

No. 630,602.

Patented Aug. 8, 1899.

J. A. FAUX.  
MANUFACTURE OF GAS.

(No Model.)

(Application filed Dec. 22, 1898.)

3 Sheets—Sheet 1.

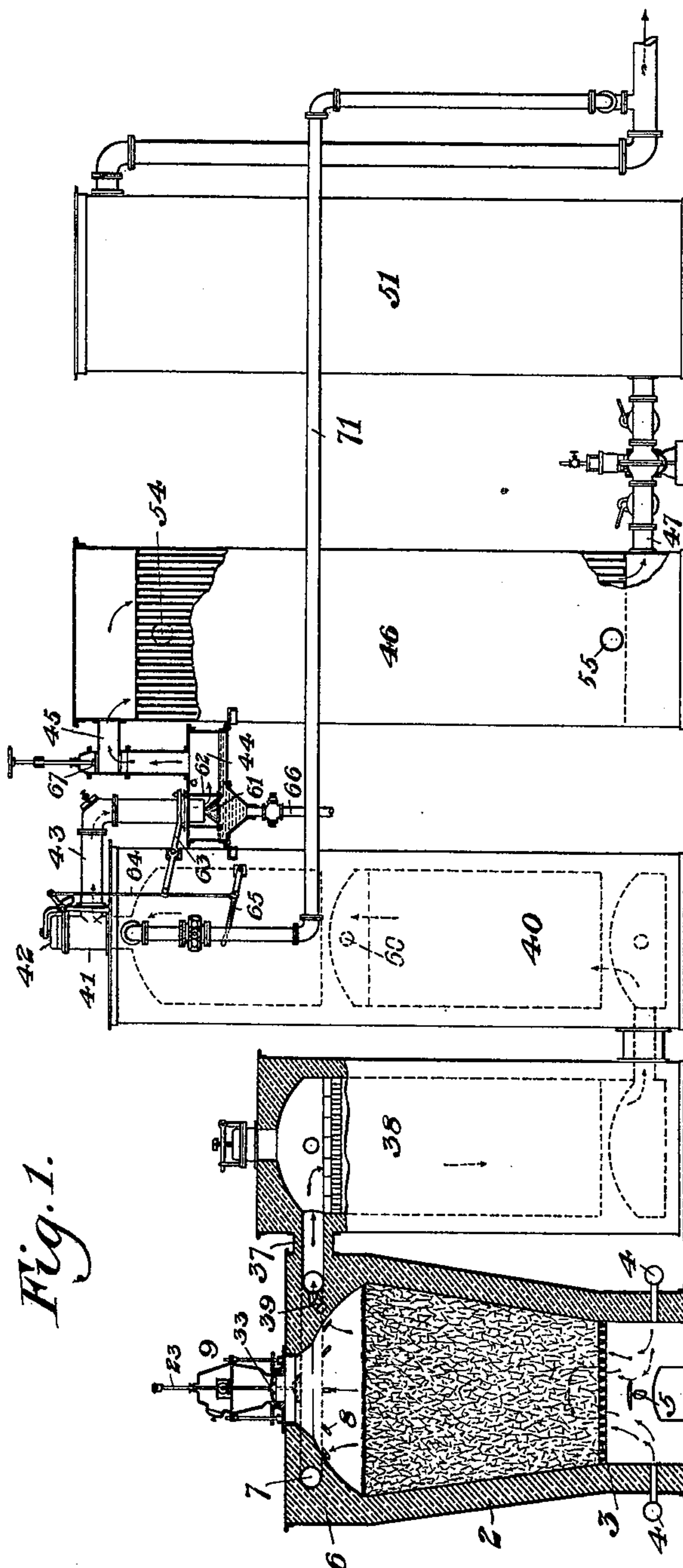


Fig. 1.

