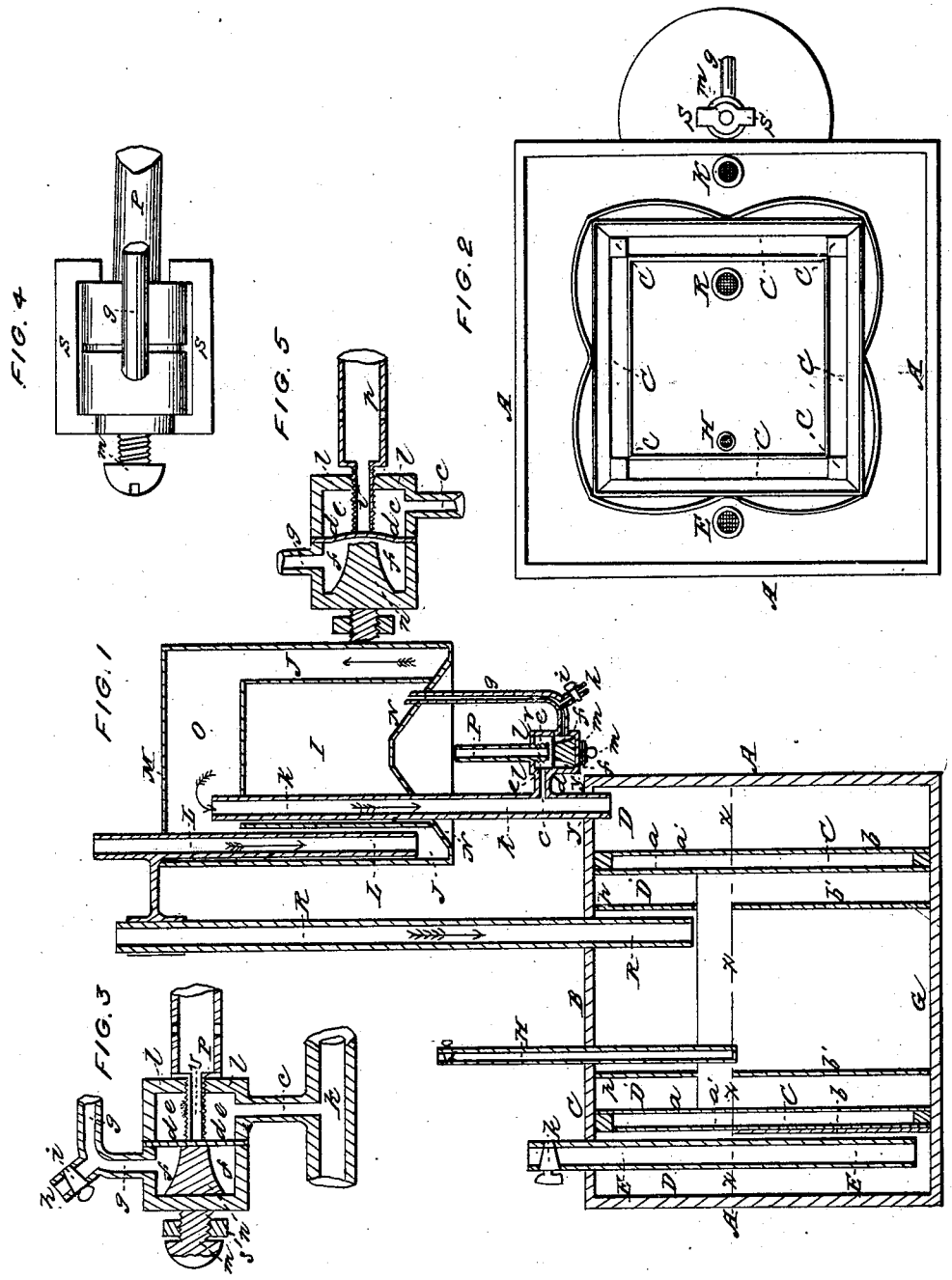
M. W. KIDDER.

Carbureter.

No. 107,268. Patented Sept. 13, 1870.



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Letters Patent No. 107,268, *dated September* 13, 1870.

IMPROVEMENT IN CARBURETING APPARATUS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, MOSES W. KIDDER, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Gas-Carbureters, that is, in the apparatus which is used for carbureting gas, of which the following is a full, clear and exact description, reference being had to the accompanying drawings making part of this specification, in which—

Figure 1 represents a vertical central section of my invention;

Figure 2, a bottom end view, after the lower head G has been removed.

Figure 3, a detached section of the diaphragm or valve *d* and its connections, considerably enlarged;

Figure 4, a rear side view of the same; and

Figure 5, a sectional elevation similar to fig. 3, but with the burner-tube P represented as having been turned upward by unscrewing, and with the diaphragm or valve *d* raised from off its seat.

