(No Model.)

2 Sheets—Sheet 1.

J. P. WILSON.

CARBURETOR.

No. 383,204. Patented May 22, 1888.

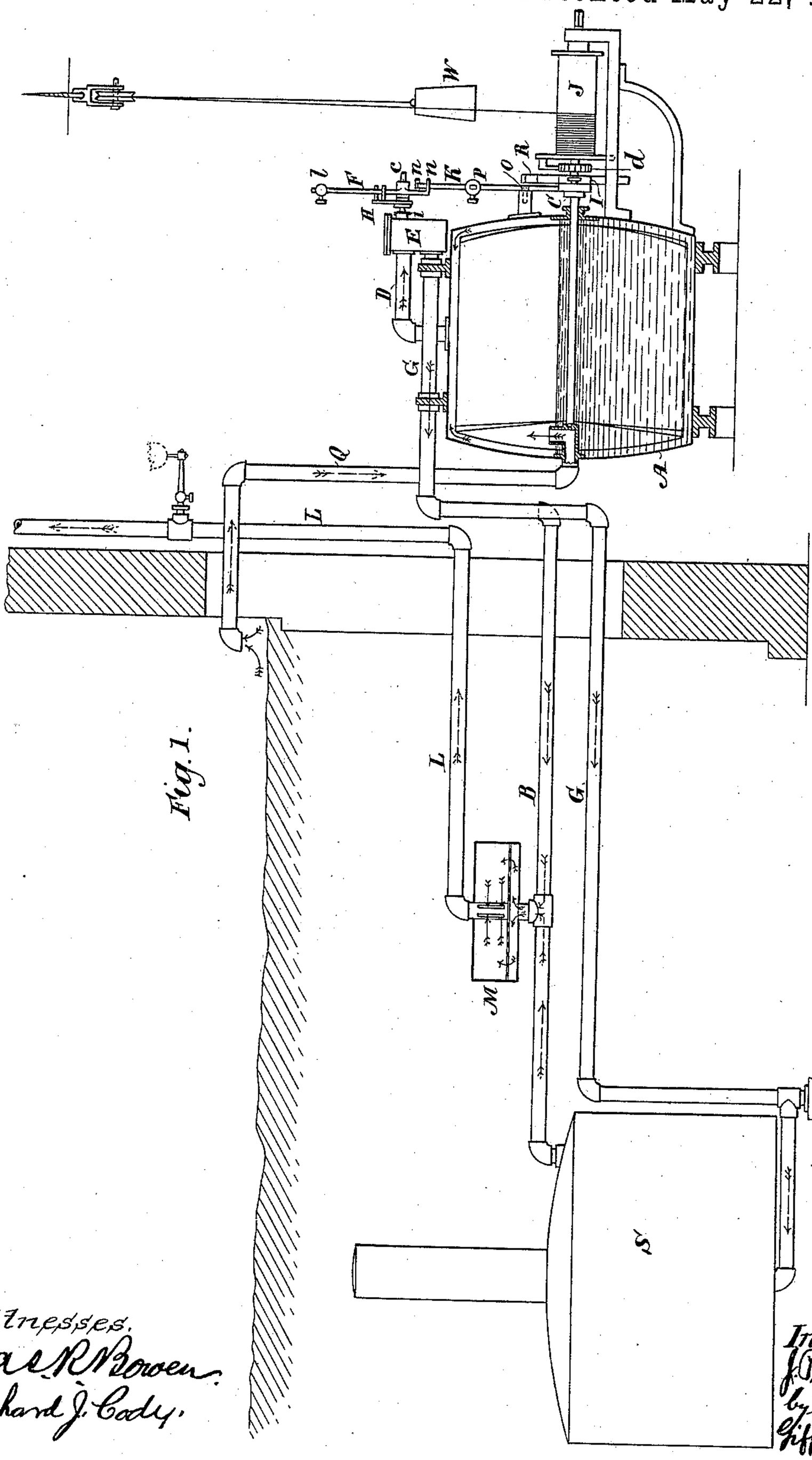

Fig. 1.

