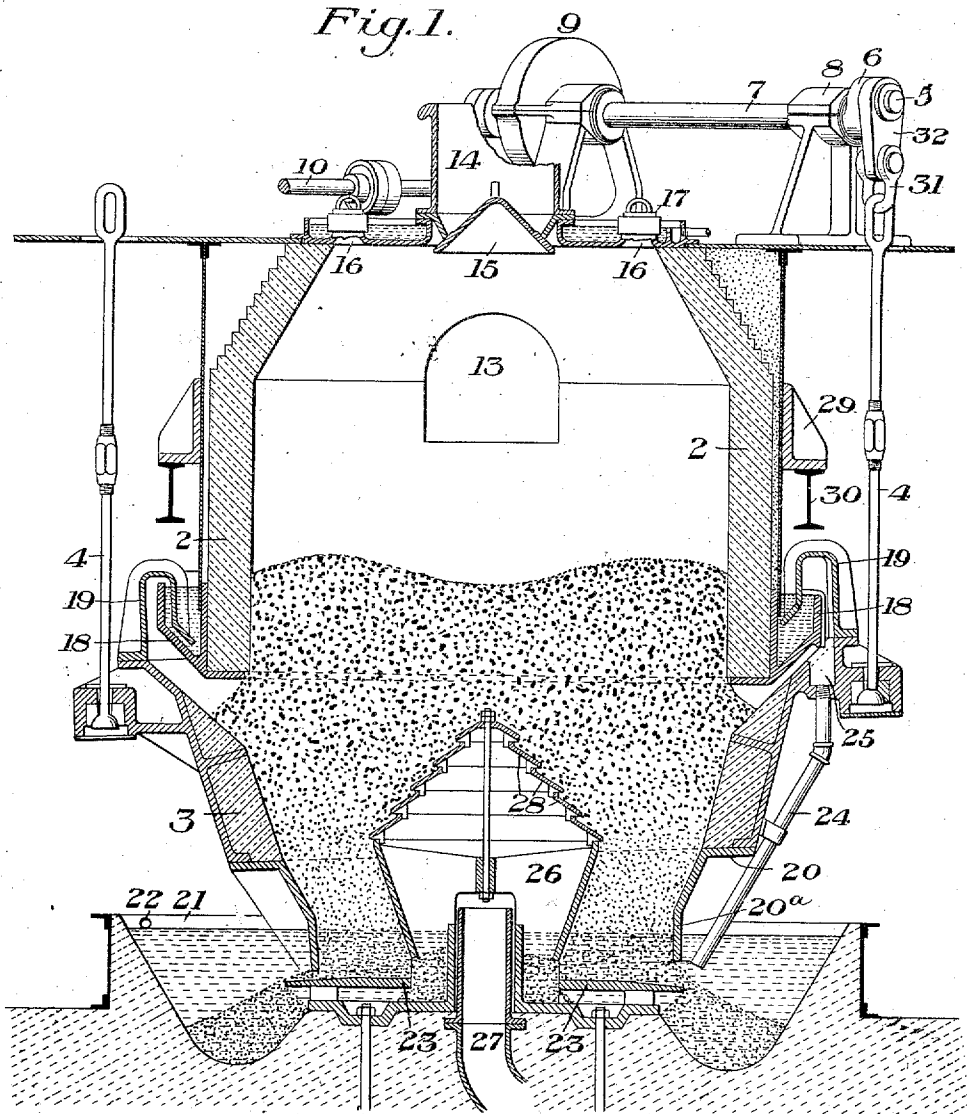


957,007.

Patented May 3, 1910.

9 SHEETS—SHEET 1.



WITNESSES

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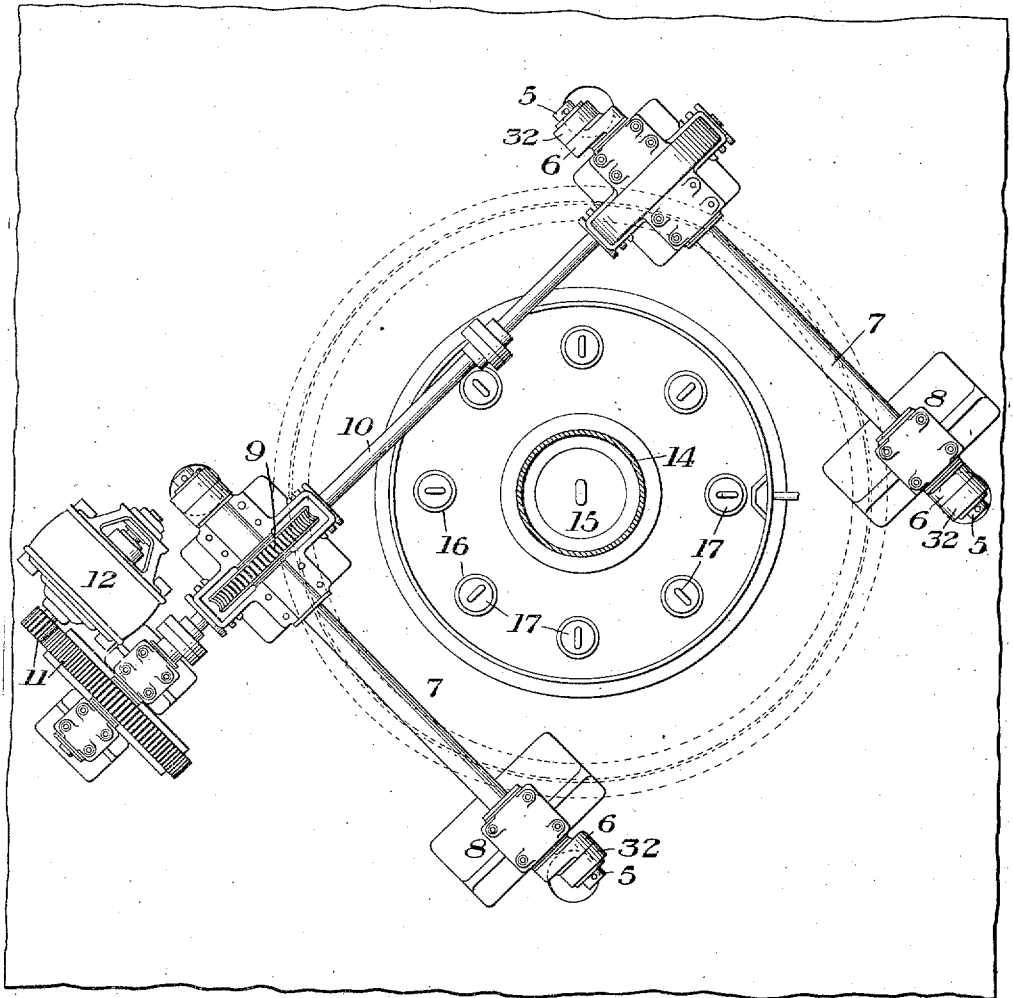
APPLICATION FILED NOV. 3, 1909.

