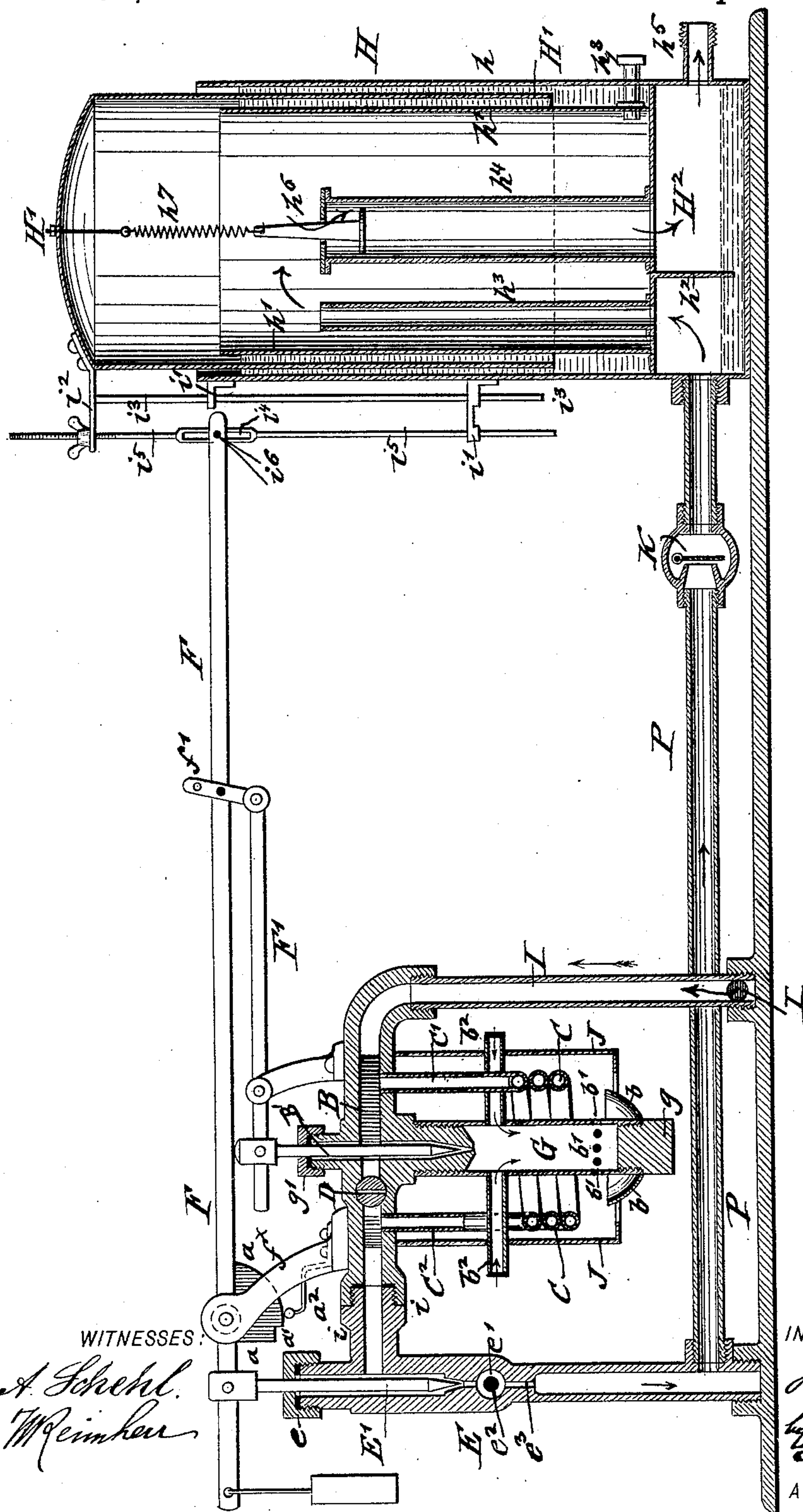


(No Model.)

J. S. WOODS.
GAS MACHINE.

No. 437,136.

Patented Sept. 23, 1890.



UNITED STATES PATENT OFFICE.

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GAS-MACHINE.