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(No Model.)

2 Sheets—Sheet 2.

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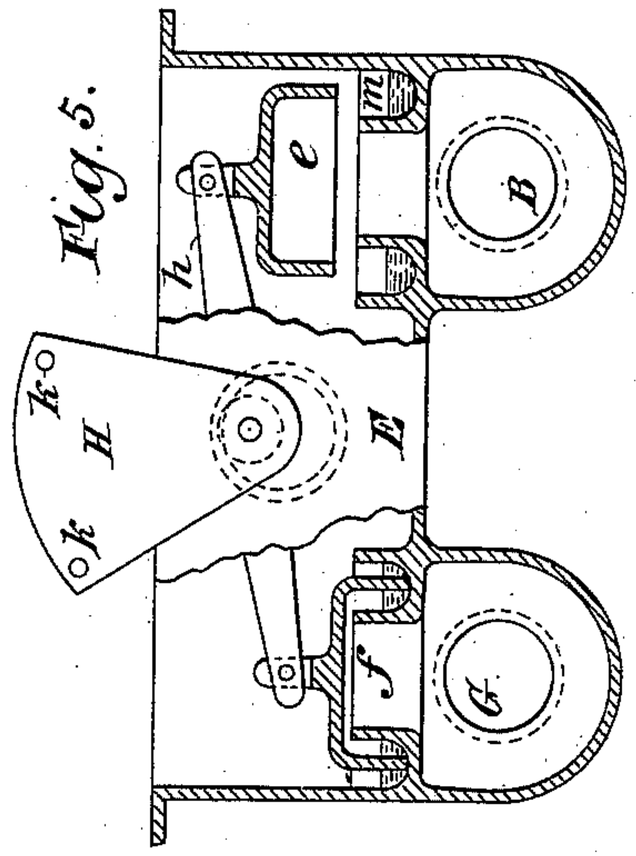
Fig. 5.