957,007.

Patented May 3, 1910.

9 SHEETS—SHEET 2.

Fig. 2.



WITNESSES

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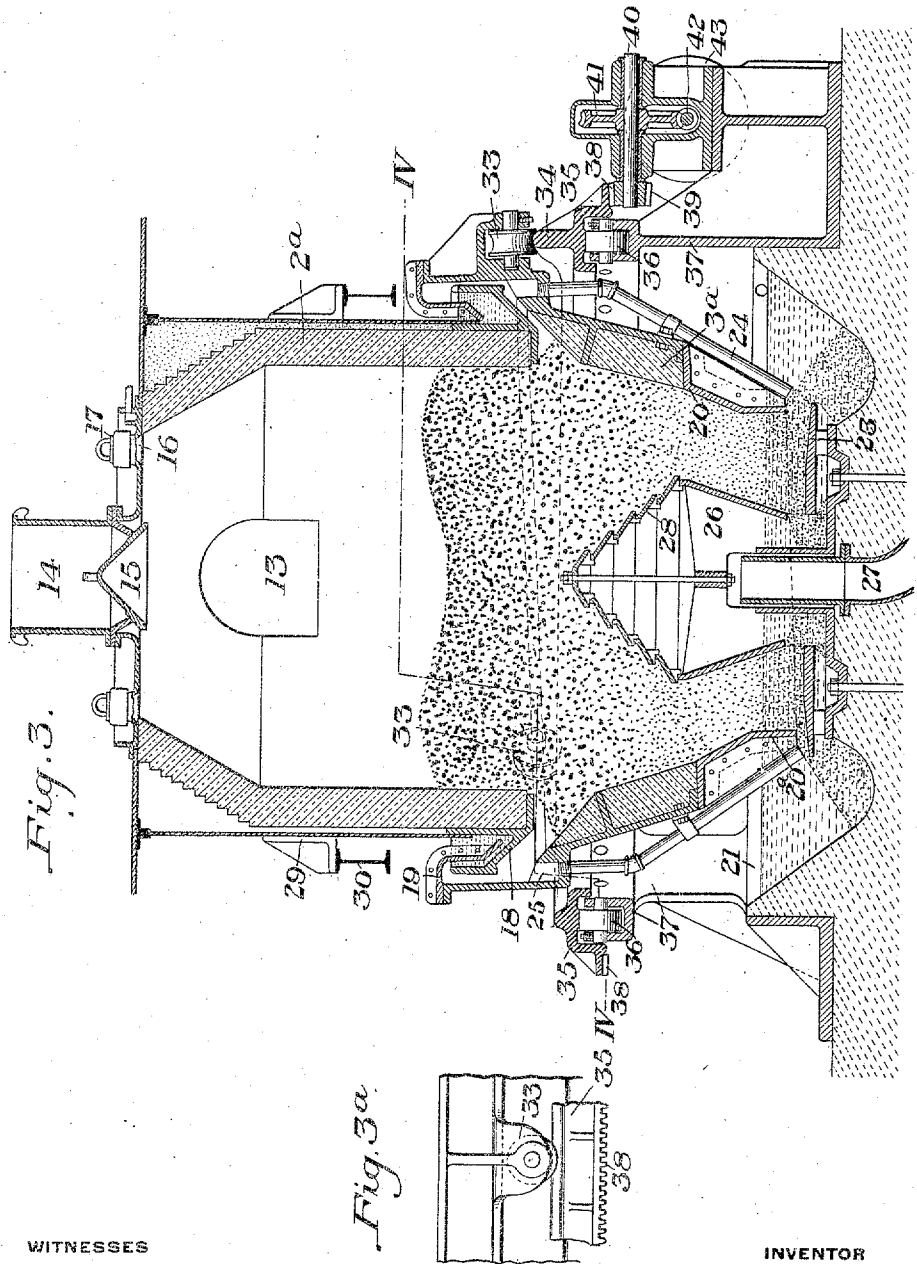
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APPLICATION FILED NOV. 3, 1909.

Patented May 3, 1910.
9 SHEETS—SHEET 3.



