E. A. W. JEFFERIES & G. H. ISLEY.

GAS PRODUCER.

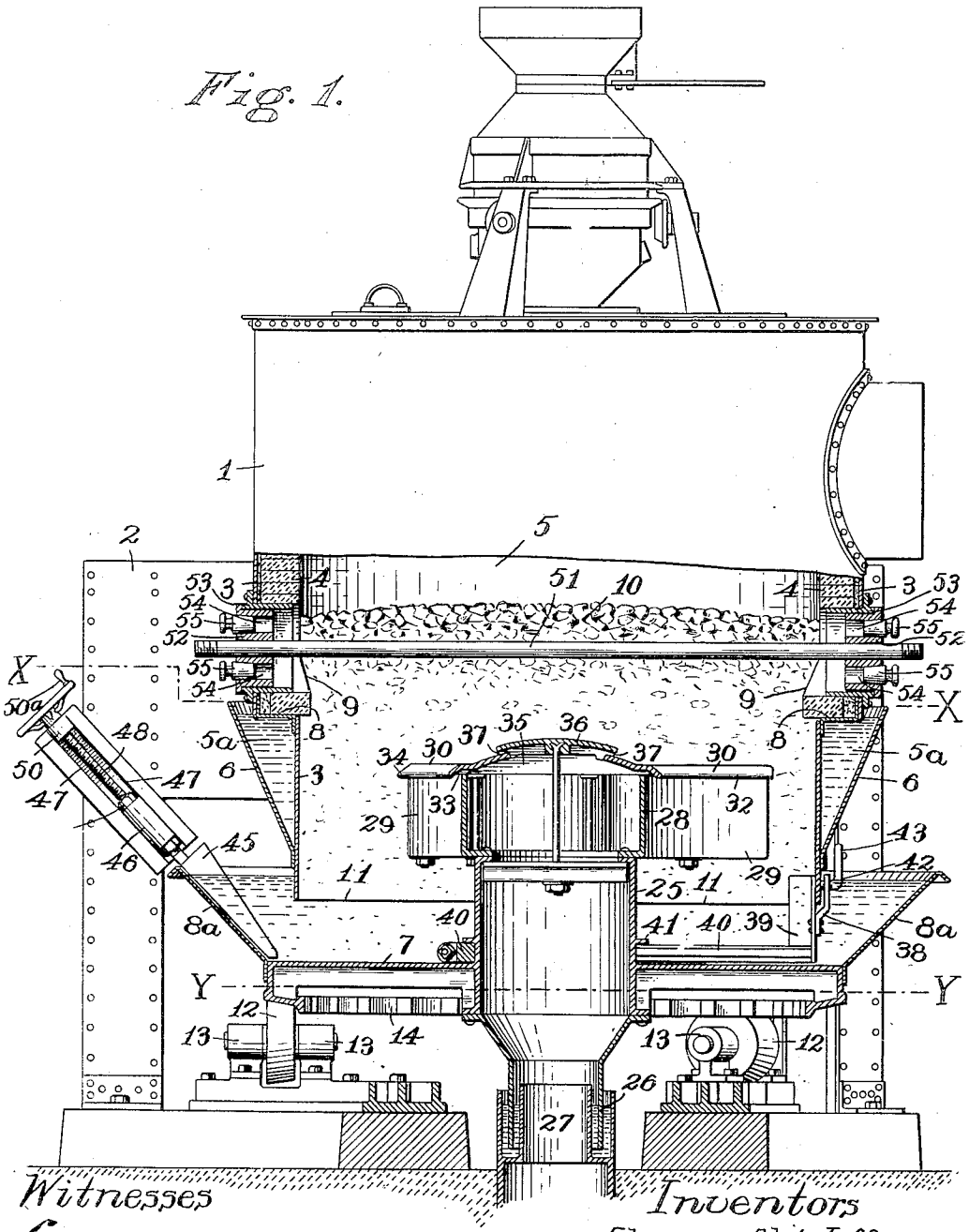
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1,112,702.