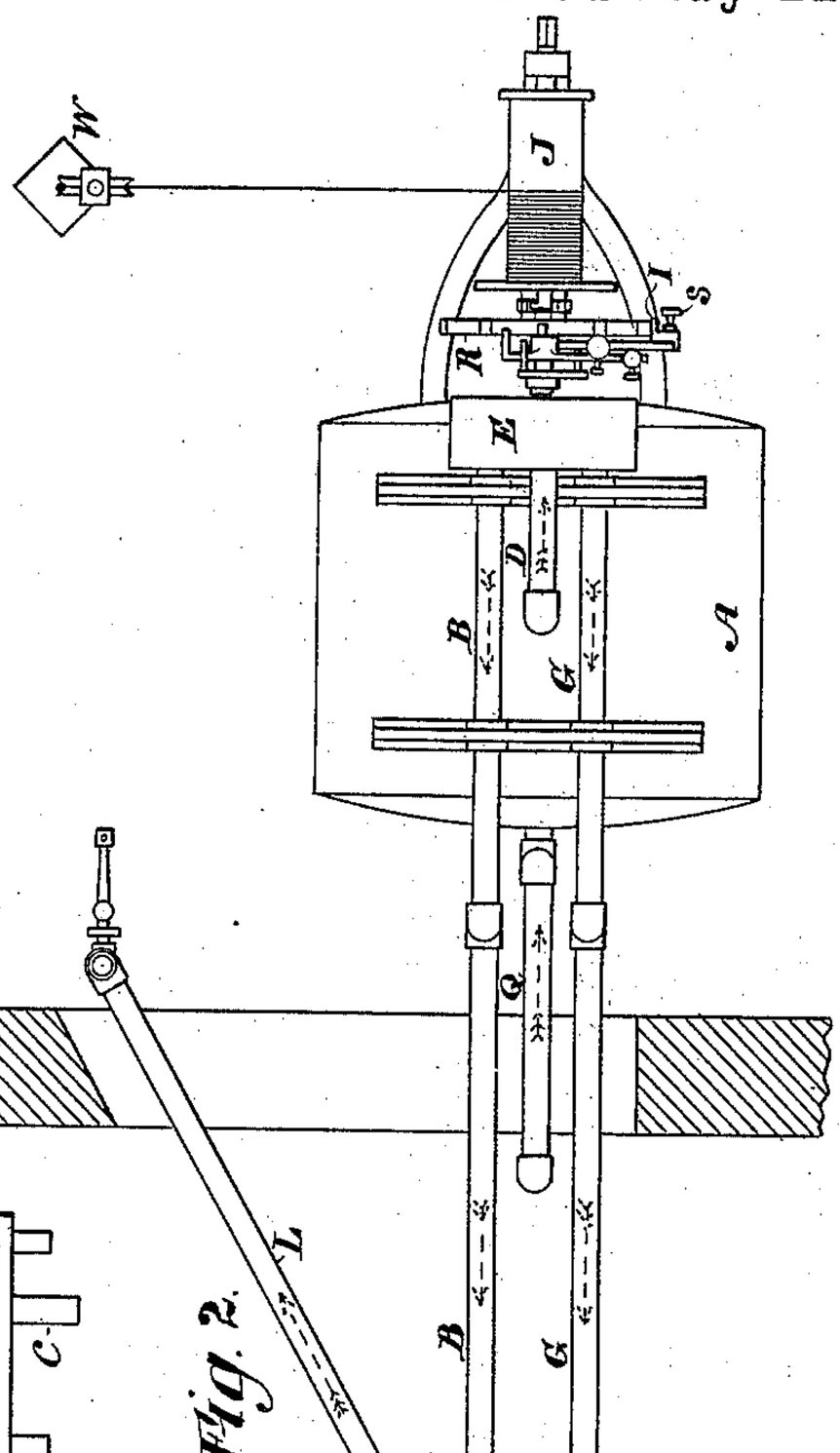


Fig. 4.

