No. 848,597. PATENTED MAR. 26, 1907.

W. MITCHELL.

BURNER.

APPLICATION FILED AUG. 30, 1905.

Fig. 1.

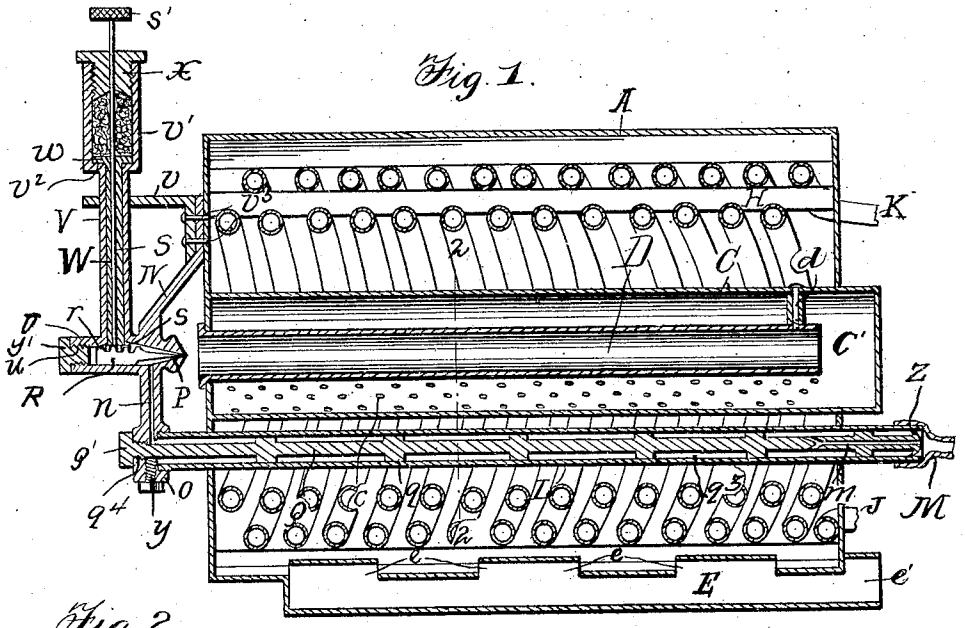
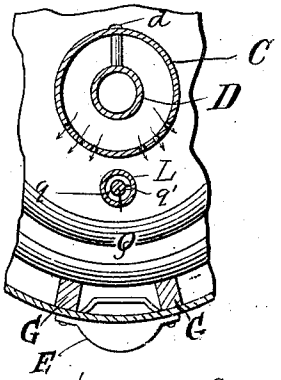


Fig. 2.



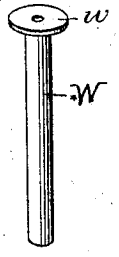


Fig. 4.

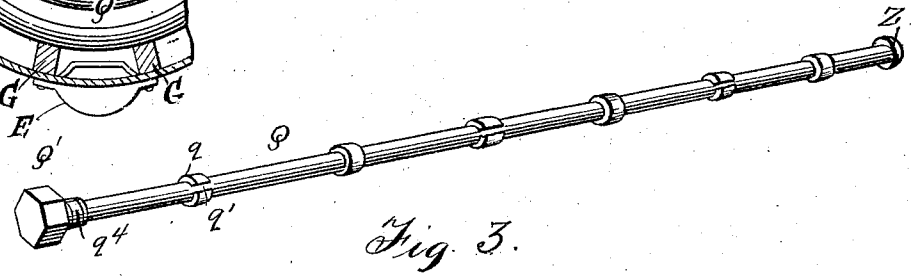


Fig. 3.

Witnesses
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UNITED STATES PATENT OFFICE.

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BURNER.

No. 848,597. Specification of Letters Patent. Patented March 26, 1907.

Original application filed January 25, 1905, Serial No. 242,638. Divided and this application filed August 30, 1905. Serial No. 276,435.

To all whom it may concern:

Be it known that I, WILLIS MITCHELL, a citizen of the United States, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Burners; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to burners for use in steam-generators and for similar purposes.

It consists in the construction and combination of parts hereinafter more particularly set forth and claimed.