WITNESSES

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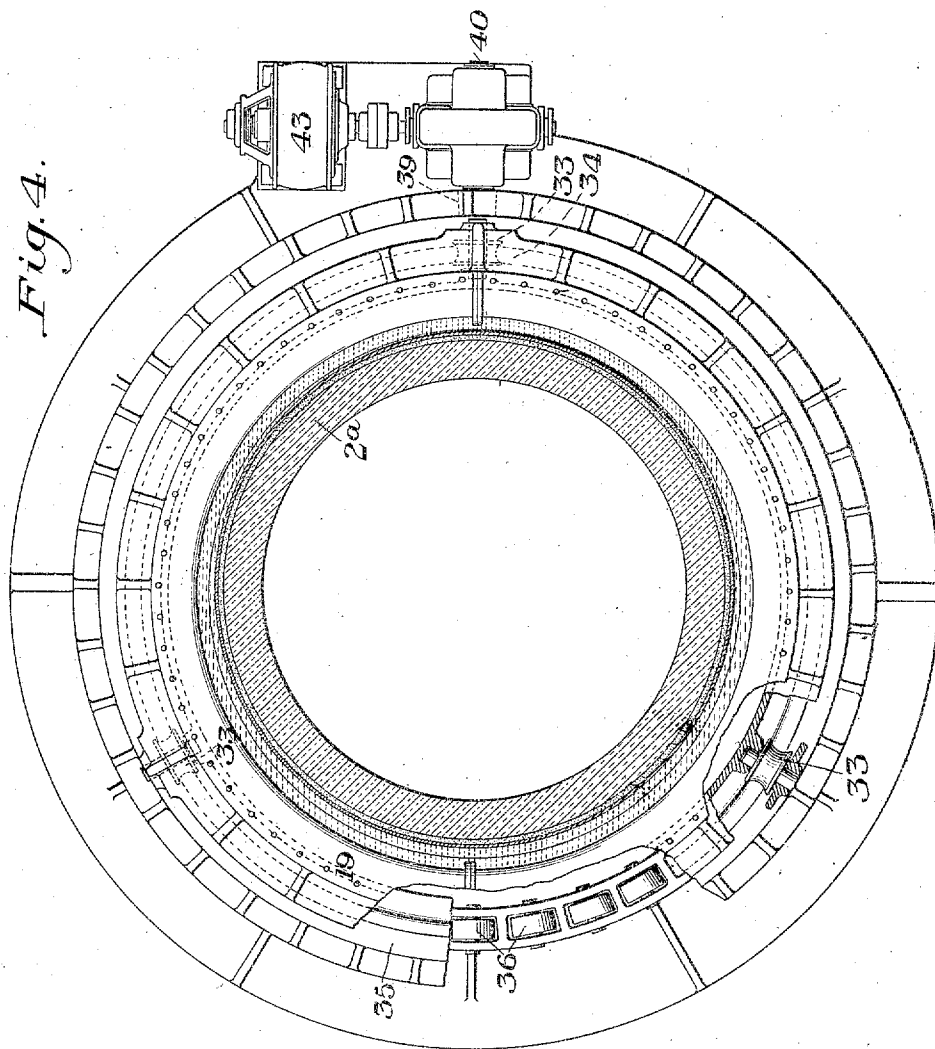
Fig. 3a

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9 SHEETS—SHEET 4.



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Patented May 3, 1910.

9 SHEETS—SHEET 5.

Fig. 5.

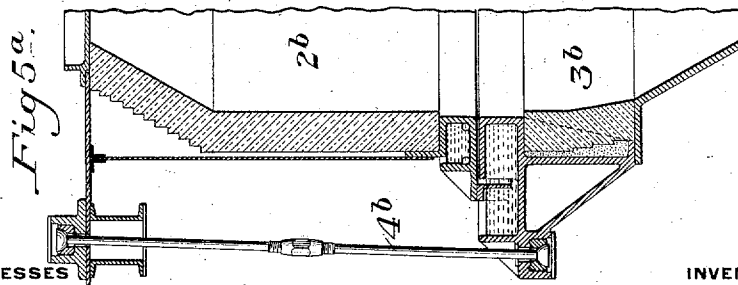


Fig 5a.

WITNESSES

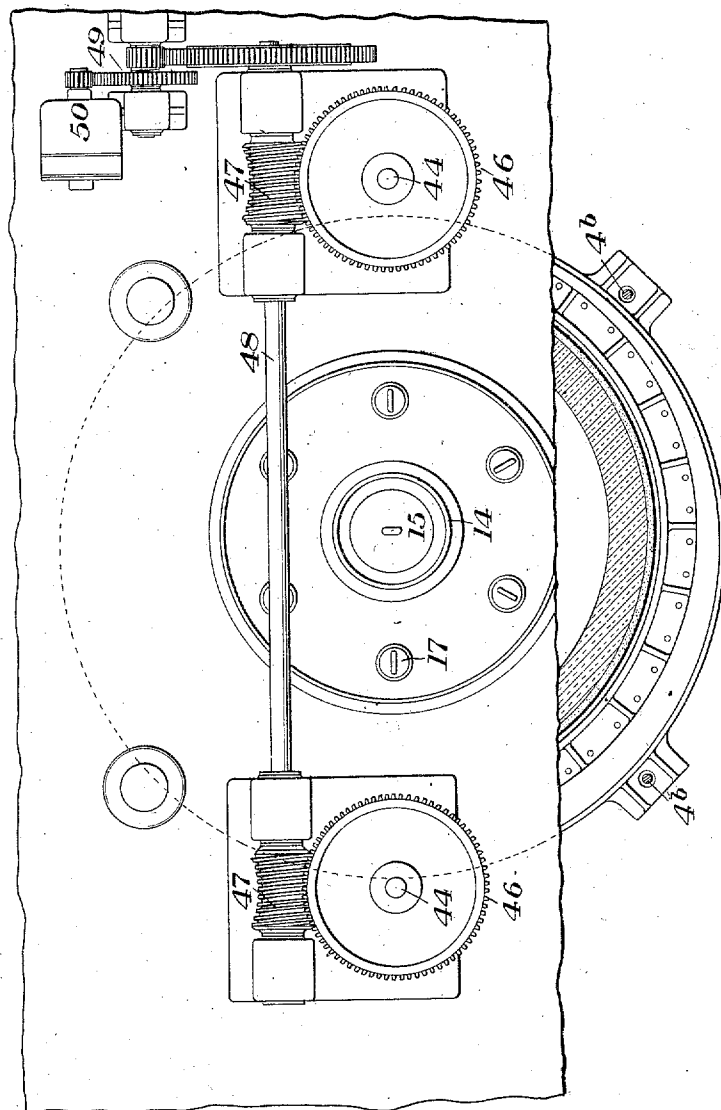
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Fig. 6.