Patented Oct. 6, 1914.

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

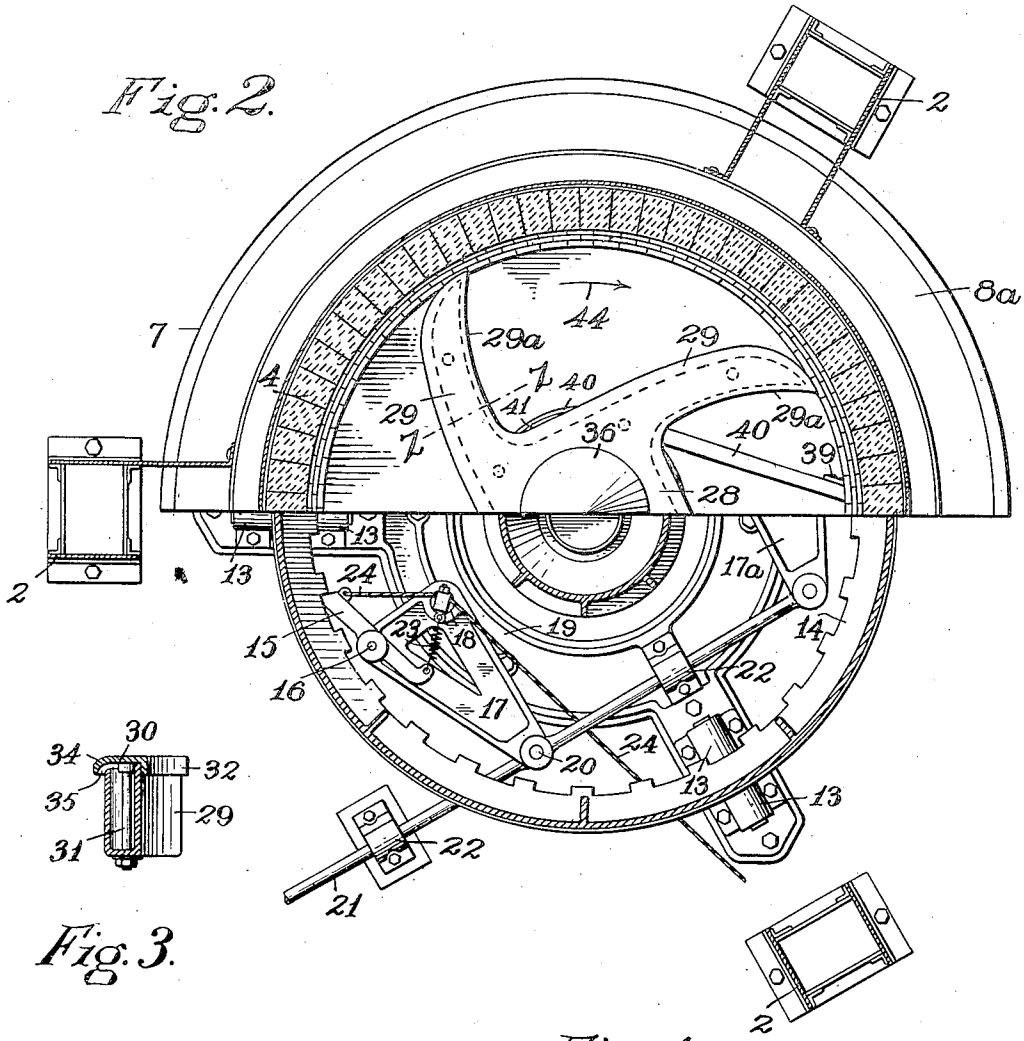


Fig. 3.