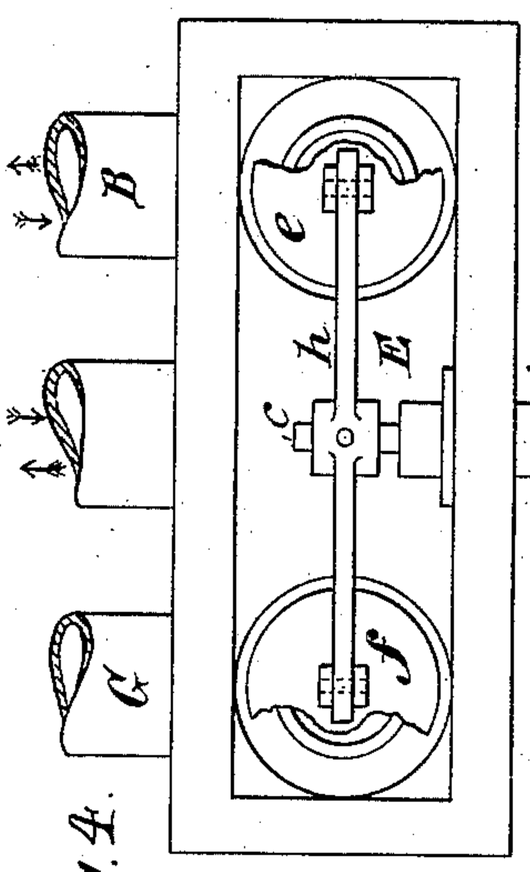
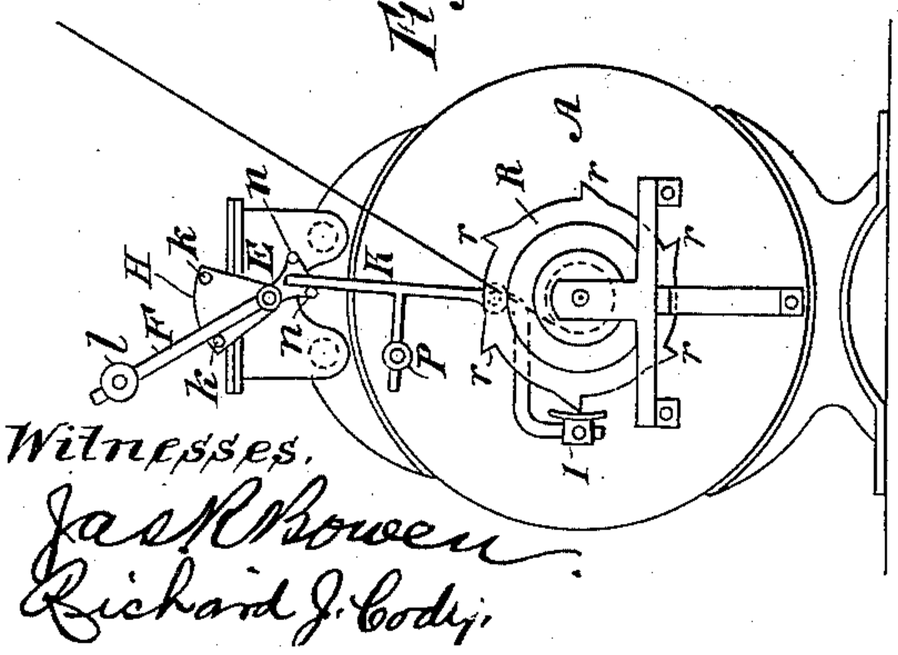