SPECIFICATION forming part of Letters Patent No. 437,136, dated September 23, 1890.

Application filed May 16, 1890. Serial No. 352,099. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH S. WOOD, of Brooklyn, county of Kings, and State of New York, a citizen of the United States, have invented certain new and useful Improvements in Gas-Machines, of which the following is a specification.

This invention has reference to certain improvements in that class of gas-machines in which a liquid hydrocarbon is vaporized by heat and mixed with atmospheric air in such proportion as to form an illuminating-gas, and in which the generation of gas is automatically regulated and controlled according to the quantity of gas burned; and the invention consists, first, in the construction of the retort for generating the hydrocarbon vapors and of the burner by which said retort is heated, said burner being provided with a needle-valve, so as to regulate the supply of oil to the burner. The vapors generated in the retort are conducted through a superheating-coil and from the same by an injector having a needle-valve into a mixing-chamber, into which the required quantity of atmospheric air is drawn and mixed with the vapors, the needle-valve of the supply-throat of the ejector and of the burner being automatically controlled by the rise and fall of the drum of the gas-holder, which drum is connected to a fulcrumed and weighted lever with the needle-valve of the ejector and by an auxiliary lever with the needle-valve of the retort-heating burner.

The invention consists, further, of certain details in the construction of the gas-holder and in the construction of a locking device for the controlling-lever of the needle-valve of the ejector, by which the supply of gas to the ejector is quietly interrupted when the gas-holder is filled and established again when the quantity of gas in the same is diminished to a certain extent, during which time the needle-valve of the burner is never entirely closed, so that a small quantity of gas is supplied to the burner sufficient to keep the retort in condition for instant action.

The accompanying drawing represents a vertical longitudinal section of my improved gas-machine.

In the drawing, B represents a retort or generator of cylindrical or other shape, which is heated by an inverted Bunsen burner G, said burner being attached to the retort B and extended downwardly from the same.

Into the supply-orifice of the burner G extends a needle-valve B', the tapering end of which serves to open or close the correspondingly tapering supply-orifice that leads from the retort to the burner G. The lower end of the burner-tube G is closed by a screw-plug g, which is provided with a cup b, that is filled with alcohol whenever it is desired to start the generation of gas in the retort B. The cup b can be raised or lowered by screwing the plug up or down in the burner-tube, so as to bring the flame in proper relative position to the retort B. The lower part of the burner-tube G above the cup b is provided with a number of perforations b', that are arranged in a circle around the burner-tube, said perforations serving for emitting the gas in jets, by which the retort is heated.

The burner G is provided with radial tubes b², through which the air required for combustion is drawn in, so as to mix with the vapors generated in the burner-tube G, and pass with the same through the perforations b'. Below the air-tubes b² the burner-tube G is surrounded by a superheating-coil C, which is connected at its upper and lower ends by pipes C' C² with the retort B. The burner G and coil C are surrounded by an inclosing-jacket J of suitable sheet metal, which serves to retain the heat of the burner and to prevent the heating-jets from being accidentally extinguished by sudden drafts of air or otherwise.

The hydrocarbon oil, which is vaporized in the retort B and superheated in coil C, is conducted to the former by a pipe I, which communicates with a suitable tank that is located at some distance from the generating apparatus, a suitable pressure of air being established in the tank on the top of the oil by an air-pump or otherwise, so as to force the oil through the connecting-pipe I to the retort B. The supply-pipe I extends into the tank near the bottom of the same, so that all the oil in the tank can be supplied to the retort, care being taken that the pressure is kept up

in the same by operating the air-pump from time to time, as customary in gas-generating apparatus of this class. The oil is vaporized in the retort B, the vapors passing through the coil C, and also through the supply-orifice, the size of which is regulated by the needle-valve B', into the burner G, where they are mixed with the air, the mixture of air and vapors being emitted through the jet-holes b', the jets of flame serving to heat up the surrounding superheating-coil C, as well as the retort B.

