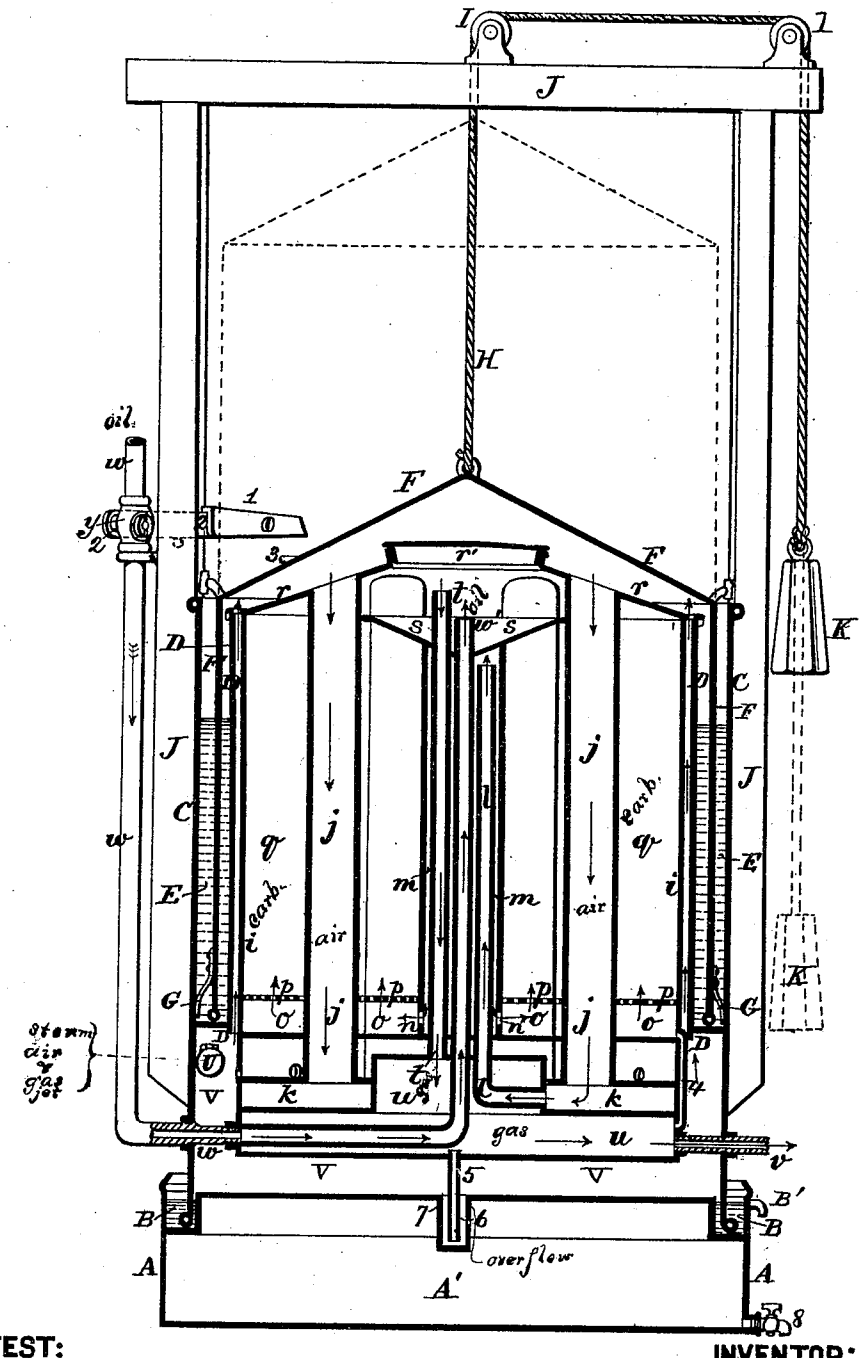
2 Sheets—Sheet 1.

I. COOK.

CARBURETER.