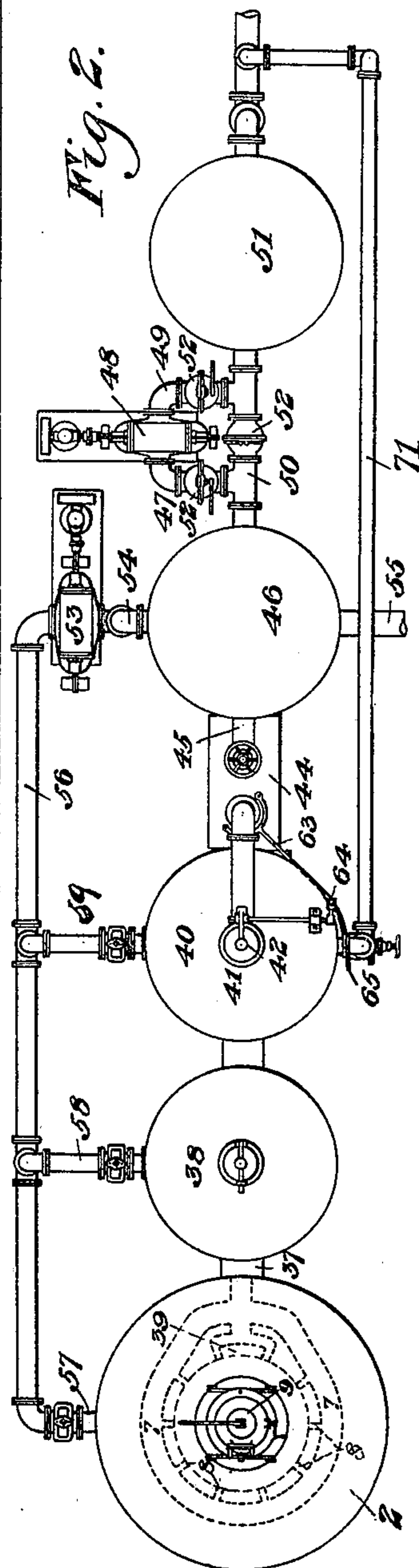


Fig. 2.

WITNESSES

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Fig. 5.

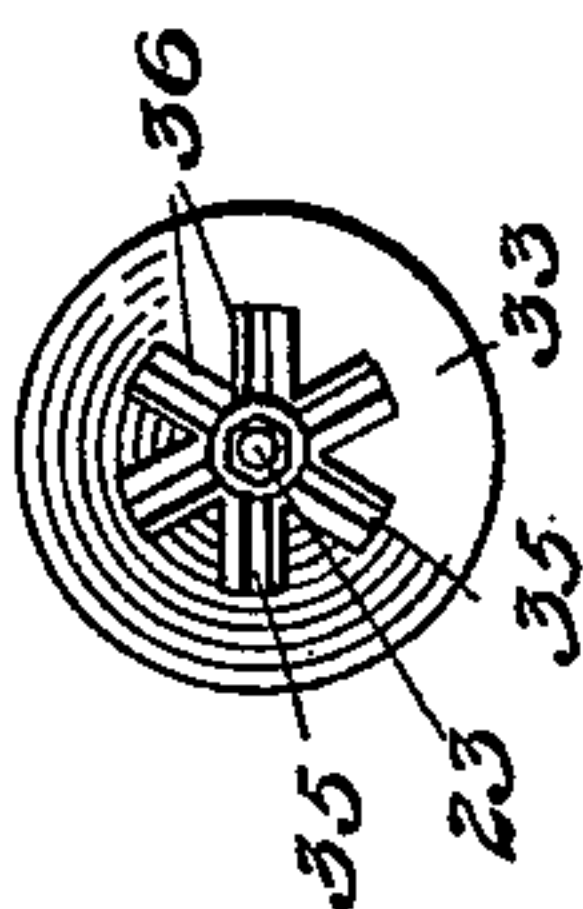


Fig. 3.