Fig. 3.



Witnesses,
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UNITED STATES PATENT OFFICE.

JAMES P. WILSON, OF NEWARK, NEW JERSEY.

CARBURETOR.

SPECIFICATION forming part of Letters Patent No. 383,204, dated May 22, 1888.

Application filed January 18, 1886. Serial No. 189,015. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. WILSON, of the city of Newark, county of Essex, and State of New Jersey, have invented a new and useful Improvement in Carburetors, commonly known as "gasoline-gas machines," of which the following is a description.

This invention relates to and is to be employed in connection with gasoline-gas machines, particularly with those which consist, essentially, of two parts, a generator and a meter-wheel pump. The generator of such a machine when in operation is charged with gasoline, (a high grade of naphtha which rapidly evaporates in the open air,) while the meter-wheel pump is employed in connection therewith to force a current of air into contact with the gasoline in the generator. This air is thus impregnated with the vapor of gasoline, the degree of impregnation depending on the gravity of the fluid, its temperature, and the temperature of the air introduced. By the action of the machine and its connecting-pipes this mixture of the vapor of gasoline and atmospheric air is carried to the burners and is the illuminating-gas generated and furnished by the machine. Such machines of various forms and arrangements are in general use throughout the United States. Both the manufacturers and users of such machines are fully cognizant of a serious objection to their employment, and this objection has in a multitude of instances prevented their introduction, especially where large institutions were to be lighted. In order to understand what this objection is, how it lessens the value of those in use, and why it often prevents their adoption, the following explanatory illustrations of the practical working of such a machine will be found useful in connection with the description of the present invention. Suppose, then, a gas-machine of the character named to be set and ready for operation, the generator having been filled with gasoline of the highest gravity—say 90°, for reasons which hereinafter will be seen to be pertinent—let the burners employed in this supposed experiment be twelve feet bat-wing burners—that is, burners that consume twelve feet of gas per hour. The weight propelling the meter-wheel pump being now wound up and the burners turned on, the gas-machine is at once in active operation. Air is forced through the generator, and becoming there charged with vapor is forced to and through the burners. The twelve-foot burners thus lighted at once exhibit a flame as large as an open hand, from which arises a cloud of dense black smoke. If the burners are turned down to a suitably-sized flame, each burner will resemble a smoky torch, demonstrating at once that the use of such a burner is impracticable as well as destructive of comfort. Why this burner delivers such a blaze will be understood by considering these well-ascertained facts: A single cubic foot of pure vapor of gasoline under an ordinary tension of one inch water-pressure is a sufficient quantity, when mixed with the proper amount of air, to furnish a fair gas-light for one hour. It is also a fact, easily verified by experiment, that when a gas-machine generator is charged with gasoline of the highest grade the air which is first passed through it will be as absolutely saturated with its vapor as a sponge is with water when immersed in it. It is further capable of demonstration that two cubic feet of air thus saturated will contain the one foot of pure vapor required to support a fair light for one hour. In the supposed experiment twelve feet of saturated air were passing through the burner per hour when only two were needed. It would seem, then, that if a two-foot burner had been employed, instead of a twelve, the result would have been a satisfactory light, and such is an undoubted fact. It remains to prove that the use of a two-foot burner in the example named would have been as utterly impracticable (except for a very brief time) as the use of the twelve-foot burner supposed. A consideration of the following facts will show how certain would have been the failure of the two-foot burner to continue its first success. Gasoline is not a homogeneous fluid. The instant evaporation begins the unevaporated portion left behind becomes denser until the last drop disappears. Every foot of air forced through the generator of such a machine as has been described will absorb less vapor than the foot of air that preceded it, because the fluid has become heavier, and therefore evaporates less readily. In the experiment supposed two feet of air absorbed vapor enough at first to afford a good light for an hour. Shortly it would have taken three feet of air to absorb an equal amount, and a three-foot burner would have been required to deliver it. Very soon, as the fluid again became denser, four feet of air would only have taken

up what the two feet did at first, and a four-foot burner would have been needed. Finally, just before the generator became exhausted of fluid it would have required twelve feet of air to absorb the quantity of vapor originally taken up by two feet. As the small burner could deliver only two feet of gas per hour, whatever might be its grade, in a few days it would have blown itself entirely out by not being adapted to the gas then being made. On the other hand, if the twelve-foot burner had been put on just before the generator was exhausted, when twelve feet of air absorbed precisely what two feet did at first, it would have been found that the twelve-foot burner delivered a beautiful clear flame, entirely free from smoke and in every way satisfactory.

It is evident from the preceding explanation that no gas-machine of the kind named can deliver a homogeneous gas. Its character must vary day by day and hour by hour. Now, the general remedy for this constantly-varying gas has been to use burners which could be easily adjusted to the grade of gas being made by the machine, and some of these burners have been so successful that if dwelling-houses alone were to be lighted the user of such a machine would have comparatively little cause to complain of its variable gas. The case is different when factories and large edifices are to be lighted. The varying quality of the gas has been a source of great annoyance, and has not only seriously interfered with their introduction in new places, but has in many cases caused them to be discarded after being tried. Even for dwelling-houses a gas-machine generating without the use of heat a regular gas like coal-gas would always have the preference at a considerably enhanced price, if for no other reason than its entire freedom from liability to smoke. It is therefore evident that a gas-machine generating a homogeneous gas requiring no special burner possesses marked advantages over one delivering a variable gas and requiring adjustable burners to be carefully watched.