No. 177,210. Patented May 9, 1876.

FIG. 1.



ATTEST:

Robt Burns.
Henry Tanner.

INVENTOR:

Isaac Cook
By Wright Bro.
Attys.

2 Sheets—Sheet 2.

I. COOK.

CARBURETER.

No. 177,210. Patented May 9, 1876.

FIG. 2.

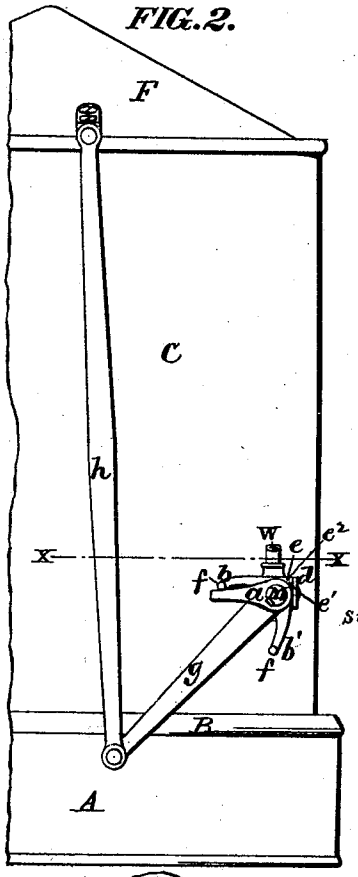


FIG. 4.

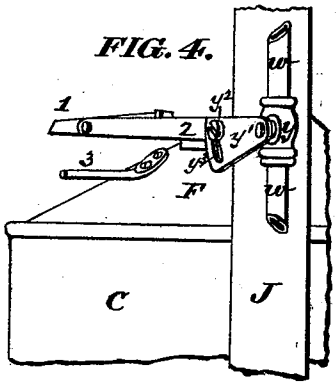


FIG. 5.

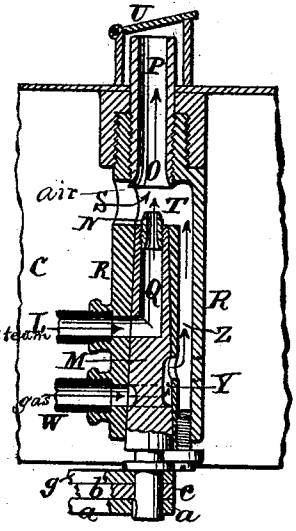
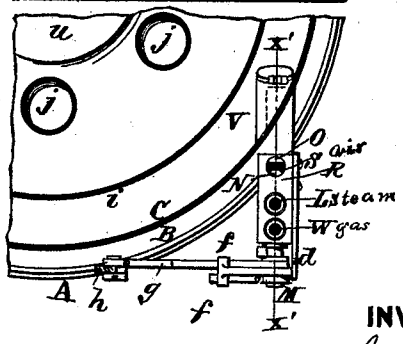


FIG. 3.



ATTEST:

Robt. Burns.
Henry Tanner

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UNITED STATES PATENT OFFICE.

ISAAC COOK, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF HIS RIGHT TO JACOB R. SPRAGUE, OF SAME PLACE.

IMPROVEMENT IN CARBURETERS.

Specification forming part of Letters Patent No. **177,210**, dated May 9, 1876; application filed February 12, 1875.

To all whom it may concern:

Be it known that I, ISAAC COOK, of St. Louis, in the county of St. Louis, and State of Missouri, have invented a certain new and useful Improvement in Carbureters, of which the following is a specification:

The first part of my improvement consists in an improved form of supply apparatus or injector, to force atmospheric air, gas, or both, into the carbureter.

The second part of my improvement consists in the construction of the operating mechanism of the injector-valve. In this the valve-stem has a radial arm, which is acted on by two spreading arms upon a head having oscillatory movement upon the valve stem or plug. This head has two flattened edges, upon which presses a spring to hold the head in position, whether the valve is closed or open, the spring also acting to carry the head around to such positions after it has been moved a certain distance by a lever connected with the rising and falling air-receiver, by whose descent the air, &c., are forced through the carbureting-chamber.