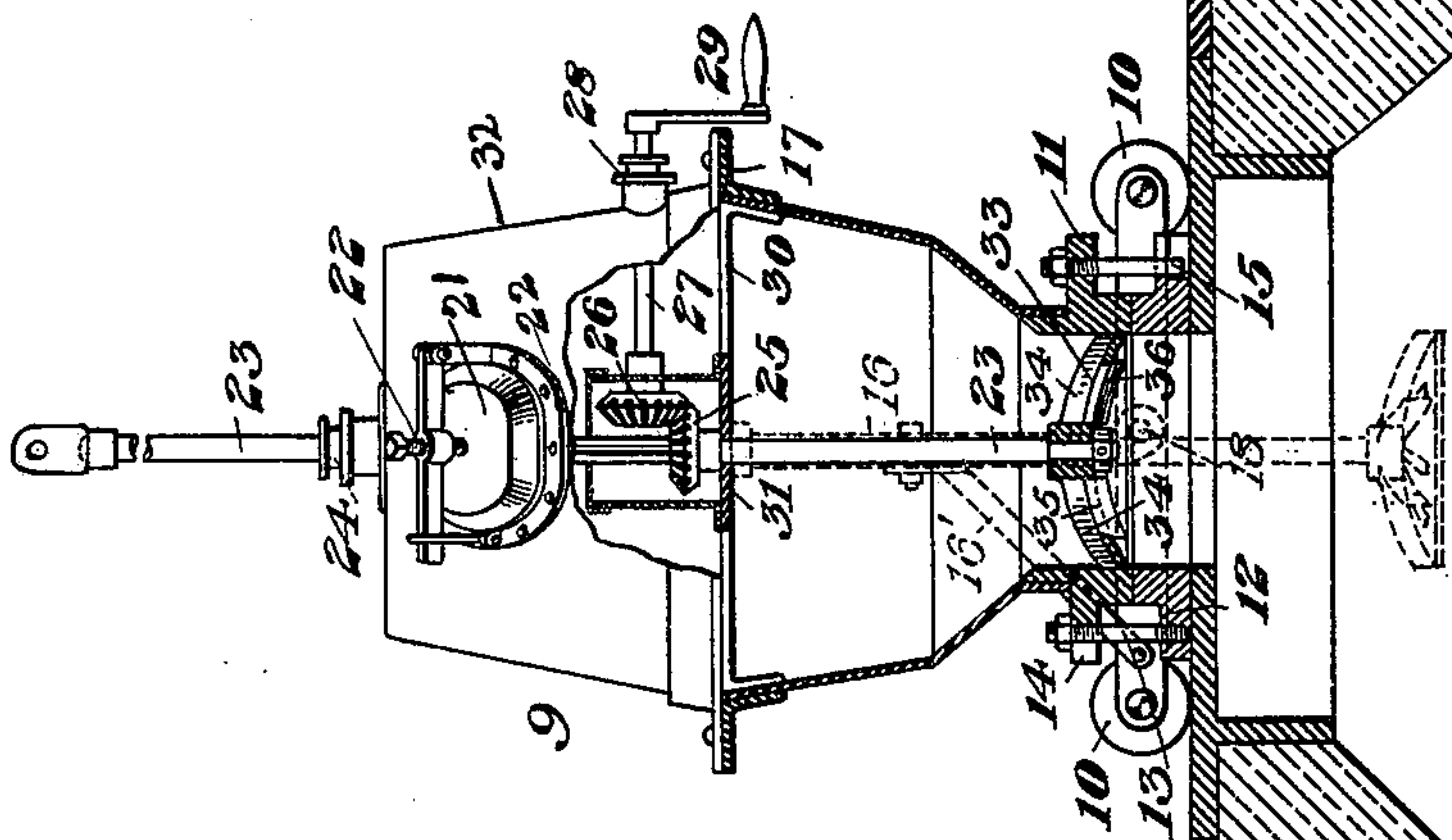
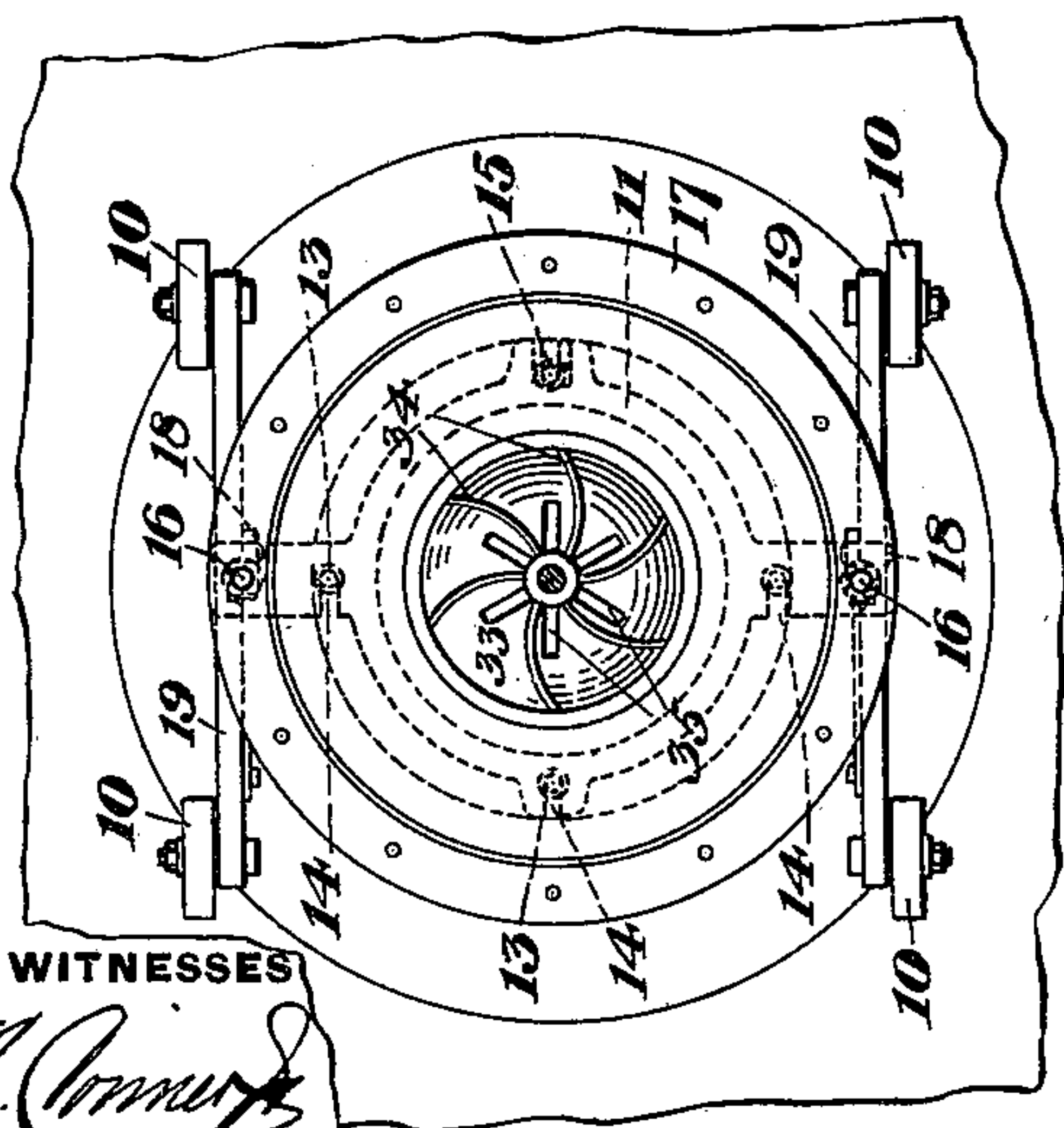