The retort B is connected by a pipe *i* with an ejector E. The oil supplied to the retort B is prevented from passing from the retort to the ejector E by a stop-cock D, which is located between the outlet-pipe C² and the needle-valve B', and by which the direct connection between the retort B and the ejector E is prevented and the vapors compelled to pass from the retort B through the supply-orifice of the burner G to the same and through the connecting-pipe C' at the opposite side of the stop-cock D to the superheating-coil C. The needle-valve B' for the burner G is extended through a suitable stuffing-box *g'* at the top of the retort B, to the outside of the same, so as to prevent any escape of gas at that point.

The stop-cock D compels the vapors to pass from the retort through the coil C and its connecting-pipes C' C², so as to be superheated during its passage through the coil C, whereby a more perfect vaporization of the oil takes place, and whereby, also, a better illuminating-gas is obtained, as the atmospheric air is mixed with the highly-heated vapors. The superheating of the vapors has the additional advantage that the condensation in the gas-holder and service-pipes is greatly diminished and that smaller burners can be used. The stop-cock D has a small opening which ordinarily is disconnected from the retort, as shown in the drawing. This opening permits the direct connection of the retort B with the ejector E and its mixing-chamber, when, by wear or otherwise, the superheating-coil should become injured, in which case the stop-cock is turned so that the vapors can pass off directly from the retort to the ejector. In this case the vapors are, however, not superheated, and the machine does not perform its function as effectively as when the vapors are superheated in the coil C.

The ejector E is constructed in the usual well-known manner and provided with a needle-valve E', which is guided by a stuffing-box *e*, the conical end of said needle-valve serving to open or close the conically-tapering supply orifice or throat of the ejector E. The vapors generated in the retort B are forced through the superheating-coil C and through the narrow throat of the ejector into the mixing-chamber *e'* of the same, so as to draw atmospheric air through an opening *e*² into the mixing-chamber *e'*, the size of the opening being regulated in the usual manner

by a suitable valve, so that the proper proportion of atmospheric air is drawn in. The air is mixed with the vapors in its passage through the outlet-throat *e*³ of the mixing-chamber, said mixture being then conducted by a pipe P to the gas-holder H. The supply-pipe P is provided with a check-valve K of any approved construction, which permits the passage of gas in the direction of the gas-holder when the pressure in the ejector is greater than the back-pressure of gas in the gas-holder, but which prevents the return of the gas from the gas-holder and the discharge of the same through the air-supply opening *e*² of the mixing-chamber whenever the pressure of the gas in the ejector is smaller than the pressure of the gas in the gas-holder.

The gas-holder H is constructed of an exterior cylindrical or other shell *h* and a second interior shell *h'*. The space between the shells *h* and *h'* is filled with water or glycerine and serves to form a hydraulic seal for the bell-shaped drum H' of the gas-holder, which extends into the space between the shells *h* *h'*. The shells *h* and *h'* are supported on a cylindrical bottom chamber H², which is connected with the supply-pipe P, and which is divided by a transverse partition *h*² into two parts, the smaller one next to the supply-pipe P serving as an inlet-chamber for the gas, while the larger one on the other side of the partition serves as an outlet-chamber for the gas. The gas is conducted from the inlet-chamber of the bottom-chamber H² by an upwardly-extending pipe *h*³ into the gas-holder H, while a central larger pipe *h*⁴ connects the gas-holder with the outlet-chamber and the gas-supply main *h*⁵. The partition *h*² in the bottom chamber H² does not extend entirely to the bottom of the chamber H², but to some distance from the same, so as to leave a space which is closed by a hydraulic seal formed by water or glycerine. The upper end of the outlet-pipe *h*⁴ is provided with a conical valve *h*⁶, which is suspended by a spiral spring *h*⁷, that is attached to the top of the drum H'. The spiral spring *h*⁷ serves to permit the raising of the drum even while the conical valve *h*⁶ closes the opening of the outlet-tube *h*⁴, so that the drum can partake of a certain rise and fall even when the valve *h*⁶ closes the outlet-tube and shuts off the supply of gas to the gas-supply main. The condensation that collects at the bottom of the gas-holder at the inside of the shell *h'* is drawn off through a discharge-pipe *h*⁸, which is closed by a screw-plug, while the condensation formed by the gas in the bottom chamber H² is collected at the bottom of the same and is mixed with the liquid forming the seal in the bottom of the same, and drawn off from time to time with the liquid. To the exterior shell *h* and to the top of the drum H' are applied horizontal brackets *i*' *i*². To the bracket *i*² of the drum H' is attached a guide-rod *i*³ and an adjustable rod *i*⁵, which is connected by a slotted portion *i*⁴ with a