The third part of my improvement consists in the combination of an air-chamber or receiver, an arm projecting therefrom, a cock-lever having a tilting-latch at its end, with a gasoline cock or valve. The tilting-latch allows the arm to pass down without operating the valve.

The fourth part of my invention consists in the combination of a cock-lever, tilting-latch, slotted adjusting-plate, set-screw, and arm, with a gasoline-cock, for regulating the supply of gasoline to the machine.

The fifth part of my improvement consists in the combination of the carbureter proper with a base, with which it is connected by a water-joint, having an overflow-pipe, the base having a trap through which the waste gasoline or petroleum passes into the waste chamber occupying the interior of the base.

In the drawings, Figure 1 is an axial section of the machine. Fig. 2 is a side view of a part of the case, giving an end view of the injector by which the air is forced into the machine. Fig. 3 is a horizontal section at line X X, Fig. 2. Fig. 4 is a perspective view of the gasoline supply-cock. Fig. 5 is an enlarged section of the injector at X′ X′, Fig. 3.

The case has a base, A, whose interior constitutes the drip or waste chamber, A′, for the waste gasoline or surplus escaping from the carbureting-chamber. Around the top of the base is an annular water-trough, B, in which rests the lower edge of the main case. The main or upper portion of the case has two concentric walls, C D, between which is an open-topped water-chamber, E, which receives the cylindrical part of the open-bottomed cover or receiver F, this arrangement forming a water-joint between the receiver and the rest of the case, and allowing of the vertical movement of the receiver. G G are guides to the receiver, the said guides having bearing against the wall or shell C. H is a cord or chain attached to the top of the receiver and passing over pulleys I upon the frame J. At the end of the cord H is suspended a weight, K, which forms a partial counterbalance to the receiver, and by increasing or diminishing this weight the pressure on the current of gas within and issuing from the carbureter is regulated. L is the steam-pipe which conveys steam to the injector by which the air or gas, or both, are forced into the machine. The injector has a plug, M, tubular at the point, and supplied with an adjustable screw-nozzle, N, and opposite to this nozzle is the mouth O, of the receiving-pipe P. The axial steam-passage Q (in the plug M) communicates with the steam-pipe through a radial extension passing through the side of the plug and the case R. S is the orifice for the entrance of air, the air passing into a cavity, T, around the nozzle N, which cavity is crossed by the steam-jet by which the air is carried into the mouth O, and through the check-valve U, into the chamber V within the machine. W is a pipe, through which city or other gas may be brought to mingle with the air in cavity T, and be carried with it into the machine.

The plug M has a passage, Y, forming communication between the pipe W and a passage, Z, of the case, when the plug is in position to admit the steam, but said passage Y is closed simultaneously with the steam-pas-

sage through the cock. Upon the outer side of the plug is an arm, *a*, by which it is turned, through the medium of two arms, *b b*, upon a collar or head turning freely on the plug-shank, but held in either of the two positions by a spring, *d*, resting against flat edges *e e*^{1} of the head *c*. At the ends of the arms *b b* are cross-pins *f*, which impinge against the arm *a* when the head *c* is turned upon the plug-shank. The head *c* is turned by the following means: *g* is a lever fulcrumed on the plug-shank, upon which (like the head *c*) it turns freely. The outer end of this lever is connected by a rod, *h*, to the lifting-top or receiver F, so as to rise and fall with it, and as it is moved up and down, when near the extremes of oscillation, it comes in contact with the cross-pins *f*, and turns the head *c* a distance sufficient to carry the point *e*^{2} past the plane of the spring *d*, so that the pressure of the spring will carry around the head *c* the rest of the distance to fully close or open the steam-cock, as the case may be. It will be observed that while the receiver is engaged in making the greater part of its (vertical) movement the steam-cock is at rest, and that said cock is only turned as the receiver is arriving at its extreme upper and lower positions.