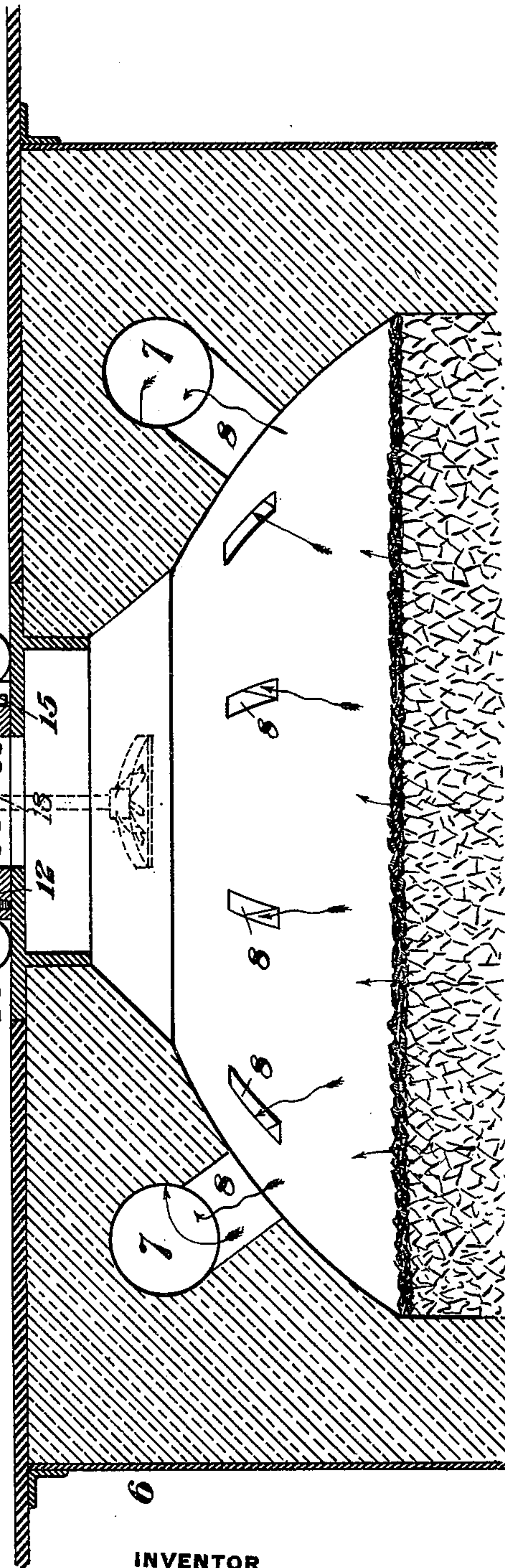