In this invention the fluid-reservoir, of which A A are the sides, and B the top, may be made either round or square, or in any other form, and it must be of metal, or some substance that will resist the action of and retain naphtha or other similar fluids, naphtha being most commonly used for the purpose of carbureting gas.

Within this tank is arranged and secured a suitable frame-work, C, upon the interior and exterior of which is drawn cotton, flannel, or other fibrous material, *a* and *a'*, which covers the entire surfaces from top to bottom, and serves as wicking to convey the naphtha to the space D and D', above its surface, where the vapor of the naphtha accumulates to carburet the gas which passes through the saturated cloth and the vapor of naphtha which surrounds it.

The tank is filled with naphtha through the pipe E, which extends downward to near the bottom of the tank, and, like all other pipes entering said tank, it has a wire-gauze strainer applied to its lower end, to prevent the possibility of flame entering to ignite the fluid, and a stop-cock, *k*, at the top, is to close when the tank is filled.

A metal jacket, *b*, surrounds the wicking *a'*, and extends from the upper line *x* of the fluid to the bottom of the tank, and a similar metal lining, *b'*, is placed within the inner wicking *a*, and extends from the line *x* to the same level below as the outer jacket.

The lower end of the metal lining and of the jacket are intended to terminate near the upper side of the lower head G, but not to join it, so that all the naphtha carried up by the wicks must be taken from the bottom of the tank by passing between the lower ends of the lining, and the jacket, and the head G to the lower ends of the wicks, and, as the naphtha is not intended to rise above the top of the lining or the jacket, only the heavier naphtha, or that of the lowest gravity, can come in contact with the wicks at their lower ends, and in no other way but by passing beneath the lining or the jacket to the wicks inclosed between them.

A gauge-pipe, H, enters the tank through the top B, the lower end of which pipe extends a little below the top of the lining *b'* and the jacket *b*, and a stop-cock is arranged in the upper end of this pipe to prevent the escape of gas. When the tank is to be filled or refilled with naphtha, the stop-cock is opened and the gas lighted at the top of the gauge-pipe, and, when a sufficient quantity of naphtha has entered the tank, such naphtha flows up to the line *x* and closes the lower end of the gauge-pipe, shutting off the gas from said pipe when the light at the top ceases to burn, thus indicating the proper height of the fluid within the tank. The stop-cocks in the gauge-pipe and in the filling-pipe are then closed, and need not be opened again until the fluid in the tank requires to be replenished.

Above the lining *b'*, and joining the under side of the top head B of the tank, a curtain, *p*, depends. This curtain incloses a space, D^2, which takes in the gauge-pipe H and the exit-pipe R, and all the gas which passes through the apparatus must pass under the lower edge of the curtain *p*, and through the vapor which is near and above the surface of naphtha in the tank.

The vapor of naphtha near the surface, being more abundant, increases the illuminating power of the gas more than at the top of the spaces D, D^1, and D^2; hence the importance of the curtain *p* to conduct or guide the current of gas downward to near the surface of the naphtha, and through or in contact with the vapor, before passing out at the exit-pipe R, and to the burners arranged for lighting or illuminating space.

At some convenient point above the tank just described, another tank or cylinder is arranged. This tank consists of an inner chamber, I, which is filled with water, and another tank or heating-chamber, J, which surrounds the water-tank, except at the under side.

This double-chambered tank is connected with the tank first described by a pipe, K, which may enter the lower tank through top head B.

This connection is not intended to be a fixed one, but so made that the parts may be detached by removing the lower end of the pipe K from the head B at *y*.

A supply-pipe, L, enters the heating-chamber J through the top end M, and extends downward to near the bottom N, which is conical or flaring, as shown.

From one side of the connecting-pipe K, and a little below the water-tank, is a small branch pipe, *e*, which connects with a gas-chamber or space, *e*, directly under the center of the flaring bottom N of the

water-tank; and below the space *e*, and divided by an elastic diaphragm or valve, *d*, is a water-space, *f*, connected with the water-tank I by a pipe, *g*, at the lower curve of which is a pipe, *h*, through which the water-tank may be filled by removing and inverting the tank. Said pipe may be closed by a stop-cock, *i*, arranged for that purpose.

An ordinary Bunsen burner, P, is applied to the top of the gas-chamber or space *e*, at the center of the top head *l*, and directly under the center of the flaring bottom N of the water-tank.