In the accompanying drawings, Figure 1 represents a longitudinal central vertical section through a steam-generator provided with a burner embodying my invention. Fig. 2 represents a cross-section of the same on the line 2 2 looking to the right. Fig. 3 represents a detail view of the collared rod or solid cylinder which forms part of the gas-generator. Fig. 4 represents a detail perspective view of a sleeve for holding the valve-operating pinion in place.

A designates a cylindrical generator-casing; B, the water-tube wound helically within the same; C, a cylindrical burner closed at the ends and extending as a hollow core through the helix formed by said water-tube, the said burner being supported by the front and rear walls of the casing and protruding beyond the latter, and D a mixing-tube or mixing-chamber open at both ends and extending inward from the front wall of the generator concentrically within the said burner as far as the rear wall of the said casing, leaving a space between the rear end of the said tube or chamber and the protruding rear end of the said chamber. The mixing-tube D is supported at its front end by the front wall of the casing A, through which wall it barely extends, the rear end of said mixing chamber or tube being suspended by a screw *d* from the upper part of the said burner or any other satisfactory means. By "front" or "forward," as applied to the various parts herein described, I mean the end which is nearest to the vapor-jet or gas-jet, hereinafter described.

The under part of the burner C aforesaid is provided with many small apertures in longitudinal series extending as far as the coils of the water-tube, these series of apertures being arranged into two sections on each side of its vertical central longitudinal plane and having an imperforate longitudinal strip of the bottom of said burner between them. The jets of burning gas are directed obliquely downward and outward in two sets of divergent streams against the lower parts of the water-tube coils. This divergence prevents the flame from impinging on the outlet of the casing, which is through a longitudinal trough or tube E along its bottom, communication between said outlet-trough and the interior of the said generator being maintained by openings *e* and the final discharge of said trough or tube being at its open rear end *e'*. There is no outlet-flue at the top of the casing, and the hot air and products of combustion gathering at the top and eddying through and about the coils of the water-tube at the sides heat all parts of the water-tube equally, or approximately so.

The water-inlet tube J enters to the helical water-tube through the rear wall of casing A, and the steam-outlet tube K passes from said water-tube out through said wall.

The water-tube coils are supported and spaced by longitudinal bars G and H, the especial construction and arrangement of which are more fully explained in the specification of my application, Serial No. 242,638, filed January 25, 1905, of which this application is a division. The same is true of all features especially appertaining to the steam-generator irrespective of the burner and the devices for supplying fuel thereto. Such features, accordingly, are not claimed nor minutely described in this application.

The extension of the burner C beyond the rear wall of the casing A provides a space C', in which the gas or vapor and air already mixed in the tube or chamber D may more perfectly commingle before turning back to the discharge-apertures *c*. The inflammable gas or vapor which constitutes the fuel of this generator is produced in a vapor-generator L, extending longitudinally through casing A parallel to burner C and between it and the helical water-tube B. The rear end of this generator L protrudes through the rear end of the casing A and is there provided with some suitable volatile liquid hydrocarbon through an oil-tube M. The forward end of

the said generator similarly protrudes through the front wall of casing A and is received by a collar O, fitting thereon, which is integral with a bent bracket N, fastened to said front wall. Said bracket and said wall support said front end of the generator. A bore *n* of said backet communicates at one end with the interior of the generator and at the other end with a jet-hole P, opposite the central line of mixing-chamber D at an interval sufficient to allow the free inflow of air with such gas to said chamber.

The generator L consists of a long fixed cylindrical hollow casing or tube and a removable rod Q of similar length contained therein, said rod being provided at intervals with collars or annular shoulders *q*, which are of equal diameter with the interior of said casing. Each collar *q* is provided with a longitudinal groove or channel *q'*, connecting the space before it to the space behind it, these grooves or channels being arranged alternately on opposite sides of the generator. The spaces between said collars constitute gas-retorts, and this alterante arrangement of such channels causes the hydrocarbon currents to eddy in the retorts, the fuel being self-retarded to insure perfect gasifying. It is more intensely heated at each retort as it passes from the rear of the generator to the front, the proximity of the burner insuring equal application of its heat to every retort and the effect being cumulative.

The collared rod Q has at its rear end a sharp-edged disk Z, which serves both to close the generator-tube and to clean its interior while the rod is withdrawing. The latter feature is important, for my generator may use kerosene as well as gasolene, and heavier oil, such as the former, will produce a quantity of soot and other residuum which would soon clog the passages q^3 and stop the generation of gas and also of steam, unless some remedy were provided. An inlet-bore *m* through the center of disk Z and the proximate part of rod Q admits the liquid fuel from inlet-pipe M to the first retort next the said disk.