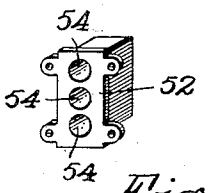
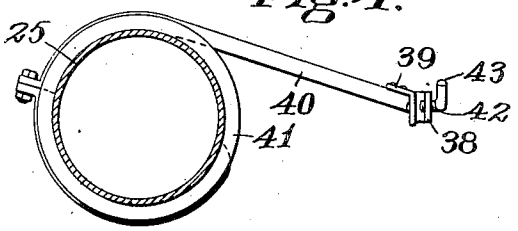


Fig. 5.

Fig. 4.



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GAS-PRODUCER.

1,112,702. Specification of Letters Patent. Patented Oct. 6, 1914.

Application filed August 23, 1909. Serial No. 514,146.

To all whom it may concern:

Be it known that we, EBENEZER A. W. JEFFERIES and GEORGE H. ISLEY, both citizens of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Gas-Producers, of which the following is a specification, accompanied by drawings, forming a part of the same, in which—

Figure 1 is a side elevation of a gas producer embodying our invention, the lower portion being shown in sectional view. Fig. 2 is a plan view, the upper half being shown in section on the plane of the broken line X—X, Fig. 1, and the lower half of Fig. 2 being shown in section on the plane of the broken line Y—Y, Fig. 1. Fig. 3 is a transverse section of one of the rotating tubular arms shown on the plane of the broken line Z—Z, Fig. 2. Fig. 4 is a plan view of the bar 40 showing its journaled connection with the vertical pipe 25. Fig. 5 is a detached perspective view of the detachable plate for supporting the water cooled pipe 51.

Similar reference characters refer to similar parts in the different figures.

Some of the objects of our present invention are to increase the efficiency and simplify the construction of gas producers by maintaining a uniform combustion in the gas producing chamber, preventing the caking of the coal and providing improved means for controlling the zone of combustion; and these objects, among others, we accomplish by the construction and arrangement of parts as hereinafter described and pointed out in the annexed claims.

Referring to the accompanying drawings 1 denotes a casing, preferably cylindrical in shape and supported in a stationary position upon columns 2, 2. The casing 1 consists of an outer metal shell 3, the upper portion of which is brick lined at 4 and incloses a gas producing chamber 5. The lower portion of the casing and the brick lining may be omitted, thereby bringing the metal shell 3 in direct contact with the contents of the casing. In order to reduce the temperature of the lower portion of the metal casing which is exposed to the direct action of heat, we surround a portion of the exposed casing by a body of water 5^a contained in an annular trough or water chamber 6. The cooling of the casing by the body of water 5^a not only protects it from the injurious effects of excessive heating, but it also prevents the accumulation of clinkers upon the inside of the casing and facilitates the downward movement of ashes into an ash pan 7. The brick lining 4 of the upper portion of the casing is supported upon an internal shoulder 8 and is preferably gradually contracted in diameter at 9 in order to afford a partial support for the upper portion of the fuel 10. Spaced below the lower end 11 of the casing is the rotating ash pan or support 7 of greater diameter than the lower end 11 of the casing and provided with flaring sides 8^a which extend upwardly above the lower end 11 of the casing. The ash pan 7 is supported upon conical rolls 12 journaled in bearings 13 and is provided with an internal toothed plate 14 which is engaged by a pawl 15, pivoted at 16 upon a swinging bell crank 17, which is pivoted upon a stud 18 supported in the fixed framework 19. The swinging bell crank 17 is pivotally connected at 20 with a sliding bar 21 to which a reciprocating movement in ways 22 is imparted by means of an eccentric, not shown, or other suitable source of power. The pawl 15 is held in engagement with the teeth of the toothed plate or ratchet 14 by means of a spring 23, but may be disengaged from the ratchet by means of a cable 24 which is extended beyond the ratchet into a convenient position to be pulled by the attendant.

In order to equalize the strain exerted in rotating the ash pan by the toothed annular plate 14, we preferably connect the reciprocating bar 21 with a second bell crank 17^a, Fig. 2, a duplicate of the bell crank 17, and carrying a duplicate pawl, not shown, which engages the toothed plate 14 at a point diametrically opposite the point of engagement of the pawl 15, so that an equal pushing force will be applied simultaneously to diametrically opposite sides of the plate 14.