Fig. 4.



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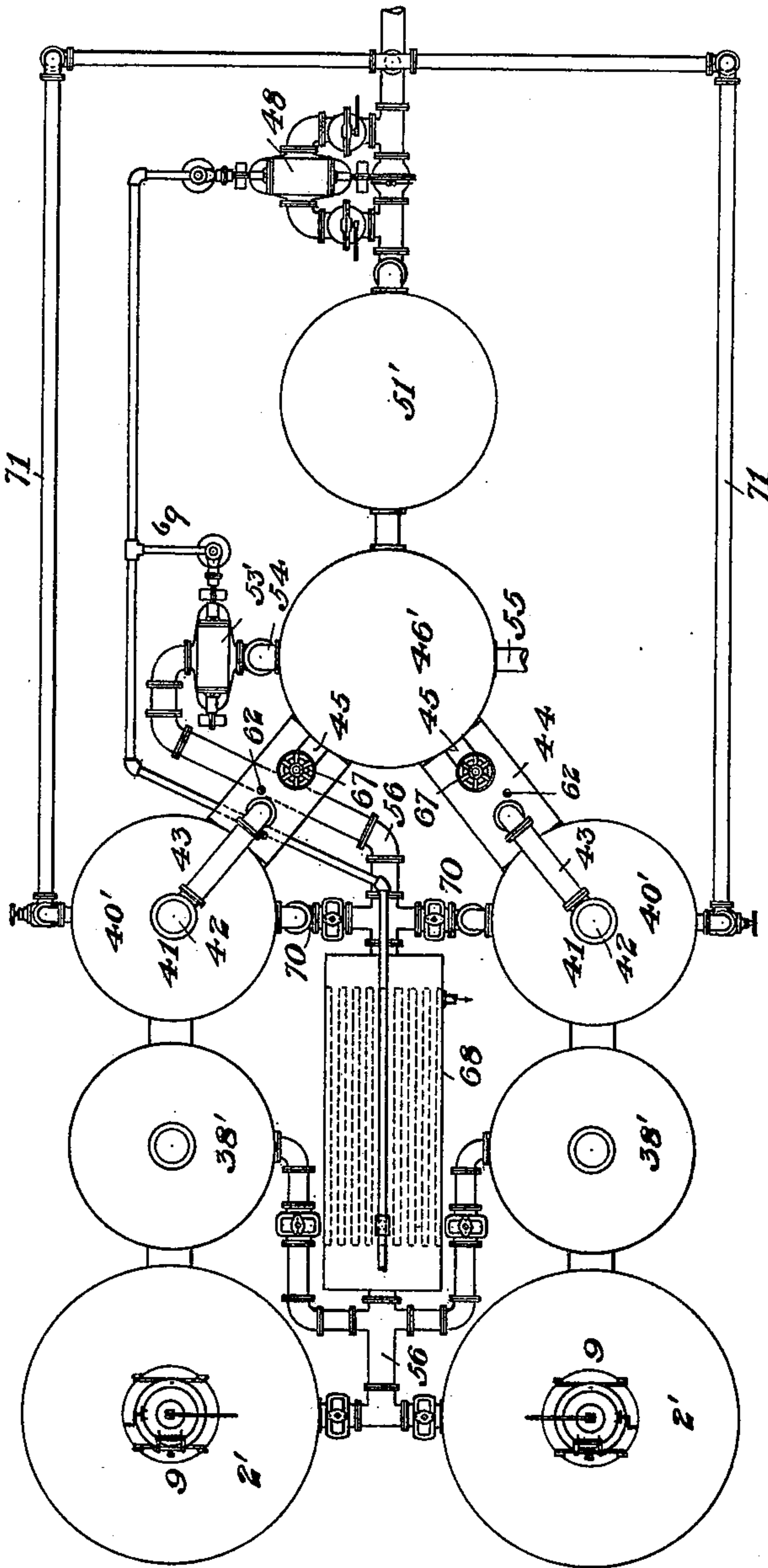
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3 Sheets—Sheet 3.

Fig. 6.



WITNESSES

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# UNITED STATES PATENT OFFICE.

JOSEPH A. FAUX, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO JOHN JARRETT, OF SAME PLACE.

## MANUFACTURE OF GAS.

SPECIFICATION forming part of Letters Patent No. 630,602, dated August 8, 1899.