The lower part of the burner-tube screws through the head *l*, and is intended to be raised or lowered to regulate and control, in connection with the elastic diphragm, the supply of gas to be admitted to the burner P, or to stop the flow of gas to said burner by screwing the tube down and pressing the diaphragm tightly on the top of the seat *n*, beneath the lower end of the tube.

The mode of applying the diaphragm is clearly shown in figs. 3 and 5. In the former the diphragm is shown as being pressed down on the seat *n*, and in the latter it is raised as it appears when in action or acted upon by the pressure of water from the tank I through the pipe *g* to the space *f*.

R is the exit-pipe, through which the gas passes from the naphtha-tank to the main gas-pipes, and to the burners in different parts of the building, or where the carbureter is connected.

The mode of holding the parts together with the diaphragm between them is clearly shown in fig. 4, by a clamp, S, which grasps the two parts *e* and *f*, and a set-screw, *m*, passes through the lower part or hub of the clamp to bind such parts firmly together.

When this carbureting apparatus is applied, the tank containing the naphtha is placed a few inches below the surface of the ground in a cellar or other suitable place, and covered with earth or with other substance that will not be liable to ignite or to injure the apparatus, leaving the top end of the filling-pipe E and of the gauge-pipe H above the surface of ground a suitable distance for convenience in filling the tank.

The tank I, containing water, and having a heating-chamber around it, is then connected with the lower tank by a pipe, K, which must be long enough between the top of the lower tank and the branch pipe *c*, to bring the upper tank above the earth surface, and convenient for operating. Gas from the main pipe is then let in through the meter and passes through the supply-pipe L to the bottom or near the bottom of the tank I, and down through the pipe K to the space D of the vapor-chamber above the naphtha in the lower tank.

From the space D the gas passes through the wicks *a* and *a'* to the space D^1, thence under the lower edge of the curtain *p* to the space D^2, and out through the exit-pipe R to the burners, and, in its passage through the several apartments or spaces, such gas passes through the vapor of naphtha near the surface of that in the tank, and such gas becomes saturated or charged with the vapor of naphtha which is constantly rising.

It is well known that when the temperature of naphtha is near a freezing point, but little of the naphtha is vaporized; and that gas, at a low temperature, or near a freezing point, is capable of combining with vapor of naphtha only in a limited degree; or, in other words, the capacity of gas to combine with or take up vapor of naphtha is very limited when the temperature of the gas is low or near a freezing point.

To render the gas capable of combining with vapor of naphtha, or to increase the capacity of gas to take up such naphtha vapor, and also to cause the naphtha to vaporize in sufficient volume, or in proportion to the capacity of the gas to take up or combine with such vapor when the temperature of the naptha or of the gas, or of both of them, is near a freezing point, the tank I being filled with water, the gas is lighted at the top of the burner P, and the burner-tube adjusted or raised up, as shown in figs. 1 and 5, to a height in proportion to the degree of cold, or the temperature of the gas or the naphtha, or both. The lower the temperature of the gas or the naphtha, the higher the burner-tube should be raised, so as to produce a larger flame at the top of the burner by a greater volume of gas passing through the tube.

Heat from the flame of the top of the burner P is transmitted through the bottom N of the tank I to the water therein, heating and expanding the water, which also fills the pipe *g* and the space *f* below the diaphragm or valve *d*.

When the water is expanded by the heat, the pressure caused by such expansion acts against the under side of the valve *d*, forcing the elastic valve upward in the direction of or nearly in contact with the lower end of the tube of the burner, thus narrowing the passage for gas to the burner, and consequently reducing the size of the flame and the amount of heat beneath the water-tank.

This reduction of heat allows the water to cool slightly, which relieves the pressure under the valve, and the valve gradually recedes or falls away from the lower end of the burner-tube, which widens the passage and admits a greater volume of gas to the burner, increasing the flame and the heat, and again raising the temperature of and expanding the water, and again forcing the elastic valve upward in the direction of the lower end of the tube of the burner, to reduce the passage for gas to the burner, the size of the flame, and the amount of heat to the tank, and the water therein, as before.

These operations and changes, such as heating and expanding the water, forcing the elastic valve upward by such expansion, reducing the size of the flame, and allowing the water to cool, relieving the pressure under the valve, and allowing it to fall and widen the passage for gas to the burner, increasing the size of the flame, and again raising the temperature of the water and forcing the elastic valve upward to narrow the passage for gas to the burner, and again reduce the flame and the heat to allow the water to cool; these changes and operations are constantly going on so long as the gas remains lighted at the top of the burner P, and so long as said burner-tube is raised or adjusted, as shown in figs. 1 and 5, to allow the pressure of the expanding water to act under the elastic diaphragm or valve *d*, and operate the same, as described.