Several very ingenious machines have been invented and patented which possessed the advantanges referred to—as, for example, the one known as "Maxim's gas-machine." The one great objection to the use of such a machine has been and is that it requires heat at all times to generate the gas, and the suspicion that this use of heat is attended with danger has seriously interfered with its general introduction. The sale therefore of gas-machines which generate gas without the use of heat has far exceeded that of the others, notwithstanding their disadvantages in the respect named. Plainly, then, if the gas-machine which now delivers a variable gas could by any practicable device be enabled to deliver the same grade of gas at all times, a given quantity always affording the same light, it would have a decided advantage over others not possessing this characteristic, and would allow of its introduction when otherwise it would not be even considered. Such an invention was the subject of United States Letters Patent No. 294,527, granted to Oakes, Tirrill, and myself on the 4th day of March, 1884. The invention I am about to describe is also intended to produce this precise result—that is, to compel a machine generating a constantly-varying gas to reform its conduct altogether, and to deliver at all times through the burner an exact homogeneous gas like coal-gas. Now gas suitable for a twelve-foot burner, when generated by such a machine as has been described, is equal to and resembles fine coal-gas, and is generated by it for only a short period, and usually just before the generator is exhausted of fluid and needs replenishing. If, therefore, the over-rich gas first generated and all that succeeded it could be reduced to the quantity of that last generated, then a twelve-foot bat-wing burner could be successfully used at all times. To accomplish this is the purpose of my present invention.

In the accompanying drawings my improvement is represented as applied to a gas-machine in which a meter-wheel pump is used to force the air through the generator by pressure as distinguished from drawing it through by suction, although it is adaptable to machines employing either mode of producing the desired current.

In the drawings, Figure 1 is a horizontal elevation of the apparatus. Fig. 2 is a plan view of the same. Fig. 3 is an elevation of the front end of the meter-wheel pump. Figs. 4 and 5 are enlarged views of the valve-box employed, Fig. 4 being a plan and Fig. 5 a sectional elevation.

Similar letters of reference designate corresponding parts in all the figures.

A designates a meter-wheel pump, the wheel of which is revolved in the usual manner by a weight, W, attached to a suspending-rope which is wound on a drum, J. This drum J is connected to the axial shaft C of the meter-wheel by means of the usual pawl and ratchet-wheel, *d*, (or its equivalent,) for transmitting the motion of the weight W to said shaft C, and thence to the meter-wheel proper, which revolves inside the shell and is fast to the shaft C. The revolving of the meter-wheel, when properly weighted and charged with water, will cause it to force a current of air out of the pipe D into the valve-box E, which air will be forced out under a pressure proportionate to the weight and water-seal employed.

Nothing whatever is here claimed as new in the meter itself, and any of the various forms in common use may be used in connection with my invention; but it is desirable to refer to its general mode of operation in order to impart a clear understanding of my invention, the purpose of which is, by an additional apparatus connected with and attached to any meter-wheel pump used for forcing or drawing air through the carburetor of a gasoline-gas machine, to compel any desired part of

the air to be carbureted, and to employ the remainder in reducing the gas made to a uniform quality.

Inside the valve-box E (which is a tight box) are two valves, *e* and *f*, communicating with or opening into pipes B and G. These two valves are represented as inverted caps, closing in quicksilver, contained in gutter-shaped seats *m;* but other forms of valve may be employed. The valves are so arranged that one cannot entirely close before the other is partly open, thus insuring a continuous current from the valve-box E. These valves *e* and *f* are pivotally connected at their upper ends to the ends of a lever, *h*. This lever *h* is secured fast on a rock-shaft, *c*, so as to move with it. In the front wall of valve-box E is a stuffing-box, *i*, through which the shaft *c* passes. To the shaft *c*, outside of the valve-box, is fastened a sector, H, in the upper part of which are fastened pins *k k*. On shaft *c*, outside the sector H, and mounted loosely on said shaft *c*, is a lever, F, weighted at its upper end with a ball, *l*. This lever F is capable of swinging loosely on shaft *c*, and vibrates between the pins *k k*, fastened in sector H, first falling to one side and then to the other by its own weight after being forced over its center of gravity. As the lever F strikes the pins *k k*, it carries in falling the sector H with it one way or the other, according to which of the pins is struck by it, thus causing the motion to communicate through shaft *c* and lever *h*, and necessarily closing the valve on the side upon which it strikes, and of course opening the opposite valve. The lever F is moved up to and past its center of gravity by the action of lever K, which presses against pins *n n*, fastened to the lower ends of the lever F.