pin i^6 on the end of a regulating-lever F, which is fulcrumed to a fixed arm on the top part of the retort. The lever F is weighted at its opposite free end and pivoted to the upper end of the needle-valve E' of the ejector E. When the drum H' is raised sufficiently so that the pin i^6 of the rod i^5 lifts the end of the lever F the needle-valve E' connected to the same is moved downward, so as to gradually close the throat of the ejector E and diminish thereby the supply of vapors. At the same time the needle-valve B', which is connected by a fulcrumed lever F' and pivot-link f' with the lever F is moved into the supply-orifice of the burner G, so that the supply of oil to the same and thereby the size of the heating-jets is diminished. The motion imparted to the needle-valve B' of the burner G is so proportioned to that of the needle-valve E' of the ejector E by the levers F F' that the needle-valve B' of the burner never closes entirely the supply-orifice of the burner, even when the throat of the ejector E is entirely closed by the needle-valve E'. By this adjustment of the needle-valve B' the flame of the burner is never extinguished, but reduced to such an extent that it only serves to keep the generating-coil and retort heated, so as to generate a small quantity of gas, just sufficient to supply the burner, which is thereby always ready to supply a larger heating-flame whenever the generation of gas is to be started again by the opening of the needle-valve of the ejector. At the under side of the lever F is arranged, near the fulcrum of the same, a quadrantal cam a , which is provided with a notch a' at its lower end. A locking-spring a^2 , that is attached to the arm f , moves along the quadrantal cam until the lever F is raised to such an extent that it enters the notch a' at the end of the same. At this point the full force of the spring a^2 is exerted on the cam a , so that the lever is quickly raised in the slot i^4 of the guide-rod i^5 , while the needle-valve E' of the ejector E is suddenly closed, and thereby the supply of gas from the retort to the gas-holder interrupted. The quick motion of the connecting-lever F, owing to the action of the locking-spring a^2 , is assisted by the weight at the outer end of the lever F. This arrangement has the advantage that whenever the gas-holder is filled to a certain extent the interruption of the gas-supply is accomplished in a positive and effective manner. This motion of the lever F also operates the needle-valve of the burner and reduces the flame of the same to such an extent that the generating retort and coil are simply kept in a heated condition, while the generation of gas is interrupted. As soon as the drum of the gas-holder falls by the supply of gas to the burners, the lever F is lowered by the action of the drum on the end of the same. This produces the lifting of the needle-valve of the mixer E, also the lifting of the needle-valve of the burner G. The locking-spring is at the same time released from the

notch of the quadrantal cam a and moved along the edge of the same until the next closing and locking action of the lever takes place.

The quadrantal cam or trip and the locking-spring have the advantage that when the gas-holder is filled to its greatest capacity, or nearly so, the generation of gas is almost instantly interrupted and the size of the heating-flame of the burner diminished. The machine responds thereby in a more effective manner to the requirements of the burners, while the generation of gas is started again as soon as a certain quantity of gas is drawn off from the gas-holder by being supplied to the burners.

The operation of the apparatus is as follows: The oil-tank is filled with oil and the latter placed under air-pressure, so that it will pass through the supply-pipe I into the retort B. The burner b is then heated up for starting the apparatus by alcohol that is burned in the cup b at the lower part of the burner. By the heat of the alcohol-flame the burner G is sufficiently heated, so that the oil supplied to the burner tube is vaporized and mixed with air, forming jets of flame, which are issued through the jet holes b' . These jets continue to heat up the coil C and the retort B, so as to generate the vapors therein, which are conducted to the ejector E and mixed in the mixing-chamber and outlet-throat of the same with atmospheric air, the gas and air mixture being then conducted through the pipe P to the gas-holder H, from which latter the burners are supplied with gas. The generation of vapors in the retort is gradually diminished as the drum rises and entirely interrupted when the drum is filled to its greatest capacity, as the lever F is dropped by the action of the slot i^4 on the pin i^6 , cam a , and spring a^2 , so that the needle-valve E' closes the orifice of the ejector E. Simultaneously the heating of the flame of the burner G is reduced to such an extent that the generation of vapors in the retort and coil is interrupted, but continued in a small measure in the burner-tube, so that the heating of the retort and coil is kept up. By the consumption of gas in lighting the burners, the drum of the gas-holder falls and the generation of gases is automatically started again, as by the action of the levers F F' the heating-flame is increased and the supply of vapors to the ejector and mixing-throat started again. When the apparatus is properly started, it requires no further attention, as the different operations are accomplished automatically and in an effective and reliable manner.