The mingled air and steam (either with or without an admixture of gas) enter the annular upper part of the chamber V in a tangential direction, (so as to give a rotary movement to the contents of the chamber,) and pass upward through the annular space between the wall D and the wall *i* of the interior case, and so into the receiver F, which is raised by the pressure, to make room for the incoming gases, until, on the receiver arriving at its upper position, (as indicated in dotted lines in Fig. 1,) the steam-cock of the injector is closed, and no more gases enter the receiver until its contents have passed through the carbureting chamber and the receiver has subsided to near its lowest position, and the injector-cock is again opened. The receiver on descending forces the air, &c., through the carbureting-chamber, with a pressure in proportion to the preponderance of the weight of the receiver over the weight K. The gases from the receiver pass downward through ducts *j* into annular chamber *k*, then upward through duct *l*, (in large duct or trunk *m*,) then down duct *m*, and through orifices *n*, into annular chamber *o*, whose top constitutes the foraminous bottom *p* of the carbureting-chamber *q*.

The carbureting-chamber *q* surrounds all the ducts *j* and *m*. The sides *i* of the interior case form the outer sides of the carbureting-chamber, and the top *r* of the said case the top of said chamber. The central part of the top *r* is formed of a removable cover, *r'*, fitting with an air-tight joint, to prevent the escape of carbureted gases into the receiver. This removable cover is to allow access to the carbureting-chamber for the introduction or removal of the fibrous or capillary material placed in such chamber for saturation with gasoline. *s* is a pan to receive the gasoline flowing into it from the supply-pipe; and this pan and the upper part of the carbureting-chamber *q* in proximity to it I prefer to fill with cotton-waste, or some such substance which will readily become saturated with the liquid, and convey it outward over the whole upper part of the chamber, from whence it percolates through the sponge, sawdust, or other suitable porous or fibrous substance with which the carbureting-chamber *q* is chiefly filled. The air or gas (or the mixture of the two, as the case may be) passes up through the saturated material in chamber *q* and down through pipe *t* into the chamber *u*, from which it (or they) passes out through the pipe *v* to the gas-burners.

The gasoline or petroleum enters the machine through a pipe, *w*, leading from a reservoir sufficiently elevated to give the requisite pressure to cause the flow of gasoline into the machine against the interior pressure therein. The flow of the gasoline is regulated by a cock or valve, *y*, opened, each time the receiver rises, by a projecting arm, 3, of the receiver coming in contact with the tilting finger or latch 1 at the end of the valve-lever 2. The lever 2 is pivoted on the plug-shank of the cock *y*, and is secured to a plate, *y*^{1}, that is attached rigidly to said plug. *y*^{2} is a set-screw, screwing into the lever 2 and passing through a slot, *y*^{3}, in the plate *y*^{1}. By adjusting the lever 2 upon the plate *y*^{1}, the time the cock remains open at each upward movement of the receiver is regulated; for if the end of the lever is set higher, the arm 3 will not so soon impinge against it, and consequently the cock will not be kept open so long a time.

As the receiver descends the arm 3 comes in contact with the top of the outer end of the tilting-finger 1, and, lifting up the heavier inner end, passes, without moving, the lever 2, and after the passage of the arm 3 the finger 1 drops back into the position shown in Figs. 1 and 4. The pipe *w* extends downward from the cock *y*, then horizontally into the machine, and upward vertically through the duct *m*, and its mouth *w'* discharges into the pan *s*, where the gasoline is absorbed by the porous material (say cotton-waste) in the pan, and by such material conducted outward to saturate the fibrous or porous material with which all of the chamber *q*, beneath the level of the pan, is filled. This latter material may consist of sponge, sawdust, or any other material calculated to sustain the hydrocarbon, and to allow the easy ascent of the air, and to give out the vapor to the air.