The lever K is fulcrumed to the front head of the meter-wheel pump A by means of pivot O, and is moved in one direction by cams *r r*, &c., on a cam-wheel, R, impinging against a cam-plate, I, which is fastened by the thumb-screw *s* to the lower end of the lever K, and it is moved in the other direction by the weight P, which is fastened to it. The cam-wheel R is fastened to the meter-wheel-pump shaft C and revolves with it.

The pipe G connects the valve-box E with the carburetor S and conveys the air to the carburetor, there to be charged with the vapor of gasoline. The pipe B connects the valve-box E with the mixing-chamber M, and conveys the air to said mixing-chamber for reducing the gas to uniform quality. It will therefore be seen that there is a measuring apparatus between the pumping mechanism and that pipe which is supplied with air from the latter and extends to the generator, and there is also a measuring apparatus between the pumping mechanism and that pipe, which is supplied with air from the latter and extends to the mixing-chamber.

A pipe, N, conveys the gas from the carburetor S to the mixing-chamber M, there to be mixed with the alternate charges of air coming through the pipe B. A pipe, L, connects the mixing-chamber M with the burners, and conveys to these the gas which has been made uniform by the apparatus herein described. A pipe, Q, is for the admission of air to the meter-wheel pump A.

The cam-plate I is one of a series of cam-plates of different lengths to be used on the lever K, according to the proportion of air which may at different times be required to produce uniform gas. Any one of these can be easily taken off, and another, representing a different percentage of air and gas, can be substituted in its place by means of the thumb-screw *s*. It is evident that the longer the cam-plate is the longer the lever K will be held in one position relatively to the revolution of the meter-wheel pump A by means of a cam-surface on cam-wheel R, while impinging on its surface, and consequently the shorter the time it will be held in the opposite position by a portion of the wheel R intervening between the cam-surfaces *r*.

By taking off the cam-plate I and not putting on another the weight P will hold the lever K always in one position, and hence it is clear that by putting on a cam-plate long enough to reach from one cam *r* to the next cam *r* the lever K will continually be held in the reverse position; hence it is plain that in proportion to the length of the cam-plate I employed, so the position of the lever K will remain in like proportion to the one side or the other.

By means of cam-plates of different lengths, which can be substituted for each other at pleasure, the valves which alternately discharge air and gas into the mixing-chamber can be compelled to deliver any proportion of either, as compared with the other, that may be desired, and hence any desired quantity of gas within the possible range can be commanded.

Having thus particularly described the mechanism of my invention, I will now more fully explain the operation thereof.

When the gas-machine begins to deliver gas through the burners, the meter-wheel A must be revolving by means of the weight W. As it revolves, the cam-wheel R must also revolve with it and actuate the parts connected with it. Then the cam-surfaces *r* impinging on the cam-plate I, move the lever K outward at its base and to the right at its upper end, thereby raising the weight P. Then as the lever K moves to the right at its upper end it presses against one of the pins, *n*, in the lower end of lever F and moves it on until this lever F is swung past its center of gravity, whereupon it falls of its own weight against one of the pins *k* in sector H, thus carrying the sector H with it. Now, since the sector H is tightly fastened to shaft *c*, to which are connected the valves *e* and *f* inside the valve-box E, it is evident that this movement of sector H must open one of these valves by raising it and close the other by lowering it and immersing its mouth

in the quicksilver bath beneath it. Then as a cam-surface, *r*, reaches the end of the cam-plate I and passes off from it, the weight P moves the lever K, causing it to press against the other pin, *n*, in the lower end of lever F, thus moving lever F over its center of gravity, when it again falls over against the other pin, *k*, in sector H, carrying said sector with it, thereby opening the other valve and closing the opposite one. Since all the air discharged from the meter-wheel pump A must pass through the valve-box E and out of the pipes B and G, it is evident, by looking at the diagram, that all the air that passes through valve *f* and pipe G will pass on to the carburetor S and be charged with the vapor of the gasoline therein contained. It is equally evident that all the air that passes through the other valve *e* and pipe B will pass on and enter the mixing-chamber M without being carbureted, and must then mix with the other charge of carbureted air coming from the generator S.

