{iv} Q^{iv} in rack Q. They are secured therein by set-screws, (not shown,) whereby they are adjustable to regulate the length of traverse of the rack upon the worm S. I thus enable the operative to control the extent of the rocking motion.

Though it is not shown, I arm my grate-bars with fire-brick casing to protect them from the intense heat of the incandescent mass.

While I have described my means of producing the automatic rocking motion, it will be evident that any skilled mechanic can devise other means of accomplishing the same result. I have also described stuffing-boxes F'' and K^{iv}. Of course, other forms of making these joints tight—such as ground metallic joints—may be used. These, however, would be the equivalent of the stuffing-boxes.

What I claim is—

1. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, an air-entrance pipe opening into one of said trunnions, a branch air-pipe leading from said last-named trunnion to the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the hollow trunnion, an automatic rocking mechanism consisting of a shaft provided with a worm, fast and loose pulleys on said shaft, and a belt-shifter and pivoted bars, and a rack with which the worm engages, all operating substantially as described.

2. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, an air-entrance pipe opening into one of said trunnions, a branch air-pipe leading from said last-named trunnion to the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the other hollow trunnion, an automatic rocking mechanism consisting of a rack provided with adjustable lugs, a shaft having a worm mounted upon it, pivoted bars and belt-shifter, and fast and loose pulleys mounted on said shaft, substantially as described.

3. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, whereby it is adapted to be rocked, an air-entrance pipe opening into one of said trunnions, a branch air-pipe leading from said trunnion to the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the other hollow trunnion, and an ash-receiver with its grate-bars set beneath and attached to said retort, whereby the ash-receiver moves with it, substantially as described.

4. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, whereby it is adapted to be rocked, air-entrance pipe opening into one of said trunnions, a branch air-pipe leading from said last-named trunnion to the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the other hollow trunnion, a steam-pipe entering through one of the trunnions to inject steam into the retort, and an ash-receiver and grate-bars set beneath and attached to said retort, whereby the ash-receiver moves with it, substantially as described.

5. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, whereby it is adapted to be rocked, an air-entrance pipe opening into one of said trunnions and passing to the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the other hollow trunnion, an ash-receiver with its grate-bars set beneath said retort and attached to it, a tortuous fixing-chamber set within the shell of the retort, and an oil-injection pipe, substantially as described.

6. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, whereby it is adapted to be rocked, an air-entrance pipe opening into one of said trunnions and connected with the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the other hollow trunnion, an ash-receiver with its grate-bars set beneath and attached to said retort, a steam-pipe entering through the exit-trunnion of the retort into the interior of the latter, whereby the steam is superheated, said pipe thence passing out of the retort, leading around into the entrance-trunnion of the retort to inject steam into the latter, that portion of said pipe which is within the retort being protected by a wall from direct contact with the fuel, substantially as described.

7. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, whereby it is adapted to be rocked, an air-entrance pipe opening into one of said trunnions and connected with the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the other hollow trunnion, an ash-receiver provided with grate-bars set beneath said retort and attached to it, a steam-pipe entering through the exit-trunnion of the retort into the interior of the latter, where it is formed into a coil, whereby the steam is superheated, said pipe thence passing out of the retort around to and into the entrance-trunnion of

the retort to inject steam into the interior of the latter, that portion of said pipe which is in the retort being protected by a wall from direct contact with the fuel, substantially as described.

8. A gas-generator consisting of a horizontal fire-brick-lined retort provided with hollow trunnions set in bearings, whereby it is adapted to be rocked, an air-entrance pipe opening into one of said trunnions, a branch air-pipe leading from said trunnion to the ash-receiver beneath the retort, a gas-exit main or pipe inserted into the other hollow trunnion, which latter is elongated and provided with a water-chamber formed by a shell enveloping the trunnion and leaving a space between it and the said trunnion, the said space being supplied with water by a pipe, as shown, the water being carried off by another pipe, whereby the products of combustion are cooled, and an ash-receiver provided with grate-bars set beneath said retort and attached to it, whereby it moves with the retort, substantially as described.

In witness that the above is my invention I have hereunto set my hand.

JOSEPH JORDAN.

Witnesses:
GEORGE E. BUCKLEY,
HARRY V. BUCKLEY.