Application filed December 22, 1898. Serial No. 700,022. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH A. FAUX, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Manufacture of Gas, 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—

Figure 1 is a side elevation, partly broken away, showing a gas-making system constructed in accordance with my invention. Fig. 2 is a top plan view of the same. Fig. 3 is an enlarged vertical section of the upper portion of the generator and charger. Fig. 4 is a horizontal section on the line IV IV of Fig. 3. Fig. 5 is a bottom plan view of the distributing-disk of the discharger; and Fig. 6 is a plan view, partly in section, showing a duplex arrangement of the plant with certain modifications.

My invention relates to the manufacture of gas by what is known as the "intermittent" system, and more especially to the making of combined coal and water gas; and its objects are to more completely utilize the gaseous contents of the coal, to prevent escape of gaseous vapors during the regenerating of the fuel-bed, to more completely heat the coal layer upon the fuel-bed during the gas-making periods, to positively draw the heat from the fuel-bed upwardly through the layer of coal, and to quickly remove the vapors and gases generated from the coal at a low temperature.

In the drawings, 2 represents the generator, the chamber of which, as shown, is in the form of the inverted frustum of a cone. The generator is provided near its lower end with the usual grates 3 and with air-inlets 4 and a steam-jet inlet 5 below the grates. The top 6 of this generator is of dome form, with an annular passage 7 therein, having a series of ports 8 leading into the generator above the fuel-bed. Above the central opening in the top of the producer is the charging-hopper 9, which I have shown as mounted upon wheels 10, so that, if desired, it may be detached and moved to one side, the charging-opening then being closed with a suitable cover if water-gas alone is desired. The lower end of the

hopper is provided with a flanged ring 11, which is secured to the top ring 12 of the producer by suitable bolts 13. I have shown three of these bolts as entering slotted lugs 14 upon the ring 11, while the fourth is provided with a T-head 15, entering the recess in the plate 12. By loosening these bolts the hopper may be moved toward the right, thus simultaneously drawing the lugs from the bolts.

To facilitate the removal of the hopper, I preferably support it upon side standards 16, a flange 17 upon the hopper resting upon nuts engaging screw-threaded portions of the standards. These standards are pivotally connected at 18 to the horizontal bars 19, which connect the wheels 10, so that after the hopper is moved to one side it may be tilted upon these standards to give access to the interior. A brace 16' is removably secured to one standard and the corresponding bar 19 to hold the hopper in its normal position.

The hopper is preferably made air-tight, and the charging-hole 20 is provided with a cover 21, which is forced into place by a screw 22, as common in manhole-covers. A vertical shaft 23 extends through a stuffing-box 24 in the top of the hopper and has a swivel connection at its upper end to an actuating-lever, by which it may be raised and lowered. The intermediate portion of this shaft has a spline connection with a bevel-wheel 25, intermeshing with a similar bevel-wheel 26, carried upon a shaft 27, passing through a stuffing-box 28 in the side of the hopper and provided with a handle 29. The bevel-gear is supported upon a spider 30, having a central plate 31, which is provided with a dust-proof case 32, inclosing the gearing.

To the lower end of the vertical shaft 23 is secured a spreading-disk 33, which is preferably made with a convex upper face, as shown. This disk is provided with a series of vanes or ribs 34 upon its top and with a series of central radial slots 35 between these ribs. The lower face of the disk is provided with a series of short radial lips or ribs 36, which are beveled upon one side and straight-faced upon the other and are located adjacent to the slots, as shown in Fig. 5.



With the above-described charging apparatus when the hopper has been filled with crushed or ground coal and the charging-opening closed the shaft 23 is lowered and simultaneously rotated by means of the handle 29 until the disk is within the charging-opening of the producer, as shown in dotted lines in Fig. 1. As the coal in the hopper falls upon and through this rotating disk it is thrown outwardly in all directions, and thus spread evenly and uniformly upon the fuel-bed. The shaft 23 is then raised into its normal position, so as to protect the disk and actuating connections from the heat generated in the producer. The gas is drawn from the producer through the ports 8 into the passage 7 and thence through an outlet 37 into the upper end of a fixer 38, and to give an even draft throughout the ports 8 I preferably provide a baffle-plate 39 in front of the outlet 37, as shown in Fig. 2. The fixer 38 is connected at its bottom with a second fixer 40, and these fixing-chambers may be made in the usual manner and filled with checker-bricks. From the fixer 40 the gas rises into a vertical pipe 41, having its upper end closed by a valve 42, and from the pipe 41 the gas is led through the pipe 43 downwardly into a valve-chamber 44, from which the pipe 45 leads to a condenser 46. The gas entering the top of the condenser passes down through the series of pipes therein and is taken out at the bottom through a pipe 47, which connects to an exhaustor 48. From the exhaustor the gas is forced through pipe 49 back into the by-pass 50, which directly connects the condenser with a scrubber 51. The by-pass, as well as the pipes 47 and 49, is provided with suitable closing gates or valves 52, so that when it is desired to repair the exhaustor, the valves in pipes 47 and 49 being closed and the valve in pipe 50 being opened, the gas will pass direct from the condenser to the scrubber. The valve in the by-pass is of course closed during normal operation.