WITNESSES

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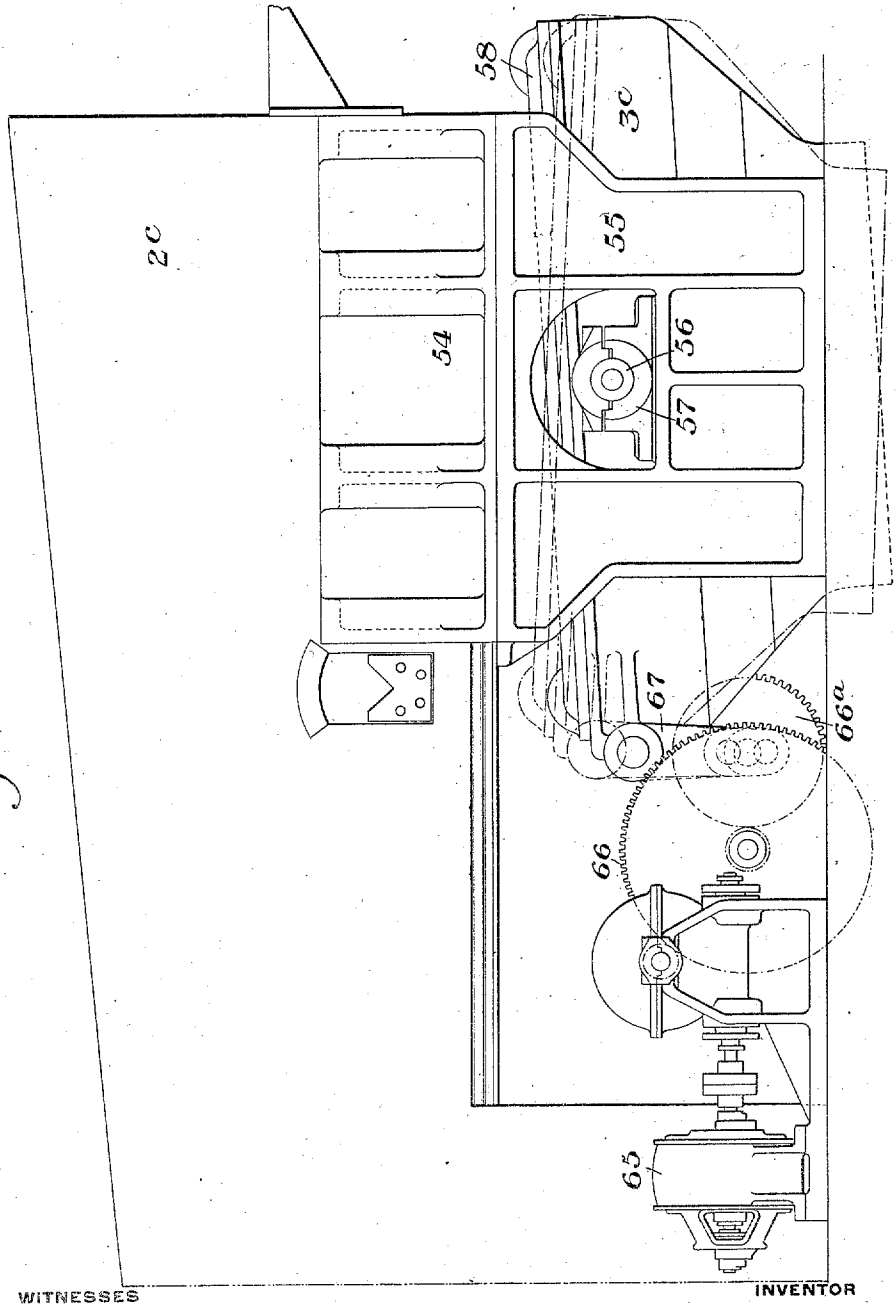
957,007.

E. E. SLICK.
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APPLICATION FILED NOV. 3, 1909.

Patented May 3, 1910.

9 SHEETS—SHEET 7.

Fig. 7.



WITNESSES

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APPLICATION FILED NOV. 3, 1909.

Patented May 3, 1910.

9 SHEETS—SHEET 8.

957,007.