By the arrangement of the superheating-coil below the retort and the improved construction of the burner for heating the coil and retort, the apparatus works with greater regularity and precision and is enabled to supply illuminating-gas in sufficient quantity as required by the number of gas-burners in

use. When some of the gas-burners are extinguished, the generation of gas is automatically diminished while it is increased when a larger number is lighted.

5 I am aware that gas-machines in which vapors are generated from hydrocarbon oil, by means of a burner below the retort and mixed with atmospheric air by means of an ejector connected with the retort, were used heretofore. I am also aware that needle-valves for the supply-orifice of the burner and ejector were operated by a suitable lever mechanism connected to the gas-holder; and I therefore do not claim these features broadly, but desire to confine myself to the arrangement of the auxiliary generating-coil located below the retort and connected therewith, the improved construction of the burner for heating the retort and coil, the automatic control of the needle-valves of the burner and ejector by a lever-connection with the gas-holder, and the construction of the gas-holder, as their specific features are not shown in the gas-machines of this class heretofore in use.

25 Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of a generating-retort having a lateral outlet-pipe provided with a stop-cock, a burner below said retort and connected therewith, a needle-valve for said burner, a superheating-coil below the retort, and tubes by which the coil is connected with the retort at opposite sides of the stop-cock, substantially as set forth.

2. The combination of a generating-retort having a transverse stop-cock, a burner below the retort and connected with the same, a needle-valve for said burner for opening or closing the supply-orifice of said burner, a superheating-coil extending around the burner, tubes connecting said coil with the retort, one of said tubes being arranged at one side and the other tube at the other side of the stop-cock, an ejector connected with the retort, a needle-valve for said ejector, a gas-holder, and a gas-supply pipe for conducting the gas from the ejector to the gas-holder, substantially as set forth.

3. The combination of a generating-retort, a burner below said retort, a tube connecting the retort with the burner, and a needle-valve

passing through the top of the retort into the upper end of the burner-tube, said burner-tube being closed at the lower end and provided with jet-openings, and with lateral air-inlet tubes above the jet-openings, substantially as set forth.

4. The combination of a generating-retort having a lateral outlet-pipe provided with a stop-cock, a burner below the same and connected therewith, a needle-valve for the supply-orifice of the burner, a superheating-coil encircling the burner, tubes for connecting the superheating-coil with the retort, one tube being located at one side and the other at the other side of the stop-cock, an ejector connected with the retort, a needle-valve for said ejector, a gas-holder, a gas-supply pipe connecting the ejector with the gas-holder, a fulcrumed lever connecting the needle-valve of the ejector with the drum of the gas-holder, and an auxiliary lever connecting the needle-valve of the burner with the main lever, substantially as set forth.

5. The combination of a generating-retort having a lateral outlet-pipe provided with a stop-cock, a burner below the same and connected therewith, a needle-valve for the supply-orifice of the burner, a superheating-coil surrounding said burner, tubes for connecting the superheating-coil with the retort, one tube being located at one side and the other tube at the other side of the stop-cock, an ejector connected to said retort, a needle-valve for said ejector, a gas-holder, a gas-supply pipe connecting the ejector with the gas-holder, a weighted and fulcrumed lever connecting the needle-valve of the ejector with the gas-holding drum, an auxiliary lever applied to the needle-valve of the burner and connected to the main lever, a notched cam or trip on the main lever, and a locking-spring for engaging said notched trip and interrupting the generation of gas when the gas-holding drum is entirely filled, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

JOSEPH S. WOOD.

Witnesses:

PAUL GOEPEL,
W. REIMHERR.