53 is a blowing-engine to which a supply-pipe 54 leads from the top of the condenser, the air being taken in at the lower end of the condenser through a pipe 55. The air being warmed as it rises through the condenser by its contact with the pipes through which the gas is passing is forced by the blower into a pipe 56, from which a branch 57 is led to the gas-producer and connected to the air-inlets 4. Other branches 58 and 59 lead from the main 56 to the fixers, the pipe 58 leading into the upper end of the first fixer, while the pipe 59 leads into the lower end of the second fixer and is continued upwardly to an air-inlet 60 in the central portion of this fixer.

Within the valve-chamber 44 is a cone-shaped valve 61, which is supported by vertical rods 62, extending upwardly through the top of the chamber and connected to a lever 63, having link connection 64 to a hand-lever 65. The link 64 is extended upwardly and connected to the actuating-lever of valve 42,

so that one valve is closed whenever the other is opened. The chamber 44 is preferably provided with a layer of water or other liquid to collect the sediment, which may be drawn off, as desired, through valved pipe 66. Pipe 45 is provided in its elbow portion with a valve 67, and other regulating-valves may be placed in the branches leading from the air-pipe and wherever desired.

In carrying out my improved process in the above apparatus when I wish to make a combined coal and water gas, assuming that the producer is filled with a body of coke, which extends from the grates upwardly to a point near the lower end of the dome, a thin layer of crushed soft coal having been spread upon the previously-heated coke-bed and the distributing-disk drawn upwardly into the lower end of the hopper, the exhaustor, acting through the connected fixers and the condenser, draws off the gases and vapors rising from the thin coal film, and these gases are taken off through the several ports and collected in the annular passage, whence they pass to the first fixer. The action of the exhaust is to draw the heat of the fuel-bed upwardly through the coal film, and the gases rising from this film are thus taken off quickly and at a comparatively low temperature. During this period the air-blast is cut off, and steam being supplied beneath the grate rises through the heated fuel-bed and is broken up into water-gas, this gas combining with the coal-gas, and the mixture passing off into the fixer. The mixed gas passing through the heated checker-work of the fixers is converted into a fixed gas and thence passes through the condenser and the scrubber, where the foreign matters are eliminated. When the heat of the fuel-bed has been lowered during this operation to a point where water-gas is not generated, then by operating the hand-lever 65 the valve 42 at the upper end of the second fixer is opened, and the valve 61 within the chamber 44 is simultaneously closed. The steam admitted below the grate-bars being shut off, air is blown in through the ports 4 and combining with the fuel raises the fuel-bed to a high temperature, while the heated products of combustion passing through the fixers heat the checker-bricks therein and are passed into the outer air at the upper end of the second fixer. When the fuel-bed has thus been brought to the desired temperature, the hand-lever 65 is operated to close the valve 42 and simultaneously open valve 61, a fresh supply of coal is spread over the fuel-bed, and steam is again admitted below the grate, thus resuming the gas-making period. These periods are of course alternated in the usual manner.

I desire to call special attention to the fact that owing to the drawing of the heat from the fuel-bed upwardly through the film of coal and owing to the large area of this film of crushed coal compared to the grate area and the thinness of the film, the coal therein



is thoroughly carbonized during each gas-making period, which occurs immediately after the coal is fed. This is a very important part of my invention, since the coal is  
 5 thoroughly carbonized and the gases quickly drawn off at a comparatively low temperature, thus obtaining substantially all of the gaseous constituents of the coal, which combine with the water-gas and pass over to the  
 10 fixing-chambers. The making of the coal film of larger area than the grates is therefore highly important, as well as the drawing off of the gas at several different points, and the use of an exhauster which acts to positively draw out the gases generated. I consider each of the above features as novel in the intermittent water-gas system and intend to cover the same broadly in my claims.