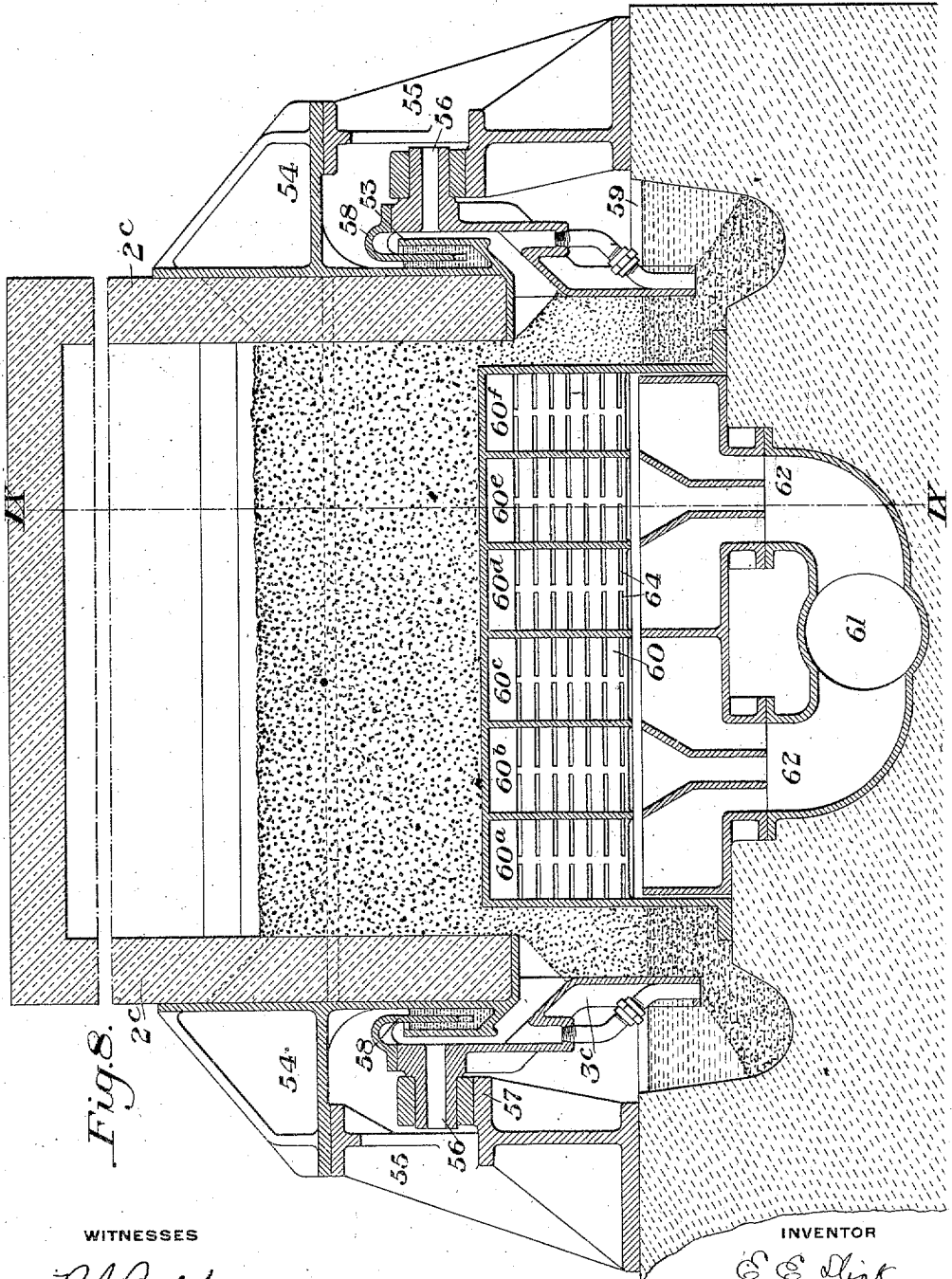


Fig. 8.

WITNESSES

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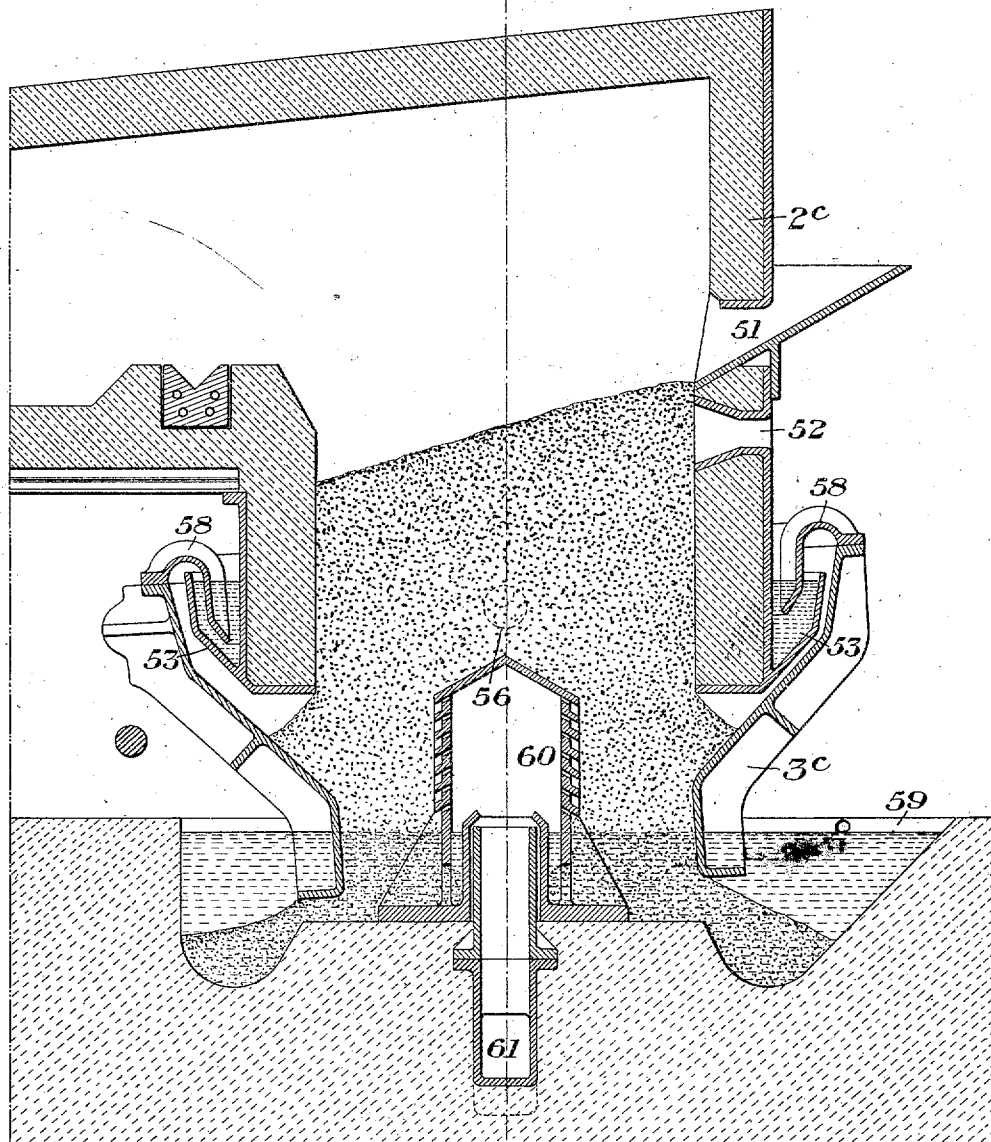
957,007.