Attached to and rotating with the ash pan is a pipe 25 for admitting a charge of

air and steam to the interior of the gas producer. The pipe 25 has a water seal connection 26 with a supply pipe 27. To the upper end of the pipe 25 is attached a dome or hood 28 supported concentrically within the lower portion of the casing and provided with hollow outwardly extending arms 29, preferably cast integrally with the hood 28, each of said arms consisting of a U-shaped trough open at the top and closed by a cover 30 attached to the arms 29 by means of bolts 31. The cover 30 is provided along one edge of each arm with a flange 32 which overlaps the side of the arm 29 and the opposite edge is curved and overhangs the other side of the arm which is shortened to provide a slit or opening 33 for the escape of air and steam. The overhanging edge 34 of the cover is downwardly curved to prevent the admission of coal or ashes to the interior of the arm 29. The hood 28 has an opening 35 at the top provided with a cover 36 which is supported in a slightly raised position to form an annular slit 37 through which air and steam may escape.

Attached to the lower end 11 of the casing is a bracket 38 to which is attached a plate 39 forming a fixed support for the outer end of a bar 40, the inner end of which partially incloses the pipe 25 between the bottom of the ash pan or support 7 and the exterior flange 41 on the pipe 25, which forms a journal bearing for the inner end of the bar 40 and around which the bar is free to turn when the outer end of the bar is released. The lower end 11 of the casing is clamped between the bracket 38 and plate 39 by means of a clamping screw 42 held in the bracket 38 and bearing against the casing in order to draw the plate 39 firmly against the inner side of the casing. The screw 42 is provided with a lever handle 43 which enables the screw to be readily tightened or loosened in order to attach or release the outer end of the bar 40. The bar 40 is preferably held in a substantially tangential position with reference to the pipe 25, and at an acute angle with a radial line at the outer end of the bar, so that the ashes resting upon the bottom of the ash pan, when the latter is rotated in the direction of the arrow 44, Fig. 2, will be crowded outward by their contact with the side of the bar 40 and moved into the annular space between the vertical wall of the gas producer casing and the tapering outer wall 8^a of the ash pan. Contiguous to the outer wall of the ash pan and substantially parallel therewith is a blade 45 attached to a block 46 capable of sliding in ways 47 and adjusted by an adjusting screw 48 swiveled in the block 46 and engaging a fixed nut 50. A crank handle 50^a is provided to rotate the adjusting screw 48 and enable the blade 45 to be raised or lowered in a line parallel with the tapering side 8^a of the ash pan. By raising or lowering the blade 45 the delivery of ashes over the edge of the ash pan may be increased or diminished at will, enabling the zone of greatest heat to be maintained in a horizontal plane substantially coincident with the contracted lower end 9 of the brick lining 4.

The solid products of combustion, ash, clinkers, etc., falling below the zone of greatest heat will be supported upon the bottom of the ash pan and will inclose the arms 29 so as to be rotated by the rotation of the arms and ash pan. The incandescent and partially incandescent mass of fuel 10 lying above the zone of greatest heat will be partially held from rotation by the contact of its edges with the brick lining 4, and by the support rendered by the contracted lining 9. The compelled rotation of the lower part of the mass of fuel by the movement of the ash pan 7 and arms 29, and restraint upon rotation of the upper part of the mass tends to produce a plane of cleavage which prevents the caking of the coal. If the restraint afforded by the lining wall of the gas producer chamber is not sufficient with certain varieties of coal which have a great tendency to coalesce under the action of extreme heat, one or more water cooled pipes 51 may be extended through the mass of fuel and supported by the casing of the gas producer. The water cooled pipe 51 is supported near its ends by plates 52, 52, which are detachably attached to a flanged collar 53 inserted in the wall of the casing. The plates 52, 52, are duplicates, one being shown in detached perspective view in Fig. 5, and they are provided with openings 54, one above the other, to allow the vertical position of the water cooled pipe to be varied according as the character of the coal, or the height of the mass of coal may determine. The openings 54 which are not occupied by the pipe 51 are closed by plugs 55.