In the form of Fig. 6 I show a duplex system  
 20 having two producers 2' and four fixers 38' and 40', the two fixers 40' being connected to a common condenser 46', which is connected to a scrubber 51', the exhauster being shown in this form as located in the pipe leading  
 25 from the scrubber instead of between the scrubber and condenser, as shown in my first form. 53' is the blower which takes the warmed air, as before, from the condenser 46' and forces this air into a heater 68. The air  
 30 passes through the pipes in this heater, and exhaust-steam is fed around these pipes by suitable connections 69, leading from the exhauster, the blower, and any other engines employed in connection with the plant. From  
 35 the heater 68 the air enters the main 56, from which branch pipes lead to the generators 2' and the first fixers 38'. The air for the second fixers 40' is taken off direct from the blower through a branch pipe 70. The operation of this system is the same as that of the  
 40 first form.

I prefer to use heated air for feeding the generator or generators for the reason that the zone of combustion is thus brought nearer  
 45 the grate and the coke is better utilized, preventing waste from a layer of dead coke at the bottom of the fuel-bed.

To prevent tar collecting in the outlet-pipes leading from the second fixer and in the valve  
 50 connections thereof, I may use a branch pipe 71, by which a small portion of the gas passing from the scrubber is led back into the upper end of the second fixer, thus lowering the temperature of the gas passing from this  
 55 fixer sufficiently to prevent the deposition of tar and the formation of carbon in the outlet-pipes.

The advantages of my invention will be apparent to those skilled in the art. The use  
 60 of a vacuum apparatus or exhauster in connection with the intermittent system positively draws away the gases rising from the coal film and insures its carbonization. The large area of the coal film also assists in this  
 65 action, as do the several ports for the outlet of the gas. The drawing of the heat from the fuel-bed upwardly through the coal film in-

sure rapid carbonization and complete release of the gaseous contents of the coal during the gas-making period. The gases are  
 70 not fixed in the generator, but are taken off at a comparatively low temperature. The feeding apparatus is of advantage, as it insures a uniform distribution of the coal film, while the spreader is protected from the heat  
 75 during the generation of the gas. The connecting of the outlet-valve for the second fixer with the closing-valve between this fixer and the condenser insures correct operation of these valves and renders their operation  
 80 easy. The using of a small portion of the gas passing from the scrubber for cooling the connecting-pipes from the fixer prevents formation of tar in these pipes and that without the use of some foreign mediums. 85

Many changes may be made in the form and arrangement of the producer, the feeding apparatus, the series of ports, and their connection, as well as in the connection of the exhauster and the other parts, without departing from my invention, since 90

I claim—

1. The method of making combined water and coal gas, consisting in spreading a layer of coal upon a previously-heated fuel-bed, 95 supplying steam below the fuel-bed, drawing the steam and heat upwardly through the coal film by an exhauster or similar apparatus and then regenerating the fuel-bed, and continuing these intermittent steps; substantially as described. 100

2. The method of making combined coal and water gas, consisting in maintaining a fuel-bed of greater area at its top than its bottom, spreading a coal film upon the top of 105 the fuel-bed, supplying steam below the fuel-bed, sucking away the combined vapors and gases from a point above the fuel-bed, and then regenerating the bed; substantially as described. 110

3. The method of making combined coal and water gas, consisting in spreading a coal film upon a fuel-bed, supplying steam below the fuel-bed, sucking away the combined 115 gases at several different points above the fuel-bed, passing them to a fixer, and then regenerating the fuel-bed; substantially as described.

4. The method of making combined coal and water gas, consisting in spreading a film 120 of crushed coal upon a fuel-bed of greater area at its top than at the bottom, supplying steam below the fuel-bed, sucking away the combined gases at several different points above the level of the fuel-bed, passing them 125 to a fixer, and then regenerating the fuel-bed; substantially as described.

5. A producer for coal and water gas, having a greater area in the upper part of the fuel-chamber than at the grate-surface, and 130 an exhauster connected to the producer above the fuel-bed; substantially as described.

6. A producer for coal and water gas having a series of ports leading from above the



fuel-bed, and an exhauster connected to said ports; substantially as described.

7. A producer for coal and water gas, having a chamber of larger area at its top than  
5 at its grate-surface, air and steam inlets below the grate, a series of ports leading from above the fuel-bed, and connected to an exhauster, and an apparatus for spreading a thin layer of coal over the fuel-bed; substantially  
10 as described.

8. A gas-producing system having a branch

pipe leading from beyond the scrubber backwardly into the fixer to lower the temperature of the gas in the pipes leading from the fixer; substantially as described.

In testimony whereof I have hereunto set my hand.

JOSEPH A. FAUX.

Witnesses:

GEORGE B. BLEMING,  
H. M. CORWIN.