E. E. SLICK.
GAS PRODUCER.
APPLICATION FILED NOV. 3, 1909.

Patented May 3, 1910.
9 SHEETS—SHEET 9.

Fig. 9.

VIII



WITNESSES

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VIII

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UNITED STATES PATENT OFFICE.

EDWIN E. SLICK, OF PITTSBURG, PENNSYLVANIA.

GAS-PRODUCER.

957,007.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed November 3, 1908. Serial No. 526,082.

To all whom it may concern:

Be it known that I, EDWIN E. SLICK, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Gas-Producer, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

10 Figure 1 is a central vertical sectional elevation of a gas producer constructed and arranged in accordance with my invention; Fig. 2 is a top plan view of the same, showing the operating mechanism by which the
15 movable lower section of the producer is actuated during the operation of the producer; Fig. 3 is a sectional elevation; Fig. 3^a is a detail view of one of the supporting rollers and track; Fig. 4 is a sectional plan
20 view on the irregular line IV—IV of Fig. 3, showing a modified construction of the producer; Figs. 5 and 5^a are sectional elevations showing a further modification in the construction of the producer, and Fig. 6
25 is a plan view partly in section of the parts shown in Figs. 5 and 5^a; Fig. 7 is a side elevation; Fig. 8 is a sectional side elevation on the line VIII—VIII of Fig. 9, and Fig.
30 of Fig. 8, showing a still further modification in the construction of the producer applied for use on the firing end of a horizontal heating furnace.

My invention relates to the construction
35 and arrangement of apparatus employed in the manufacture of combustible gases from coal and other carbonaceous materials and the object of the invention is to provide a gas producer having improved means by
40 which the descent of the fuel bed in the producer is regulated and controlled.

A further object of the invention is to provide apparatus having improved means
45 for preventing caking of the fuel bed, and to prevent the formation of openings or holes through the fuel bed during the operation of the producer.

A still further object of the invention
50 is to provide a gas producer having improved means by which ashes are removed from the ash bed upon which the fuel bed is supported during its descent downwardly through the gas producer.

In the apparatus shown in Figs. 1 and 2,

2 represents a stationary top section of the 55 producer, and 3 is a movable lower section which is suspended or hung on the suspension rods 4 from the crank pins 5 on the cranks 6. The cranks 6 are mounted on the
60 ends of shafts 7 which are rotatably mounted in bearings 8 on top of or above the stationary section 2 of the gas producer. Each of the shafts 7 is provided with a worm
65 wheel 9 which meshes with and is caused to rotate by suitable worms secured on the driving shaft 10. The shaft 10 is connected by
70 slow-down gearing 11 with a motor 12, by which the movable bottom section of the producer is actuated. The top section 2 of the producer is provided with a gas outlet
75 opening 13, and with a fuel inlet opening 14, which is ordinarily closed by means of the bell 15. Openings 16 forming peep-holes are provided in the top part of the producer,
80 these openings also being employed for the insertion of poking rods used in poking the fuel bed when such poking operation is found necessary or desirable. The top cover
85 plate of the producer is formed of a pan-shaped casting which is kept cool by means of the pool of water maintained therein. The openings 16 through the cover plate are
90 closed by suitable covers 17 when the producer is in operation. The lower end of the top section 2 of the producer is provided
95 with a bottom casting 18 forming an annular water trough. The top end of the bottom section 3 of this producer is provided with an inwardly and downwardly extending
95 flange 19, which projects downwardly into the water trough formed by the casting 18, so as to form and maintain a water seal between the stationary top section 2 of the
100 producer and the movable bottom section 3 and form a gas-tight joint between the sections. Water is supplied to the trough formed in the casting 18 in any desired manner, and an overflow pipe 24 is provided by
105 which surplus water is carried away from the trough 18, the water overflowing from this trough into the pocket 25 with which the pipe 24 is connected. The lower end of the movable section 3 of the producer terminates in a casting 20 having a flange 20^a which projects downwardly below the level
110 of the water maintained in the ash pit 21 to provide a water seal at this point in the producer. The ash pit 21 is provided with

a suitable overflow outlet 22, which maintains the water in the pit at the desired level, and the producer is provided with a circular bottom plate 23 in the ash pit on which the ashes are supported, the ashes in turn supporting the column of fuel extending upwardly into the upper portion of the producer. In the lower portion of the producer is a wind box 26 which is supplied with air under pressure through the pipe 27, which connects the wind box 26 with a fan or other source of air supply. The air is forced through the annular openings between the plates 28 forming the sectional top for the wind box 26, and, rising upwardly through the ash bed into the burning fuel, assist in burning and converting the solid fuel into a combustible gas. The top section 2 of the producer is provided with brackets 29 by which the producer is carried on the supporting beams 30 extending transversely below the top of the producer. The movable lower section 3 of the producer is connected by a ball and socket joint with the lower end of the rod 4 and the upper ends of these rods are connected by clevises 31 and links 32 to the crank pins 5 on the cranks 6. The movable lower section 3^a of Fig. 3 is provided at a plurality of points on its upper end with supporting rollers 33, which are arranged to turn by contact with the cam surface 34 of the rotatable ring 35. This ring, which tilts the movable section 3^a of this producer, is mounted upon and rotates on the anti-friction rollers 36, which are secured in suitable bearings in the support 37. The ring 35 is provided on its periphery with bevel gear teeth 38, which mesh with the teeth in the bevel pinion 39 on the shaft 40. Mounted on the shaft 40 is a worm wheel 41, the teeth of which mesh with the worm 42 which is directly connected to the armature shaft of the driving motor 43 by which the ring 35 is caused to rotate.