At its forward end the rod Q is provided with an operating-knob Q', also with screw-threads q^4, engaging similar threads screw-tapped in said bracket N, through which it extends, being locked there normally by a small screw *y*, that works through on one side of said opening. The said rod is, however, easily freed by unscrewing first the said locking-screw and then itself, whereupon it may be withdrawn by a slight pull, incidentally cleaning the interior of the tube or casing of generator L, as stated. It may be as readily returned to its place and locked there by reversing the above procedure. The gas-generator is then complete again.

The jet-hole P is governed by a needle-valve R, having on its stem a toothed rack *r*, engaged and operated by a pinion *s*, turning with a rotary adjusting-rod S, having a knob or head *s'*. By said rod, pinion, and rack the valve is advanced or withdrawn, as desired. The said valve-stem and adjusting-rod move in and are supported by tubular guide arms or castings U and V at right angles to each other and preferably integral with bracket N. A supplemental bracket *v* supports the middle part of arm V. Both brackets N and *v* are fastened to the front wall of casing A by screws v^3. A sleeve surrounds rod S within the tubular arm V, its lower end being in contact with pinion *s* and its upper end being provided with a disk-form head *w* within an enlargement *v'* of the said arm. This head bears against shoulder v^2 thereof, and the interior of said enlargement constitutes a packing-chamber normally supplied with any suitable readily-compressible substance, as shown, and closed at the outer end by a screw-threaded gland or screw-plug X, which engages internal screw-threads of the wall of said chamber, compressing said material on the rod S and against the head *w*, said gland being centrally bored to receive said rod. The sleeve W is thereby held against the pinion *s*, keeping it in engagement with the rack R by a sufficient pressure. The outer end of the horizontal tubular arm U is internally screw-threaded at *u* and closed by a screw-plug *y'*.

The operation of my improved burner is as follows: The vapor from the jet-hole enters the proximate front end of the mixing-tube or mixing-chamber D, this initial flow being started by any convenient means for preheating. This current draws air in with it, and the air and vapor mix in said tube or chamber D, completing such mixture in the space C' before returning through the burner C outside of the said mixing-chamber toward the front of the apparatus. This mixture escapes, by the way, through holes *c* and is ignited in thus escaping by a match inserted through an opening of casing A or in and other convenient way. The intense heat thus generated causes a flow of hydrocarbon through the generator under pressure to the jet-hole and mixing-tube, owing to special construction of the generator and the cumulative action of the retorts and heat acting thereon, as already explained. This gas and air drawn in therewith follow the same circuit as the first mixture of air and vapor and continue in perfect and efficient combustion, the jets of flame impinging on the lower parts of the coils of the helical steam-generator, ascending thence to the upper part of casing A and acting equally and thoroughly on all parts of the generator before finally escaping through outlet E at the open end *e'*. If the internal pressure of the generator tends to become excessive, the said outlet will afford relief; but the outflow through *e'* is or-

dinarily light and the combustion of the fluid fuel is so complete as to cause hardly any odor.

By leaving the outer end of the mixing-tube quite open I admit air freely through the same, as drawn in by the blast of the jet block or nozzle, to mix with the vapor in said tube and am enabled to leave the wall of the mixing chamber or tube imperforate, besides avoiding the expense and trouble of providing a branch tube and coupling.

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

A horizontal, elongated burner closed at both ends and having its under side provided with perforations, in combination with a mixing-tube, which is open at both ends, arranged concentrically within said burner and supported at its inner end by the latter, a jet block or nozzle discharging into the open outer end of said mixing-tube, and a vapor or gas generator arranged under the said burner, to be acted on by the flame-jets from said perforations, and supplying vapor to the said jet-block, the said burner and the said mixing-tube being each in a single piece, with an unobstructed space between their sides, a space being also left between their inner ends, to provide for reversing the current of mixed air and vapor, and the said generator being provided with a collared core which divides said generator into a series of connected retorts, and a cleaning-disk with inlet-passages on the inner end of said core, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIS MITCHELL.

Witnesses:
WALTER E. LOMBARD,
CHAS. A. MERRIAM.