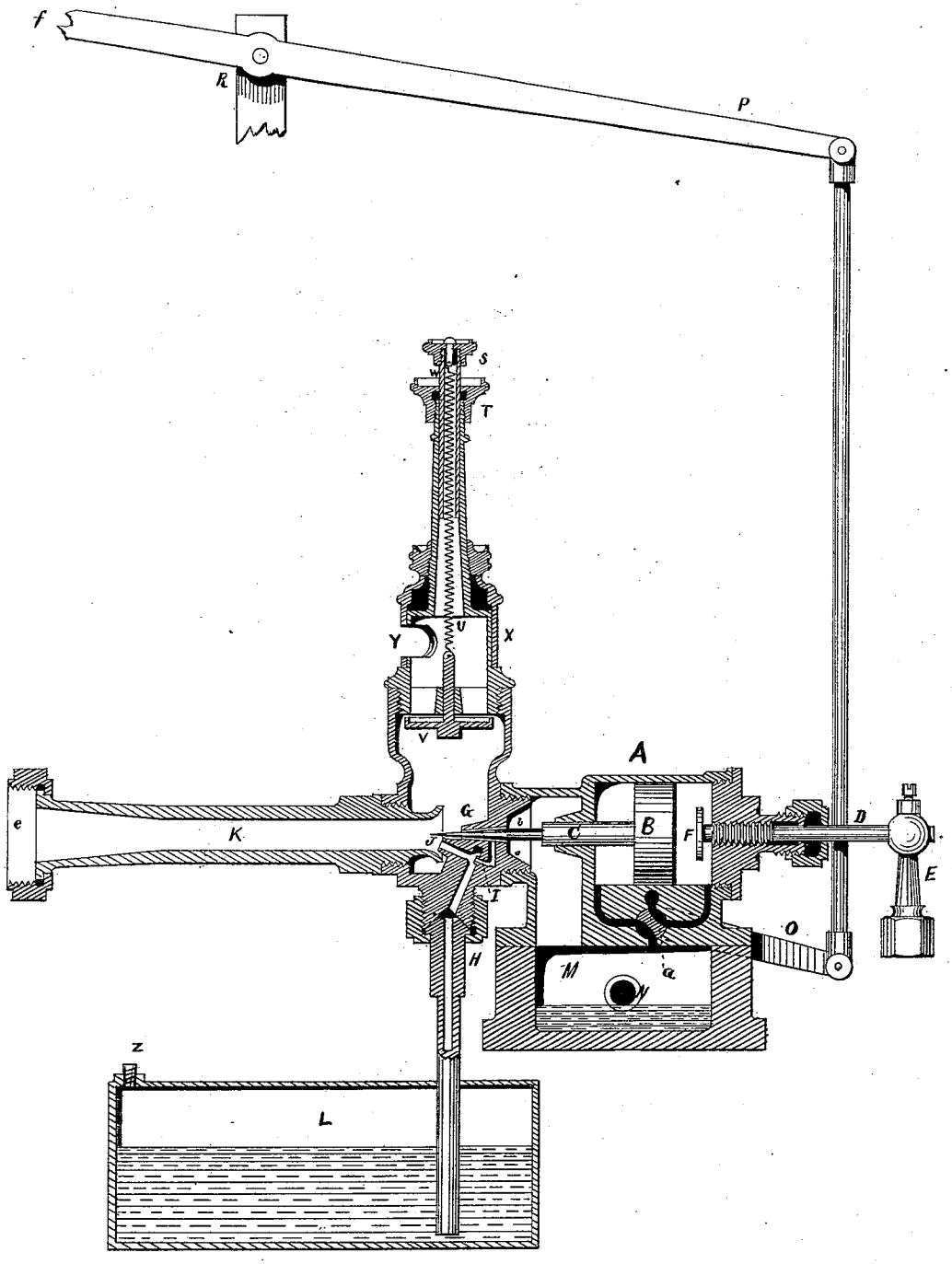
H. S. MAXIM.

Gas Apparatus.

No. 228,547. Patented June 8, 1880.



Witnesses:
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GAS APPARATUS.

SPECIFICATION forming part of Letters Patent No. 228,547, dated June 8, 1880.

Application filed December 22, 1879.

To all whom it may concern:

Be it known that I, HIRAM S. MAXIM, of the city of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Apparatus for Making Illuminating-Gas from the Lighter Products of Petroleum, of which the following is a specification, reference being had to the accompanying drawing, which forms a part hereof.

My invention relates especially to the class of apparatus for the most part invented and patented by myself, in which gasoline or naphtha is vaporized by heat and afterward mixed with air, so as to make gas of a uniform density. In such apparatus as have heretofore been constructed the gasoline or other oil used is converted into vapor in a boiler or heater somewhat resembling a steam-boiler, and in order to feed the gasoline into the boiler under sufficient pressure—say twenty-five pounds to the square inch—the gasoline or other oil is stored in a tank at a considerable elevation, or is kept in a closed vessel with air-pressure maintained over the oil by a condensing-pump.

The remainder of the apparatus consists of a gasometer, suitable valve-gear, and a very intricate device to prevent the gasoline from flooding the apparatus upon casual reduction of the heat. Apparatus of this class work with very great nicety and make gas of excellent quality and uniform density; but the first cost of the apparatus has heretofore been too great to allow such apparatus to come into general use.

My present invention is designed to simplify and cheapen the apparatus for making gas by the process above mentioned, and at the same time to make it more efficient by obviating certain difficulties attending the use of such apparatus.

The drawing represents the only part of my apparatus which is new, the gasometer and steam-boiler not being shown.