The gas producer shown in Figs. 3, 3^a and 4 is provided with a gas outlet opening, fuel inlet opening, and poking holes similar to those shown in Figs. 1 and 2, and a water seal is maintained between the top and bottom sections of the producer and between the lower end of the lower section of the producer and the ash pit in a similar manner to that shown in Figs. 1 and 2, and the construction of the wind box, bottom plate and stationary top section of the producer is the same as that shown in Figs. 1 and 2.

In the construction shown in Figs. 5, 5^a and 6, the stationary top section 2^b of the producer is mounted upon brackets and is supported by means in a similar manner to that shown in the preceding figures. The movable bottom section 3^b is suspended upon rods 4^b in a manner similar to that shown in Figs. 1 and 2. In this construction, however, the rods 4^b are used solely for supporting the

movable bottom section 3^b of the producer and rotary vertically disposed shafts 44 are provided, having cranks 45 on their lower ends for moving the bottom section 3^b relatively to the top section 2^b. The cranks 45 are provided with crank pins which project vertically downward into the bearings 46, which are secured to and form part of the movable bottom section 3^b of the producer. The upper ends of the shafts 44 are provided with worm wheels 46, the teeth of which mesh with the worms 47, mounted on the shaft 48. The shaft 48 is connected by slow-down gearing 49 with a driving motor 50 by which the movable bottom section of this producer is actuated. The stationary top section of the producer is provided with gas outlet openings and fuel inlet openings, and with poking or peep holes constructed in a similar manner to that shown in the preceding figures. The producer is also provided with a wind box and with a water sealed ash pit of similar construction to those shown in the preceding figures, the lower end of the movable section 3^b of the producer projecting downwardly below the level of the water in the ash pit to provide the necessary water seal. The upper end of the lower movable section 3^b of this producer is provided with an annular casting forming a water-trough, and the lower end of the stationary top section of the producer is provided with a depending flange which projects downwardly into the water in the trough so as to form a water seal.

In the modification shown in Figs. 7, 8 and 9, a gas producer rectangular in horizontal cross-section is shown, which is attached to and forms one end of a heating furnace. The stationary top section 2^c of the producer is provided with a side inlet 51 through which the fuel is delivered into the producer, and suitable openings 52 are provided in the side of the producer through which the fuel bed can be observed and stirred when necessary. The lower end of the stationery top section 2^c of the producer is provided with a water trough formed by the casting 53 in a somewhat similar manner to that shown in Figs. 1, 2, 3 and 4. The stationary top section 2^c of the producer is carried by means of brackets 54 on the supporting stands 55. Supported below the top section 2^c of this producer is a movable bottom section 3^c. The movable section 3^c is provided with trunnions 56, which are mounted in bearings 57, secured on the stands 55, so as to permit of the bottom section 3^c being rocked or oscillated. The marginal top edge of the section 3^c is provided with a depending flange 58 which projects downwardly into the water in the water trough 53 so as to maintain a water seal between the stationary top section and the movable bottom section of the producer and prevent

escape of the gases between the sections. The lower end of the movable section 3^a projects downwardly into the ash pit 59 so as to form a water seal in a manner similar to that shown in the preceding figures. A wind box 60 is provided in the lower portion of the producer, in this case the wind box being rectangular in cross-section and being divided into a plurality of compartments 60^a, 60^b, 60^c, 60^d, 60^e, 60^f. An air pipe 61 which is provided on its one end with branches 62 is arranged to connect the several compartments in the wind box 60, and supply these compartments with air under pressure. The air is forced outwardly from the box through the openings 64 in the sides of the wind box and, passing through the ashes, finally reach the burning fuel bed located in the producer above the ash bed.

In the operation of the gas producers shown in the drawings, the fuel is supplied to the producer and the ashes are removed from the water sealed ash pit in the usual manner. After the fuel bed has been ignited and the making of gas has been started, the lower movable section of the producer is caused to move relative to the stationary top section.

In Figs. 1, 2, 3 and 4, the bottom section is lifted so as to cause a vertical movement of the fuel and ashes in the bottom section of the producer relative to the fuel in the top section and the ash bed beneath the producer.

In Figs. 5 and 6 the fuel in the lower movable section 3^b is moved transversely and bodily relative to the fuel in the top section 2^a. By reason of the suspension rods 4^b there is also a slight vertical movement of the lower section and its contents.

In the modification shown in Figs. 7, 8 and 9, the lower section of the producer is rocked or tilted relatively to the stationary top section 2^a, this motion being imparted from the motor 65 through the train of slow-speed gearing 66, the last wheel 66^a of this train having a pitman connection 67 with the movable section 3^b.

As the bottom section is moved relatively to the top section, the column of fuel is caused to gradually descend in the producer and finally, in the form of ashes, reaches the open lower end of the lower movable section of the producer.

When the movable section is actuated the ashes in the lower part of the supporting ash bed are moved sidewise from beneath the movable section of the producer from which point they are removed by hand by the operator at suitable intervals. As fuel is consumed fresh coal or other solid carbonaceous material is added to the top of the bed through the fuel inlet opening in the producers and in moving the lower section of the producer relative to the top section, one section or zone of the fuel is moved

bodily relatively to another section or zone of the fuel bed and openings or holes forming through the fuel bed are broken up and are caused to close, and in this way the fuel is caused to burn uniformly throughout the producers and the formation of lean gases is prevented.

The advantages of my invention will be apparent to those skilled in the art. The movable bottom section of the producer causes the fuel to descend evenly in the producer and prevents the formation of openings through the fuel bed, such holes resulting in the formation of lean, poor gases, while the moving lower end of the bottom section of the producer causes the ashes to be gradually moved from the bottom portion of the column of ashes supporting the combustible fuel in the producer.

Modifications in the construction and arrangement of the parts may be made without departing from my invention. The manner in which the lower section of the producer is moved relatively to the top section and the apparatus by which it is moved may be changed. The construction of the water seal between the sections may be modified and other changes may be made.