Any superabundance of gasoline drips through the bottom *p* of the chamber *q*, and passes through the pipe 4 to the chamber *u*, and down through the pipe 5 to the trap 6, having holes 7 above the level of the lower end of the pipe 5, so as to shut off communi-

cation between the air in the waste-chamber A′ and the chamber V. The bottom of the chamber *u*, owing to the heat of the mingled steam and air entering the chamber V beneath it, is considerably heated and causes the evaporization of gasoline falling or dripping upon it, and the said vapor will be carried out with the carbureted air passing through the pipe *v*. 8 is a cock to draw off any gasoline from the chamber A′.

The operation of the apparatus has been pretty fully described in the body of the specification, but something more remains to be said under this head.

The machine may be used with air alone (with the necessary steam) forced in by the injector, or with gas alone—in either case the orifice through which the other fluid enters being closed—or both gas and air may be used. The pressure on the receiver may be regulated so as to force the gas through the burners at any desired pressure, and of this feature I propose to avail myself by using burners with an induction-opening for atmospheric air, which is drawn in by the current of gas passing through the burner, and mingles therewith so as to render the light more brilliant by the thorough mixing of the gas and air before ignition. To accomplish this to satisfaction, the pressure of the gas has to be up to a certain point. This application of the described burner would render it unnecessary that atmospheric air should be injected into the carbureter, as the city gas alone might be passed therethrough, and the air mingled at the burner, and there would be no explosive mixture in the machine. But, as with my carbureter there is no possibility of a burning substance being accidentally brought in communication with the interior, the described feature of absolute safety is not perhaps of much importance. The forcing of the air in by steam renders any form of mechanical blower unnecessary, but in addition to this negative advantage there is a great positive advantage in that the interior of the carbureter is heated, much increasing its efficiency, and rendering it operative in cold situations in winter, where, without this provision, it could not work.

To heat the carbureter throughout, but especially the carbureting-chamber *q*, I make the heated air to pass up all around the sides *i* of the said chamber, and then downward through the ducts *j*, passing through the annular carbureting-chamber, and, after passing upward through the pipe *l*, downward through the pipe or duct *m*, extending through the center of the chamber. The carbureting-chamber *q* might be heated by allowing the heated air and steam to pass directly into it; but this would be objectionable, because the air should be freed from moisture before entering the carbureting-chamber, and this end is accomplished by causing the air to follow the devious course described and shown, in which it loses heat, and the moisture is condensed, the latent heat of the steam being given out to the air and surrounding metallic surfaces. The condensed moisture in the annular chamber, between the walls D and *i*, and that in the receiver F, except that running down the sides of the latter, finds its way into the trough B, forming the water-joint between the base A and the upper part of the case, and the water escapes from the trough B through overflow-spout B′.

The carbureted air is heated before leaving the carbureter or machine by passing through the heated chamber *u*, this chamber being made hot by the heated air and steam in the chamber V beneath it.

I claim as my invention—

1. The supply apparatus or injector, consisting of the case R, provided with steam, air, and gas supply orifices and passage T, and the plug M, having passage Y, substantially as and for the purpose set forth.

2. The combination of the plug M, arm *a*, fork *b b′*, spring *d*, lever *g*, rod *h*, and receiver F, all operating substantially as set forth.

3. The combination of the receiver F, arm 3, cock-lever 2, having tilting-latch 1, with the gasoline-cock *y*, as and for the purpose set forth.

4. The combination of the cock-lever 2, tilting-latch 1, slotted adjusting-plate y^1, screw y^2, and arm 3, with the gasoline-cock *y*, as and for the purpose set forth.

5. The base, A having a closed top and water-joint, B, having an overflow-pipe, B′, or its equivalent, in combination with the shell C of the upper or main part of the machine, forming an air-tight joint through which the water of condensation escapes, substantially as set forth.

ISAAC COOK.

Witnesses:
SAML. KNIGHT,
ROBERT BURNS.