The arms 29 are preferably slightly curved at their extremities in the direction of their movement as shown at 29^a so as to better engage the contents of the producer and compel their rotation. Each of the arms 29 forms a substantially closed trough which is filled with a charge of air and steam supplied through the pipe 25 and hood 28, and which is discharged into the gas producing chamber through the slit 33 in a thin sheet which becomes distributed throughout the entire cross section of the gas producing chamber.

In the operation of our improved gas-producer, coal is fed in the usual manner at the top of the casing, a blast of air and steam is supplied through the vertical pipe 25 and admitted through the slit or opening 37 and the openings 33 in the radial arms 29 into the gas producing chamber to support

combustion. As the combustion proceeds the solid products descend into the ash pan 7, where they are crowded outwardly beneath the lower edge of the casing and against the flaring wall of the ash pan. The downward movement of the ashes and solid products of combustion, relatively to the feeding of coal at the top determines the height of fuel in the chamber and the vertical position of the zone of maximum heat. This zone is preferably maintained approximately in the horizontal plane of the lower end of the upper section of the casing or at the lower end of the brick lining. During the combustion of fuel the contents of the casing below the zone of maximum heat are caused to rotate by the movement of the arms 29 and the ash pan 7, while the uppermost portion of the fuel inclosed within the brick lining is impeded by its frictional contact with the interior brick wall of the casing, aided, when found necessary, by a contraction of its diameter and also by the insertion of a water cooled pipe 51.

The rotation of the lower portion of the contents of the chamber and also their downward movement into the ash pan is facilitated by the vertical metallic water cooled wall of the lower section of the casing. The removal of ashes from the pan 7 is controlled by the vertical adjustment of the ash removing blade 45. Lowering the blade 45 into the ash pan will cause the ashes to be removed faster and a consequent lowering of the zone of maximum heat. The removal of ashes is further controlled by attaching or releasing the free end of the tangential bar 40. When the bar 40 is released by loosening the clamping screw 42, the bar will be free to travel with the ashes as the latter are carried around by the ash pan, but when the clamping screw is tightened, the bar 40 is held stationary and acts to crowd the ashes lying on the bottom of the ash pan outward.

We are aware that means for agitating the fuel in the heating chamber of a gas producer has been heretofore proposed for the purpose of breaking up the accumulation of clinkers, and we do not claim such means. The agitation of incandescent fuel tends to reduce its heat just as stirring ignited coal deadens the fire. We prevent the formation of clinkers by means of arms lying in substantially the same horizontal plane and presenting vertical walls to the fuel by which the mass of fuel in the plane of the arms is pushed bodily around the fuel chamber. The fuel above the plane of the arms is restrained from rotative movement causing a cleavage between two horizontal strata of fuel. This process prevents the violent agitation of the fuel which would tend to deaden the fire. In order to counteract any reduction of heat which might otherwise occur, jets of air are admitted through openings in the arms and upon their rear sides, thereby increasing the combustion in this plane.

We claim,

1. In a gas producer, a shell or casing inclosing a fuel chamber, rotatable arms extending from the center of the fuel chamber in a horizontal plane above the bottom of the fuel chamber, means for rotating said arms in a horizontal plane, and means extending into the fuel chamber in a horizontal plane for restraining the rotation of the fuel and spaced above said horizontal arms, whereby a horizontal stratum of fuel inclosed between said restraining means and said horizontally rotating arms is subjected to a cleaving or shearing action to prevent caking.

2. In a gas producer, a shell or casing inclosing a fuel chamber, an ash support spaced below said casing, a series of hollow rotatable arms extending from the center of said fuel chamber in a horizontal plane and spaced from the bottom of said ash support, means for rotating said arms about an axis corresponding with the axis of the fuel chamber, and means for supplying air to the fuel through said hollow arms.