I claim:—

1. A gas producer divided transversely into sections, having an annular movable bottom section, and having means arranged to move the bottom section without rotation thereof and shift the position of its contents relatively to the materials in another section of the producer during the operation of said producer; substantially as described.

2. A gas producer divided transversely into a stationary top and an annular movable bottom section and having means arranged to move the bottom section without rotation thereof and shift at least part of its contents relatively to the materials in said top section of the producer during the operation of said producer; substantially as described.

3. A gas producer divided transversely into sections and having a vertically and horizontally movable bottom section, means for moving the bottom section and a water seal between the adjoining ends of said sections adapted to prevent escape of gases from between the sections of the producer; substantially as described.

4. A gas producer divided transversely into sections, having a suspended bottom section, means for swinging the suspended section, a water trough on the lower end of the top section and a depending flange on said bottom section extending into the water in said trough and arranged to maintain a water sealed joint between the sections and prevent escape of gases therethrough.

5. A gas producer divided transversely into a stationary top and a swinging bottom

section and having means arranged to swing the bottom section and move materials therein relatively to the top section and its contents during the operation of the producer; substantially as described.

6. A gas producer divided transversely into a stationary top and a swinging bottom section and having means arranged to swing the bottom section and move materials therein relatively to the top section and a plurality of suspension rods on which said swinging section is supported; substantially as described.

7. A gas producer divided transversely into a stationary top and a swinging bottom section and having means arranged to swing the bottom section and move materials therein relatively to the top section and means on the rods for adjusting one side of the bottom section relatively to another; substantially as described.

8. A gas producer divided transversely into sections, having an annular vertically movable bottom section and having means arranged to move said bottom section and shift materials therein vertically and horizontally relatively to the contents of another section during the operation of the producer; substantially as described.

9. A gas producer divided transversely into sections, having a vertically movable bottom section and having means arranged to move said bottom section and shift materials therein relatively to the contents of the other section or sections during the operation of the producer, and means for maintaining a gas-tight joint between the adjacent ends of said sections; substantially as described.

10. A gas producer divided transversely into top and bottom sections and having its bottom section suspended so as to be vertically movable, and means for moving said bottom section and changing the position of its contents relatively to the materials in said top section during the operation of said producer; substantially as described.

11. A gas producer divided transversely into sections and having an annular vertically movable bottom section, an ash pit beneath said bottom section and means for moving said bottom section vertically, the movement of the bottom section being adapted to remove ashes from below the bottom section and cause the descent of the bed of fuel in said producer; substantially as described.

12. A gas producer divided transversely into sections, having an annular movable bottom section, an ash pit having an ash bed for supporting the fuel bed in said producer and means for moving said bottom section during the operation of said producer without rotation thereof and thereby causing the removal of ashes from said ash bed and per-

mitting the fuel bed to descend within the producer; substantially as described.

13. A gas producer comprising a stationary top section, and a movable bottom section, means for moving said bottom section vertically and horizontally, means for maintaining a gas-tight joint between the sections, and an ash pit having water therein, the lower edge of said bottom section projecting downwardly below the surface of the water in said pit to form a water seal; substantially as described.

14. In a gas producer, a top section having gas outlet and fuel inlet openings therein, an annular movable non-rotary bottom section, means for actuating said bottom section during the operation of said producer, a wind box in the bottom of the producer, and a water sealed ash pit below said producer; substantially as described.

15. A transversely divided gas producer comprising a stationary top section, a transversely movable bottom section, and means for moving said bottom section and causing a bodily movement of the contents of said lower section relative to the contents of said top section; substantially as described.

16. A transversely divided gas producer comprising a stationary top section, a transversely movable bottom section, and means for moving said bottom section and causing a bodily movement of the contents of said lower section and the ashes below said lower section relative to the contents of said top section; substantially as described.

17. A transversely divided gas producer comprising a stationary top section, a transversely movable bottom section, means for moving said bottom section and causing a bodily movement of the contents of said lower section relative to the contents of said top section, and means for maintaining a water sealed joint between the adjoining ends of said sections; substantially as described.

18. A transversely divided gas producer comprising a stationary top section, a transversely movable bottom section, means for moving said bottom section and causing a bodily movement of the contents of said lower section relative to the contents of said top section, an ash pit below said bottom section, and means for maintaining a water sealed joint between the ends of said movable section and the adjoining ash pit and stationary top section of the producer; substantially as described.

19. A transversely divided gas producer comprising a stationary top section a water trough on the lower end of said section, a water sealed ash pit below said producer, a movable non-rotary bottom section between said top section and the ash pit, and depending flanges on the ends of the said movable section extending downwardly into the water

in said trough and ash pit in all positions of said movable section; substantially as described.

20. A gas producer divided transversely into a stationary top and a swinging bottom section and having means arranged to swing the bottom section and move materials therein relatively to the top section, a plurality of suspension rods on which said swinging section is supported and crank mechanism for actuating the section; substantially as described.

21. A gas producer divided transversely into a top section and a vertically and horizontally movable bottom section, and having means adapted to move said bottom section and shift materials therein relative to the top section and its contents in operating the producer; substantially as described.

22. A gas producer divided transversely into a stationary top and a vertically and horizontally movable bottom section and having means arranged to move the bottom section horizontally and vertically and shift materials therein relatively to the contents of the stationary top section; substantially as described.

23. A transversely divided gas producer comprising annular stationary top and movable bottom sections and means for moving said bottom section vertically and transversely, and causing a bodily movement of the contents of said lower section relative to the contents of said top section; substantially as described.

24. A gas producer divided transversely into hollow top and bottom sections and having means for moving one section relatively to the other, the vertical axes of said sections being thrown out of alinement in moving the movable section; substantially as described.

25. A gas producer divided transversely into hollow top and bottom sections and having means for moving one section relatively to the other, the vertical axis of said moving section describing a conical path in its movement; substantially as described.

In testimony whereof, I have hereunto set my hand.

EDWIN E. SLICK.

Witnesses:

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