A is a steam-cylinder. B is a piston working in the cylinder A. C is the piston-rod. D is a screw-spindle passing through one head of the cylinder and extending into the cylinder, so as to limit the backward motion of the piston. E is a lever for turning the spindle D, and it has a weight on the end to keep it in position when once adjusted. G is a conical opening connecting the steam-chamber M with the tube K, and receiving the conical end of the piston-rod C. H is a connection between the gasoline-tank L and the tube K. I is a small jet leading from the conical opening G and opening into the gasoline-injector J. J is the gasoline-injector operated by the jet I. K is the induction-pipe leading to the gasometer. L is the gasoline-reservoir. M is a steam-chamber, provided with a suitable trap for carrying away condensation. N is a steam-pipe leading to the same. O is a lever operating the cock *a*, and joined by a connecting-rod to the lever P. P is a lever hung upon a fixed fulcrum at R, and connected with the gasometer beyond *f*. S is a thumb-nut, and U a spiral spring for supporting the check-valve V, which opens downward. W is a sliding tube for adjusting the tension of the spring U, and T a binding-nut for holding it in position. X is a revolving sleeve for opening and closing the air-inlet Y when desirable. Z is the filling-pipe of the gasoline-reservoir.

a is a four-way cock, so constructed as to connect either end of the cylinder A with the steam-chamber M by means of the steam-passages, (indicated by black lines,) and at the same time connect the other end of the cylinder with the exhaust or outlet shown immediately underneath the piston.

The operation of this machine is as follows: The tank L is filled with gasoline and steam is admitted to the steam-chamber M. The lever P is connected with the gasometer in such a manner that upon the falling of the gasometer consequent to the consumption of the gas contained in it the four-way cock *a* is turned to the position shown in the drawing. Steam thereupon enters the cylinder at the left of B and withdraws the conical end of the piston-rod from the opening G, when the steam also passes through G, there being a free passage for the steam from M to G, and at the same time through the jet I. Gasoline is drawn through H by the action of the jet I blowing through the tube J, and is driven into the tube K, while air is drawn in through the valve V by the jet G, and the air, steam, and

gasoline are thoroughly mixed together in the tube K. The gasoline is vaporized by the heat in the steam, and sufficient pressure is produced by the action of the jets to drive the gas thus formed into the gasometer, which is connected with K by a pipe attached at *e*. As the gasometer becomes filled and rises the lever P turns the cock *a* until the end of the cylinder (marked F) is connected with the steam-chamber, and the piston-rod is driven forward so as to close both G and I, and the operation of the apparatus is suspended until the gas in the holder is again exhausted.

The amount of air admitted may be properly adjusted by turning the sleeve X, and the amount of steam by turning the spindle D. As one pound of steam carries about as many units of heat as are required for vaporizing two pounds of gasoline and combining them with the proper proportion of air, the amount of steam may be so regulated that the combined vapors shall be quite cold when they enter the tube K. It is possible, indeed, to congeal the steam if a small enough quantity is used, and it will be perceived that the apparatus acts both as a vaporizer and a condenser.

When the pipes of the building to be lighted are exposed to a low temperature it is desirable to keep the temperature of K quite low, so as to condense out all the matter which is readily condensable, and avoid condensation in the service-pipes, which would otherwise frequently become annoying and dangerous. The water of the steam, moreover, acts as an efficient purifier of the gas, washing and condensing out all tarry substances and atoms of heavy oil.

It will be observed that no elevation of the gasoline-tank or air-pressure over the gasoline is necessary, as the oil is drawn into the apparatus instead of being forced in, and consequently all danger of accident or stoppage of the apparatus from failure or irregularity of pressure is obviated; also all possibility of flooding the apparatus is removed, as no gasoline can be introduced into the apparatus except in connection with a jet of steam, which at once vaporizes it and converts it into gas.

The operation of the apparatus is entirely automatic, and requires no attention as long as the tank is filled with gasoline and steam is supplied.

The construction of the apparatus may be changed in various details without substantial change in its mode of operation. The gasoline-tank may be elevated slightly above the mixing-tube K, and the gasoline be admitted through a valve operated by the rise and fall of the gasometer. The air and steam may be mixed before combining with the gasoline, and the combined jet of steam and air be made to draw in the gasoline, and instead of the four-way cock *a* a sliding valve may be used. All such constructions I regard as within my invention.

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

1. In an apparatus for making gas from volatile oils, the combination of an injector provided with steam-jets for injecting gasoline and air into a common chamber, with a valve or cock admitting steam to said injector, and levers or other mechanism operating said cock and connected with a gasometer, substantially as set forth.

2. In an apparatus for making gas from volatile oils, a valve or valves regulating the supply of air and gasoline or other oil, in combination with a steam cylinder and piston operating the same, the admission of steam to said cylinder being controlled by a cock or valve operated by the rising and falling of a gasometer, substantially as described.

3. The combination, in a gas apparatus, of the cylinder A, the piston B, the spindle C, and the adjusting-spindle D, substantially as described, and for the purposes set forth.

4. The combination, in a gas apparatus, of the valve V, the spring U, the sliding tube W, and the nut T, substantially as described, and for the purposes set forth.

5. In a gas apparatus, an injector provided with the jets G and I, in combination with the spindle C, substantially as described, and for the purposes set forth.

6. In a gas apparatus, an injector provided with the jets G and I, in combination with the spindle C, the piston B, and the cylinder A, substantially as described, and for the purposes set forth.

7. In a gas apparatus, an injector provided with the jets G and I, in combination with the gasoline-inlet H and the air-passage and valve V, substantially as described.

HIRAM S. MAXIM.

Witnesses:
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