When the water in the tank I is heated by the flame at the top of the burner P, the gas which passes through the apparatus is also heated by passing around and above the heated water-tank through the annular space J and the chambers O, and such gas is still further heated by passing through the pipe K, which is completely surrounded by the heated water in the tank.

Heating the gas before passing it into the naphtha-tank renders it more susceptible or capable of taking up or combining with the vapor of naphtha, which greatly increases the illuminating power of the gas, and the heat contained in the gas so raises the temperature of the naphtha, as the heated gas passes through the saturated wicking, and through the compartments above, and near the surface of naphtha in the tank, as to cause suitable evaporation of naphtha to supply the gas with that vapor which so greatly increases its illuminating power.

When the temperature of the naphtha or of the gas is sufficiently raised to allow the naphtha to vaporize, and the gas to combine with or take up the

vapor of the naphtha without the aid of artificial heat, as when there is a change in the atmosphere from cold to warm, or where the building or inclosure containing the carbureting apparatus is heated to that degree to allow the naphtha to vaporize and the gas to combine with the vapor of naphtha, so as to materially increase the illuminating power of the gas, then the tube of the burner P may be screwed down to a position shown in fig. 3, pressing the diaphragm down onto the seat *n*, and perfectly closing the lower end of the burner-tube, and preventing the escape of gas from the burner.

The gas which supplies this burner passes from the pipe K, through the branch-pipe *c*, into the space *e* above the valve *d*, and through the tube *v* of the burner.

In vaporizing the naphtha, and in rendering the gas capable of combining with the vapor, as above described, and without the use of artificial heat, I do not consider that the operation will be performed in a suitable manner unless the surrounding atmosphere, which affects the warming or heating of the substances, shall heat both the gas and the naphtha, and merely passing the gas through ordinary pipes to the burners, as arranged for the burning of such gas to illuminate space, will not be sufficient. It is of importance that both the gas and the naphtha shall be in a place suitably heated or warmed, or that artificial heat shall be used.

The naphtha-tank is more properly placed in the ground at the bottom of a cellar, or under the building which contains the carbureter, and the gas is admitted from a main pipe from the street, the temperature of which is modified or determined by the prevailing temperature of the season, at times falling below the freezing point, when its capacity for taking up the vapor of naphtha is necessarily insufficient to render the process of any considerable value; but by raising the temperature of the gas before it enters the naphtha-tank, its capacity for taking up the vapor is not only increased, but the evaporation of the naphtha, depending also upon the temperature, is insured by the increased temperature of the gas.

Others and mere formal variations from the construction, arrangement, and mode of operation herein described I do not consider to be unprotected by this patent, if granted.

One object of this invention is to utilize such gravities of naphtha for carbureting as otherwise could not be employed with advantage in the winter season, when the largest quantity of gas is consumed.

Another object of this invention is to use such gravities of naphtha as bear a low market value and at the same time a higher value than higher gravities of naphtha for the special purpose of carbureting, as the low gravities contain a larger per cent. of carbon than the higher, and this is the particular substance required to increase the illuminating power of gas.

I do not confine myself to the specific mode or means described for heating the gas before passing it into the carbureter, but I intend to use any equivalent mode or means, or any obvious substitute, for the herein-described gas-heating device or apparatus, when used in combination with the naphtha-tank, substantially as set forth and shown.

The most important feature and principle of my invention is to heat the vapor of the naphtha and prevent heating the naphtha itself, for to heat the naphtha produces distillation, and, consequently, condensation of vapor in the pipes; and this I avoid by first heating the gas, and then, by passing such previously-heated gas into the vapor-chamber or the space above the naphtha, thereby heating the vapor and rendering it more capable of combining with the gas, which, being previously heated, combines more readily with the vapor of the naphtha, and increases its capacity to combine with the gas, and all without perceptibly raising the temperature of the liquid naphtha, the effect of which would be injurious, as before explained.

The gas, being heated to 124° Fahrenheit before it enters the carbureter, falls in temperature 58°, and passes from the carbureter at 66° Fahrenheit, the 58° of evident heat in the gas becoming latent in the process of evaporation.

I disclaim any and all modes, means, devices, or apparatus for carbureting gas by heating the naptha or other liquid, the vapor of which becomes the carbureting agent; but as my invention, and which I desire to secure by Letters Patent,

I claim—

The method, substantially as described, of combining illuminating gas with the vapor or the vaporized products of naphtha or other equivalent liquid, by first heating the gas, and by passing such previously-heated gas into the vapor-chamber or the space above the naphtha, thereby increasing the capacity of each product to combine with the other, and also increasing the illuminating power of the gas, as set forth.

MOSES W. KIDDER.

Witnesses:

JOHN E. CRANE,

ALVIN LAWRENCE.