3. In a gas producer, a casing inclosing a fuel chamber, an ash support spaced below said casing, a rotatable pipe extending upwardly from said ash support into said fuel chamber and concentric therewith, a series of hollow arms supported by said pipe in a horizontal plane within said fuel chamber and presenting a vertical wall to the mass of fuel, and means for rotating said pipe.

4. In a gas producer, a casing provided at its lower portion with vertical metal walls open at the bottom, an ash support spaced below the lower end of said casing, horizontal arms contained within the lower portion of said casing, means for rotating said arms about a vertical axis, and means for restraining rotation of fuel lying above said arms.

5. In a gas producer, a fuel chamber, a pipe extending upwardly into said chamber, hollow arms carried by said pipe and communicating therewith, said arms having at their upper edges openings for the admission of air into said chamber, means for rotating said pipe, and means for supplying air to said pipe.

6. In a gas producer, a stationary fuel chamber, a series of rotatable hollow arms supported in a horizontal plane within said chamber and having openings along their upper edges for the admission of air to said chamber, means for rotating said arms, and means for supplying air to said arms.

7. In a gas producer, a stationary fuel chamber, arms supported in a horizontal plane in said chamber, means for rotating said arms, said arms having their free ends hooked in the direction of their rotative

movement, and means for restraining rotation of fuel lying above said arms.

8. In a gas producer, a fuel chamber, an ash support spaced below said chamber, a series of arms supported in the same horizontal plane within said chamber and presenting vertical sides to the fuel, means for imparting a rotary motion to said arms about a vertical axis, and means for restraining the rotative movement of the fuel above said arms.

9. In a gas producer, a fuel chamber, a series of arms supported in the same horizontal plane within said chamber, means for rotating said arms about a vertical axis, said arms presenting an advancing vertical wall to the fuel, and means for admitting air to said chamber in a horizontal plane corresponding with the plane of said arms.

10. In a gas producer, a fuel chamber, a series of arms contained in said chamber in a horizontal plane, means for rotating said arms about a vertical axis, said arms presenting a vertical wall to the fuel, and means for supplying air to said chamber in the horizontal plane of the arms and upon the rear sides thereof.

11. A gas producer having a stationary casing inclosing a gas producing chamber, a rotating ash support spaced below said casing, a pipe attached to said ash support and extending upwardly into said chamber, said pipe having an opening at its top for the admission of air to said chamber, hollow arms extending radially outward from the top of said pipe and inclosed entirely within said chamber, said arms also having openings from their upper sides for the escape of air, means for supplying air to said pipe, and means for rotating said ash support.

12. In a gas producer, a rotating ash support, an annular plate attached to the bottom of said ash support with internal teeth, a pair of actuating pawls engaging said toothed plate on diametrically opposite sides, and means for simultaneously moving said pawls to rotate said toothed plate.

13. In a gas producer, a fuel chamber, a rotatable ash support spaced below said chamber, means for rotating the ash support, a pipe supported by said ash support and extending upwardly into said chamber, a bar resting on the bottom of the ash support having its inner end journaled on said pipe, and means for holding the outer end of said bar stationary, whereby the ashes may be ejected at a single point at one side of the producer.

14. In a gas producer, a stationary casing inclosing a fuel chamber, a rotatable ash support spaced below said chamber, means for rotating the ash support, a bar above the bottom of said ash support at an oblique angle to the radius of the support, and means for detachably attaching the outer end of said bar to said casing, whereby the ashes may be ejected at a single point at one side of the producer.

15. A gas producer having a stationary casing, rotating means for imparting a positive rotary movement to the contents of the lower portion of said casing, a stationary water cooled pipe extending through the contents of said casing above said rotating means, said pipe detachably attached to the walls of said casing, and means in said casing for attaching said pipe thereto in different vertical positions.

Dated this twenty-first day of August 1909.

EBENEZER A. W. JEFFERIES.
GEORGE H. ISLEY.

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