As the gas which comes from the carburetor S would in itself not only be of a widely variable quality, but on many occasions too rich and smoky for ordinary burners, by the use of the apparatus which has been explained any desirable mixture of air and gas can be obtained by simply using the suitable cam-plate I of the series to be employed. These cam-plates I when in use each represent in the mixing-chamber a certain fixed unvarying percentage of carbureted air and a fixed percentage of uncarbureted air, making when added and mixed together a resulting grade of gas. This grade of gas can be changed at pleasure by the substitution of one cam-plate I for another representing the grade of gas desired.

The combined discharges of air and gas out of the valve-box E into the mixing-chamber M represent a unit volume, and of this any proportion may be gas, and the remainder must necessarily be air, or vice versa.

The longer the cam-plate I which is employed on the lever K the longer the valve *e* will be kept open and the more air will enter the mixing-chamber M, and, on the other hand, the shorter will be the time that the opposite valve *f* will be kept open to admit gas, and vice versa, when the shorter cam-plate is employed.

As I have before remarked, the apparatus herein described is represented as being attached to a meter-wheel pump, from which the air is forced under pressure to and through the carburetor; but it is equally applicable to the use of a meter-wheel when employed to draw air by suction through the carburetor instead of forcing it through it. A slight change in the arrangement of the pipes would only be necessary, the form of the respective parts of the apparatus itself remaining unchanged.

I am aware that it is old in apparatus for making gasoline-gas to employ a meter-pump from which a pipe extends, through which air is forced by the pump, said air being divided, a portion passing to the carburetor or generator and a portion to a measuring apparatus. In this old apparatus also a pipe leads from the carburetor to the measuring apparatus, and the measuring apparatus communicates with a mixing-chamber. There is no direct communication between the carburetor and the mixing-chamber.

I am also aware that it is old to take air into a measuring apparatus from the external atmosphere and deliver all the air so received into a mixing-chamber, where it is mixed with gas coming from a carburetor, the mixed air and gas being received into a meter-pump, from which it is sent out through a discharge-pipe. In this old apparatus there is no communication between the carburetor or generator and the measuring apparatus.

In my present invention atmospheric air is received into the pump. All the air so received passes directly to a measuring apparatus. A pipe leads from the measuring apparatus to the generator; another pipe leads from the measuring apparatus to a mixing-chamber, and still another pipe leads from the generator to the mixing-chamber. By this means the measuring apparatus is caused to supply air both to the generator and the mixing-chamber, each of which derives all its supply of air from that source, and that in a positive quantity wholly independent of the other. Therefore means is afforded whereby the supply of air to the generator in proper quantity to make gas and the supply of air to the mixing-chamber to dilute the gas as required may be regulated and varied as desired, and this by one operation and from the same point. This is advantageous, because, by measuring not only the quantity of air which is delived to the generator, but also that which is delivered to the mixing-chamber, a much more homogeneous and uniform quality of gas is produced than is possible with either of the two old methods to which I have referred.

Having thus explained my invention, what I desire to secure by Letters Patent is—

The combination of a pumping mechanism, a carburetor or generator, a pipe supplied with air from the pumping mechanism and extending to the carburetor or generator, a mixing-chamber, a pipe extending from the carburetor or generator to the mixing-chamber, a pipe supplied with air from the pumping mechanism and extending to the mixing-chamber, a measuring apparatus arranged between the pumping mechanism and that pipe which is supplied with air from the latter and extends to the generator, and a measuring apparatus arranged between the pumping mechanism and that pipe which is supplied with air from the latter and extends to the mixing-chamber.

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Witnesses:
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